CHAPTER IV

RESULTS

The purpose of this study was to determine if gender differences might explain why the females in an elite High School do not plan careers involving computer technology or study computer technology at the same rate as the males. Important characteristics of the study are also provided to introduce background information about the participants of the study. The method used was a questionnaire to gather data about the students' computer attitudes and experiences, self-efficacy, and demographic information. Participant's academic records and test scores were also used to collect additional information. The results of this descriptive case study are summarized in a series of tables (1-24).

Sample

The 11th and 12th grade classes at an elite High School consisted of 238 students during the 1998-99 school year. As shown in Table 1, there were slightly more 11th graders (55%) than 12th graders, slightly more males (53%) than females, and a vast majority of Caucasians (80%). The minority profile for the school was 21% overall (22% for males and 20% for females). On a percentage basis, the profile for males and females were nearly identical.

Table 1.

Demographics of Juniors and Seniors from the Elite High School

	Males N = 126 (53%)		**Females N = 112 (47%)**		**Total N = 238**	
	N	**%**	**N**	**%**	**N**	**%**
GRADE						
11^{th}	71	56.00	60	54.00	131	55.0
12^{th}	56	44.00	51	46.00	107	45.0
RACE/ETHNIC						
African American	06	04.00	01	01.00	07	03.00
American Indian	00	00.00	02	01.80	02	01.00
Asian/Pacific Islander	11	09.00	09	08.00	20	08.00
Caucasian	98	78.00	90	80.30	188	80.00
Hispanic	11	09.00	09	09.90	20	08.00

Seventy-six percent of these students were present or available on the day of the survey and provided data for the study forming a convenience sample. Seventy-nine percent of the males (n = 100) and seventy-one percent of the females (n = 80) [180 of the 238 students in the 11^{th} and 12^{th} grades] participated in the survey. The resulting profiles for grade and race/ethnicity of the sample, however, were similar to the whole group, 4% more 12^{th} graders and 2.4% fewer Hispanics (see Table 2). Most of the subjects were males (56%), enrolled in the 11^{th} grade and in the 12^{th} grade (51%), and Caucasian (81%). Nineteen percent of the study was minority (19% for males and 18% for females). Based on Chi-square statistics, there was no difference in the distribution of males and females across either grade level (χ^2 = .071, p = .79) or race/ethnicity (χ^2 = 3.227, p = .52).

Table 2.

Demographics of Juniors and Seniors' Sample from the Elite High School

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	N	**%**	**N**	**%**	**N**	**%**	χ^2	**p-value**
GRADE							.071	.790
11th	52.00	52.00	40.00	50.00	92	51.11		
12th	48.00	48.00	40.00	50.00	88	48.89		
RACE/ETHNIC							3.227	.52
African American	04	04.00	02	02.50	06	03.33		
American Indian	00	00.00	02	02.50	02	01.11		
Asian/Pacific Islander	10	10.00	06	07.50	16	08.89		
Caucasian	80	80.00	66	82.50	146	81.11		
Hispanic	06	06.00	04	05.00	10	05.55		

p = < .05

The students who participated in this case study were almost evenly split between the grade levels (11th graders, 51.1%, and 12th graders, 48.9%). The demographic characteristics of the subjects who participated in this case study did not differ from the overall characteristics of the general student population, with most being Caucasian and male.

The mean age of the students (16.46 years) was measured when they took the Strong Interest Inventory in March of their junior year. Almost all of the students were 16 (53%) and 17 (46%) years of age except for two students (a 15-year-old and an 18 year-old). These are typical ages for 11th and 12th graders in public high schools.

Family Characteristics

Parental Employment

The cross-tabulations of parent characteristics by student gender are represented in Table 3. There were no apparent gender differences for any of the variables included in Table 3. None of the Chi-square values resulted in a statistically significant p value for these family characteristics. Overall, 71% of the fathers were white-collar workers, as were 65% of the mothers. The somewhat large percentages of both males (22% for fathers and 25% for mothers) and females (21% for fathers and 30% for mothers) were not sure about their parent's occupation. This may indicate that either the term "white collar" or "blue collar" was not understood by all of the participants in this study or that the participants may not have known what their parents' occupations were.

Thirty-seven percent of the participants reported the family income as "high" and 47% reported "medium income." Only 5% reported "low income." Ninety-three percent of the fathers and 84% of the mothers worked outside of the home. Ninety-two percent of the participants live in the City of Falls Church, and 8% outside of the City of Falls Church. These students are called "tuition students" and pay approximately $7,500 per year to attend the school from out of the school district. Tuition students at the High School comprise from 5 to 10% of the 11th and 12th grades.

Table 3.

Family Characteristics

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	N	**%**	**N**	**%**	**N**	**%**	χ^2	**p-value**
Father's occupation							2.429	.297
White Collar	66	68.0	55	75.3	121	71.2		
Blue Collar	10	10.3	03	04.1	13	07.6		
Not Sure	21	21.6	15	20.5	36	21.2		
Mother's occupation							1.624	.444
White Collar	61	64.2	48	64.9	109	64.5		
Blue Collar	10	10.5	04	05.4	14	08.3		
Not Sure	24	25.3	22	29.7	46	27.2		
Family income							2.633	.425
High	38	38.0	27	36.0	65	37.1		
Medium	43	43.0	39	52.0	82	46.9		
Low	07	07.0	02	02.7	09	05.1		
NS	12	12.0	07	09.3	19	10.9		
Father works outside the home							3.752	.153
Yes	92	92.0	72	93.5	164	92.7		
No	02	02.0	04	05.2	06	03.4		
Not sure	06	06.0	01	01.3	07	0.04		
Mother works outside the home							0.177	.915
Yes	84	84.8	65	83.3	149	84.2		
No	12	12.1	11	14.1	23	13.0		
Not sure	03	03.0	02	02.6	05	02.8		
Lives in Falls Church							1.599	.213
Yes	90	90.0	76	95.5	166	92.2		
No	10	10.0	04	05.0	14	08.0		

p = < .05

Levels of Parental Education and Student's Educational Aspirations

The cross-tabulation of level of male and female student's educational aspirations and the educational levels of their mothers and fathers by gender are represented in Table 4. The only statistically significant difference between male and female frequencies involved student's educational aspirations (Chi-square = 11.5, $p = .042$).

The parents of the participants showed high levels of education with 29% of fathers having four years of college and 48% postgraduate school for a total of 77%. A higher percent of mothers had four years of college (38%), but less post-graduate percentages (31%) for 69%. Only 4% of the parents had less than a high school education.

In comparing males and females in the study, only one male did not plan to graduate from high school. This student was known to the researcher as a student who had unrealistic fears that he would not graduate. Six males (6%) planned to finish high school or attend a two-year college compared to two female students (3%) who planned to finish high school or attend a two-year college. Of interest is the fact that over half of the females anticipate going to post-graduate institutions (57%) and almost half of the males also had this aspiration (49%).

Although there was a statistically significant Chi-square value associated with this variable, there were few apparent differences in the male and female educational aspirations. Ten of the males said that they did not know what their educational aspirations were, while none of the females indicated that they did not know what their educational aspirations were.

Table 4.

Educational Demographics for Parents and Students

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	N	**%**	**N**	**%**	**N**	**%**	χ^2	**p-value**
Father's Education							8.877	.114
Less than High School	00	00.0	02	02.7	02	01.2		
High School	10	10.3	11	14.7	21	12.2		
Two Year College	07	07.2	03	04.0	10	05.8		
Four Year College	33	34.0	16	21.3	49	28.5		
Post Graduate	41	42.3	41	54.7	82	47.7		
Don't Know	06	06.2	02	02.7	08	04.7		
Mother's Education							6.427	.267
Less than High School	02	02.1	02	02.6	04	02.3		
High School	17	17.5	10	12.8	27	15.4		
Two Year College	07	07.2	11	14.1	18	10.3		
Four Year College	40	41.2	26	33.3	66	37.7		
Post Graduate	26	26.8	28	35.9	54	30.9		
Don't Know	05	05.2	01	01.6	06	03.4		
Student's Educational Aspirations							11.501	.042*
Less than High School	01	01.0	00	00.0	01	01.0		
High School	02	02.0	01	01.3	03	02.9		
Two Year College	04	04.1	01	01.3	05	02.9		
Four Year College	38	38.8	31	40.3	69	39.4		
Post Graduate	43	43.9	44	57.1	87	49.7		
Don't Know	10	10.2	00	00.0	10	05.7		

*p = < .05 level

Use of Computers by Parents and Students

Father's Computer Use

The cross-tabulations of gender for father's uses of computers are represented in Table 5. Only father's uses of computers for "other tasks" tested statistically significant for gender

Table 5.

Father's Uses of Computers

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	N	%	N	%	N	%	χ^2	p-value
Use at Home							1.533	.465
Uses	69	69.7	60	77.9	129	73.3		
Does Not Use	24	24.2	14	18.2	38	21.6		
Not Sure	06	06.1	03	03.9	09	05.1		
Taxes							3.370	.081
Uses	42	43.8	22	30.6	64	38.1		
Does Not Use	54	56.3	50	69.4	104	61.9		
Budget							0.446	.504
Uses	32	33.0	20	28.2	52	31.0		
Does Not Use	65	67.0	51	71.8	116	69.0		
Internet							0.070	.792
Uses	71	73.2	54	75.0	125	74.0		
Does Not Use	26	26.8	18	25.0	44	26.0		
E-mail							1.102	.294
Uses	67	69.1	55	76.4	122	72.2		
Does Not Use	30	30.9	17	23.6	47	27.8		
Word Processing							2.794	.095
Uses	64	66.0	56	77.8	120	71.0		
Does Not Use	33	34.0	16	22.2	49	29.0		
Games							0.947	.330
Uses	22	22.9	21	29.6	43	25.7		
Does Not Use	74	77.1	50	70.4	124	74.3		
Other Tasks							6.782	.009*
Uses	27	21.8	08	11.4	35	21.1		
Does Not Use	69	71.9	62	88.6	131	78.9		

*p = <.05

favoring males in the study (x^2 = 6.782, p = .009). The difference between fathers of males' other uses of computers (22%) and the fathers of female's other uses of computers (11%) was 10%. A large number (129) of the participant's fathers used a computer at home (73%), while a much smaller number (38) did not use a computer at home (22%). A few participants (9) indicated that they were not sure whether or not their fathers used a computer at home (5%).

Mother's Computer Use

The cross-tabulations of gender for mothers of participants' computer use are represented in Table 6. None of mother's uses of computers tested statistically significant for gender. A majority of the participants (n = 128 or 72%) indicated that their mothers or other female guardians used a computer at home. Forty-five (25%) of the participants said that their mothers did not use the computer at home, while four students (2%) were not sure whether or not their mothers or other female guardians used a computer at home.

The two highest frequency areas of computer use for mothers were word processing (74%) and E-mail (70%). The two lowest frequencies (n = 25 or 15%) were the use of computer games and other tasks (n = 31 or 18.1%). Other areas of use that represented low frequencies for the participant's mothers were the use of the computer for various tasks such as doing taxes (76%) and budgeting (74%). Sixteen percent more of the participant's mothers used the computer for the Internet (58%).

Table 6.

<u>Mother's Uses of Computers</u>

	Males N = 100 (55.5%)		**Females** N = 80 (44.5%)		**Total** N = 180			
	N	**%**	**N**	**%**	**N**	**%**	χ^2	**p-value**
							1.722	.423
Use at Home	68	68.7	60	76.9	128	72.3		
Uses	28	28.3	17	21.8	45	25.4		
Does Not Use	03	03.0	01	01.3	04	02.3		
Not Sure							2.221	.136
Taxes	27	27.8	14	18.2	41	23.6		
Uses	70	72.2	63	81.8	133	76.4		
Does Not Use							0.501	.479
Budget	27	28.1	18	23.4	45	26.0		
Uses	69	71.9	59	76.5	128	74.0		
Does Not Use							0.000	.989
Internet	56	58.3	45	58.4	101	58.4		
Uses	40	41.7	32	41.6	72	41.6		
Does Not Use							1.101	.294
E-mail	64	66.7	57	74.0	121	69.9		
Uses	32	33.3	20	26.0	52	30.1		
Does Not Use								
Word							1.116	.291
Processing	68	70.8	60	77.9	128	74.0		
Uses	28	29.2	17	22.1	45	26.0		
Does Not Use							0.241	.624
Games	15	15.6	10	13.0	25	14.5		
Uses	81	84.4	67	87.0	148	85.5		
Does Not Use							2.277	.131
Other Tasks	21	22.1	10	13.2	31	18.1		
Uses	74	77.9	66	86.8	140	81.9		
Does Not Use								

$p = < .05$

Comparisons of Father's and Mother's Uses of Computers

Almost three-quarters of the participant's fathers and mothers used computers at home. There was little difference in what male and female students reported for both parents. For instance, they reported that the Internet, E-mail, and word processing as most frequently used by their parents. However, the order of use differed slightly. Fathers used in order: (1) Internet, (2) E-mail, and (3) word processing and mothers' uses in order: (1) word processing, (2) E-mail, and (3) Internet. Also, computer games, taxes, and doing budgets were the least observed among both parents.

Participant's Use of Computers

Ninety-four percent of the participants indicated that they used a computer at home (see Table 7). A nearly equal proportion of males and females indicated that they used a computer at home (95% of females and 94% of males). The results of the Chi-square tests for association indicated that there was no statistically significant difference between the males and females' use of computers at home.

Table 7.

Participant's Use of Computers at Home

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	N	**%**	**N**	**%**	**N**	**%**	χ^2	**p-value**
Computer Use							.071	.790
Yes	93	93.9	74	94.9	167	94.4		
No	06	06.1	04	05.1	10	05.6		

p = < .05

Types of Computer Uses for Participants

The average amount of time participants perceived themselves spending during the past week on various computer tasks is represented in Table 8. The most time was spent on tasks using the Internet (M = 3.5 on a scale of 1 = none to 5 = a lot), using word processing (M = 3.4), and doing required assignments (M = 3.35). Results indicated only two statistically significant differences in mean scores between the male and female students. Males were slightly more inclined to use chat rooms (2.0 v. 1.6) and computer games (2.3 v. 1.9). However, perceived time spent in both of these activities was very low.

Table 8.

Participant's Type of Computer Use**

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Hours spent last week on the computer:								
Using the Internet	3.61	1.36	3.33	1.43	3.48	1.40	1.319	.189
Getting information	3.18	1.36	2.80	1.38	3.01	1.38	1.868	.063
Using word processing	3.44	1.31	3.34	1.33	3.39	1.32	0.517	.606
Using chat rooms	2.00	1.39	1.55	1.03	1.80	1.26	2.340	.020*
Using E-mail	3.02	1.42	3.19	1.52	3.10	1.47	-0.767	.444
Computer games	2.32	1.44	1.89	1.13	2.13	1.32	2.116	.036*
Doing assignments	3.33	1.34	3.38	1.32	3.35	1.33	-0.264	.792
For career planning	1.90	1.12	1.63	1.05	1.78	1.10	1.633	.104

* p = < .05

** Means based on responses from 1 = none to 5 = a lot

Academic Characteristics

Grade Point Average (GPA)

The mean scores and standard deviations of the academic variables for males and females in the study are represented in Table 9. The only aptitude or achievement variable where males and females differed statistically significant was on GPA. Based on a 4-point scale, the average female GPA was 3.31, compared to the average male GPA of 3.01 ($t = -3.2$, $p = .002$).

The GPA of the participants was calculated at the end of the student's junior year and ranged from a low of 1.2 to a high of 4.2. Cumulative percentiles indicated that 50 percent of the participants in the study had a GPA above 3.2. The mean GPA was 3.14, the median was 3.24, and the mode 4.0. The standard deviation was .65.

Scholastic Aptitude and Preliminary Scholastic Aptitude Test Scores (SAT I and PSAT)

The total SAT I scores had a range of 1000 points from a low score of 540 to a high score of 1540. The mean score was 1186, the mode was 1310, and the standard deviation was 181.57. Two students, one male, and one female scored 1540 and one male scored 540. Seven participants (4%) scored 1310. Fifty-two percent of the participants scored at 1200 or above. Twenty-eight participants (16%) did not have SAT I scores, which are not required if students attend a junior college. This non-participation could indicate (1) that juniors were waiting to take the SAT I until their senior year, (2) the scores were not sent to the High School, or (3) that students did not plan to take the SAT I.

The range of the Verbal SAT (VSAT) scores was 200 to 800. The mean Verbal score was 597.43, the median was 605, and the mode was 610. The standard deviation was 100.02. The range of the Math SAT (MSAT) scores was 330 to 790 and the mean Math score was 589.87, the median 600, and the mode 610. The standard deviation was 95.82.

Table 9.

Participant's Academic Variables**

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Aptitude								
PSAT	168.49	27.45	170.22	24.41	169.34	25.93	-0.41	.685
SAT Verbal	587.63	100.59	608.33	90.24	597.43	100.02	-1.28	.203
SAT Math	595.75	100.59	583.33	90.48	589.87	95.82	-0.80	.427
SAT I Total	1183.00	193.29	1189.86	168.87	1186.25	181.57	-0.23	.817
Achievement								
GPA	3.01	0.66	3.31	0.62	3.14	0.65	-3.21	.002*
# of Classes								
Math	4.27	1.08	4.43	0.98	4.34	1.04	-1.04	.302
Computer Sci.	1.67	1.00	1.06	0.62	1.50	0.94	1.58	.126
Participation								
Keyboarding	1.44	0.50	1.26	0.44	1.36	0.48	2.49	.014*
Computer Sci.	1.79	0.41	1.90	0.30	1.84	0.37	-2.01	.046*
IB Info Tech.	1.94	0.24	1.95	0.22	1.94	0.23	-0.29	.773

*Statistically Significant at the p = < .05
**Means for Participation based on 1 = participated, 2 = did not participate

There were no statistically significant differences in the SAT I scores. Although the males scored somewhat higher on the Math SAT I (596 v. 583), females scored higher on the Verbal SAT I (608 v. 587) and the Total SAT I (1190 v.1183).

The PSAT selection index scores had a range of 127 points from 109 to 236. One hundred fifty-seven and one hundred sixty-eight were the highest frequencies for five (3%) of the participants. Fifty percent of the participants scored 169 or above on the PSAT. The mean score was 169.34; the mode was 157, and the median 169, with a standard deviation of 25.93. Twenty-nine participants (16%) did not take the PSAT, most likely because they (1) transferred from another school, (2) were ill the day the test was given (one day each year in October), or (3) they did not choose to take the test. Females scored only slightly higher than males (170 v. 168) on the PSAT selection index, but there were no statistically significant differences between the male and female scores.

Overall, the participants did not differ in a statistically significant manner on any of the standardized test scores (SAT I, VSAT, MSAT, and PSAT). These statistics are represented in Table 9.

Table 9 also represents the number of math classes and computer science classes students took at the High School. Females took somewhat more math classes (4.43 v. 4.27). Additionally, student's participation (one or more classes, coded 1 = participated and 2 = did not participate) in Keyboarding, Computer Science and IB Information Technology classes are represented in Table 9. Two of these variables were statistically significant for greater participation in Keyboarding favoring females and in Computer Science favoring males, but the differences were minor.

Computer Attitudes and Opinions

A summary of student's mean scores concerning the importance of computers is represented in Table 10. Participant's mean scores ranged from a high of 4.0 measuring the importance of computers in their current academic lives to a low of 2.4 in their current job or job searching lives. Scores were based on a scale of 1 = not important to 5 = extremely important. Participants had higher mean scores concerning the importance of computers in their future academic life (3.8) and higher mean scores on the importance of computers to their future career

Table 10.

Computer Importance, Changes Needed and Likelihood of Advanced Computer Use**

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Importance of Computers								
Current personal life	03.00	1.36	02.89	01.41	02.95	01.38	0.542	.589
Current academic life	03.97	1.04	04.14	01.06	04.04	01.05	-1.065	.288
Current career	02.61	1.34	02.14	01.22	02.40	01.30	2.422	.016*
Future personal life	02.84	1.33	02.94	01.38	02.88	01.35	-0.487	.627
Future academic life	03.77	1.23	03.78	01.35	03.78	01.28	-0.038	.970
Future career	03.63	1.26	03.34	01.30	03.50	01.28	1.503	.135
For knowledge	03.38	1.78	03.06	01.09	03.24	01.19	1.762	.080
Changes needed								
Need more computers	03.43	1.29	03.13	01.17	03.43	01.29	1.615	.108
No restrictions	03.74	1.22	03.13	01.31	03.74	01.31	3.257	.001*
No requirement WP	02.54	1.49	02.36	01.27	02.54	01.27	0.835	.405
More IT classes	03.40	1.13	03.25	00.97	03.25	00.97	0.892	.374

*p = < .05
**Means based on a scale of 1 = not important to 5 = extremely important

(3.5). Participants in the study also registered lower mean scores on the value of computers to them in both their current personal lives (3.0) and their future college personal and social lives (2.9). Only the student's use of computer's in their current job and job searching was associated with gender favoring males (2.6 v.2.1).

Additionally, participants gave their opinions about changes that were needed or not needed in the use of computers at the High School. Both the general means for the group and the separate male and female means are also listed in Table 10. Again, only the variable for no restrictions on computer use at the High School was associated with gender favoring males (3.7 v. 3.1).

Computer Anxiety and Self-Efficacy

The Heinssen, et al. (1987) 19-item Computer Anxiety Rating Scale (CARS) was administered as part of the survey questionnaire. The data from the CARS was analyzed using the data from Heinssen's study for comparisons to the current findings. According to Heinssen et al. the CARS scores range from 19 (a low level of computer anxiety) to 95 (a high level of anxiety). Data from the Miller and Rainer (1995) factor analyzed, short form of the CARS was also used to compare data in the present study. According to Miller and Rainer, these scores range from a low of 7 (low anxiety) to a high of 35 (high anxiety). Additionally, eight items from the Delcourt and Kinzie (1993) Attitudes toward Computers (ACT) were added to the CARS's items to give a measure of computer self-efficacy. These items have a range of 8 (high computer self-efficacy) to 40 (low computer self-efficacy).

Computer Attitude Rating Scale (CARS) Results. The participant's CARS scores ranged from a low anxiety level of 19 to a high anxiety level of 75. The mean score was 39.12 (SD = 11.56). The mode was 37 with 10 participants (6%) scoring at this level. The second highest frequency was 9 participants scoring at 34 (5 %), and the third highest frequency was 40 with 8 participants (4%) scoring at this level. Four groups of seven students had the next highest frequency scoring at 23, 27, 38, and 45 (4%). Fifty percent of the participants scored 38 or below on this administration of the CARS.

Miller and Rainer Factor Analyzed Short Form CARS (MRCARS) Results. On the factor analyzed shortened version of the CARS, a similar pattern as noted on the CARS emerged. The scores ranged from a low anxiety level of 7 to a high anxiety level of 32. The mean score was 15.37 (SD = 5.22). The mode was 10 with 18 participants scoring at this level (10%). Seventeen participants scored 13 (9%) and 14 scored at 15 (8%). Thirteen participants in four different groups scored at 14, 16, 17, and 19 (7%). Fifty percent of the participants scored 15 or below on this shortened version of the CARS.

Attitudes toward Computer Technology (ACT) Results. The ACT scores ranged from 7 (high self-efficacy, with positive scores reversed to compare them to CARS and MRCARS scores) to 32 (low self-efficacy). The mean score was 14.83 (SD = 4.84). The median and mode scores were both 15. Fifty percent of the participants scored at 15 or below. Sixteen scored at the median (9%). The variance in this scale was 23.41. Seventy-five percent of the participants scored at 18 or below, so the tail of the top 25% of the scores ranged from 19-31.

Combined Computer Anxiety and Self-Efficacy Results. The computer anxiety and self-efficacy results in this case study for males and females are summarized in Table 11. All of the means on the CARS, MRCARS and the ACT were statistically significant and favored females. Thus, there appeared to be higher computer anxiety, less comfort with computers, and less computer self-efficacy or confidence in their ability to use computers for females in the study.

Table 11.

Computer Anxiety and Self-Efficacy Variables

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Anxiety/Self Efficacy								
CARS	37.22	11.19	41.50	11.65	39.12	11.56	-2.504	.013*
MRCARS	14.38	04.72	16.62	05.57	15.37	05.22	-2.911	.004*
ACT	13.94	04.95	15.94	04.48	14.83	04.84	-2.085	.006*

*p = < .05

Comparison of Study CARS with Original CARS

The 1987 CARS validation study (Heinssen et al, 1987) had a mean of 43.58 (n = 270, SD = 11.73) compared to this current 1999 case study CARS mean of 39.12 (n = 180, SD = 11.56). Although on the original 1987 CARS females reported higher levels of computer anxiety (M = 44.57, SD = 10.94) than men (M = 41.97, SD = 12.81), the difference was not statistically significant, F (1,268) = 3.16, p < .08, according to Heinssen. However, when the data in the current study was analyzed using Analysis of Variance (ANOVA), the mean square was 814.151 with 1 degree of freedom, F = 6.271, p < .013, which was statistically significant. Thus, for the current study females not only reported higher levels of computer anxiety, but also this finding achieved a statistical level of significance.

Other Important Computer Attitude, Anxiety, and Self-Efficacy Findings

Using t tests of equality of means, several females' mean computer anxiety and self-efficacy scores were higher than males' mean scores on the specific CARS and ACT items.

Females in the sample generally reported greater levels of computer anxiety or had more frequent computer concerns such as the following:

-More anxiety about causing the computer to destroy a large amount of information by hitting the wrong key (CARS #15, t = -2.314, p = .022)

-More anxiety about not knowing what to do if something goes wrong (ACT #24, t = -2.805, p = .006)

-More hesitation to use a computer for fear of making mistakes that cannot be corrected (CARS #2, t = -2.231, p = .027)

-More thoughts about not being the type to do well with computer technologies (ACT #22, t = -3.101, p = .002)

-More thoughts about feeling threatened by the impact of computer technology (ACT #27, t = -2.745, p = .007)

-More avoidance of computers because they are unfamiliar and intimidating (CARS #4, t = -2.187, p = .030)

-More not looking forward to using the computer on the job (CARS #12, t = -2.503, p = .013

-Less understanding of the technical aspects of computers (CARS #6, t = -2.927, p = .004)

-Less confidence in keeping up with advances in the computer field (CARS #3, t = -3.438, p = .001)

-Less comfort in the ability to work with computer technologies (ACT #20, t = -3.119, p = .002

-Less confidence in the ability to create materials to enhance performance on the job now and in the future (ACT #25, $t = -2.104$, $p = .037$).

-Less confidence in thinking that they can learn computer skills (CARS #1, $t = -2.034$, $p = .043$)

Twelve of the twenty-seven items on the combined CARS and ACT were statistically significant for gender differences favoring females. These statistics are summarized in Table 12. The items were rated on the extent to which the participants agreed with the statements about computer attitudes, anxiety, and self-efficacy on a scale of 1 = not at all, 5 = to a great extent.

Table 12.

Computer Anxiety and Self-Efficacy Questionnaire Items**

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Anxiety Items (CARS)								
Not confident/learning IT	1.62	0.80	1.88	0.87	1.73	0.84	-2.034	.043*
Fear IT/making mistakes	1.49	0.94	1.84	1.15	1.64	1.05	-2.231	.013*
Can't keep up/technology	2.14	1.10	2.68	0.95	2.38	1.07	-3.438	.001*
Avoid computers/intimidate	1.51	0.89	1.85	1.19	1.66	1.05	-2.231	.027*
Anyone can't learn/IT	2.09	0.87	2.01	0.93	2.06	0.90	0.572	.568
Difficulty/technical IT	2.04	1.16	1.16	1.25	2.59	1.23	-2.927	.004*
Learning IT/ no practice	1.74	0.91	1.87	0.88	1.79	0.90	-0.912	.363
Dislike IT smarter than I am	1.75	1.23	1.74	1.12	1.75	1.18	0.022	.983
Couldn't use IT/schoolwork	1.48	0.76	1.71	0.89	1.58	0.82	-1.893	.060
Have to be genius/ for IT	1.89	1.21	1.60	0.82	1.76	1.66	1.892	.069
Feel apprehensive/IT	1.93	1.17	2.24	1.42	2.07	1.30	-1.598	.112
Don't want to use computer	2.36	1.26	2.85	1.36	2.58	1.32	-2.503	.013*
Feel insecure/printout	1.88	1.04	2.16	0.98	2.02	1.03	-1.854	.065
Don't feel IT necessary tool	1.91	1.07	1.90	1.01	1.91	1.05	0.064	.949
Fear destroy info/wrong key	2.10	1.19	2.54	1.34	2.29	1.28	-2.314	.022*
Challenge of IT not exciting	2.79	1.29	3.06	1.11	2.91	1.21	-1.509	.133
Can't learn IT program lang.	2.26	1.23	2.45	1.04	2.34	1.15	-1.102	.272
Don't want to learn more IT	2.00	1.10	2.24	1.07	2.11	1.09	-1.456	.147
Afraid become dependent IT	1.97	1.13	2.05	1.08	2.01	1.11	-0.481	.631
Self-Efficacy Items (ACT)								
Feel uncomfortable with IT	2.00	1.06	2.53	1.19	2.23	1.15	-3.119	.002*
IT means more work for me	2.16	1.12	1.98	0.88	2.08	1.02	1.202	.228
Not type for computer use	2.04	1.16	2.60	1.25	2.29	1.22	-3.101	.002*
Be less productive with IT	1.90	1.09	2.21	1.12	2.04	1.11	-1.890	.060
Anxious about computer	2.20	1.21	2.70	1.14	2.42	1.20	-2.805	.006*
IT not helpful to advance job	1.96	1.06	2.29	1.01	2.11	1.05	-2.104	.037*
Have no use for computers	1.77	1.01	1.79	1.04	1.78	1.02	-0.129	.898
Feel threaten by IT	2.32	1.38	2.86	1.22	2.56	1.33	-2.754	.007*

*p = < .05

**Means based on an agreement scale of 1 = not at all, 5 = to a great extent

Strong Interest Inventory Occupational, Interest Activities, and Personal Preferences

Strong Interest Inventory General Occupational Themes

All of the participants took the Strong Interest Inventory when they were juniors. The Strong Interest Inventory score scales range from a high of 80 to a low of 20. The mean for a scale is 50 and the standard deviation is 10. In the present study, the mean scores of the six General Occupational Themes clustered in the 40's and ranged from a low of 43.3 for the Investigative theme to a high of 48.06 for the Artistic theme. The frequency distributions of the scales indicated that on the Realistic scale 19 participants scored 38 (11%). Over 50% of the scores fell at 43 or below on the Realistic scale. The GOT Investigative scores ranged from a low of 28 to a high of 68. There were two high frequency points, one was at 31 (7 %) and the other at 45 (7 %). Fifty percent of the scores were at 43 or below. The frequencies for the GOT Artistic scale ranged from a low of 27 to a high of 70. The largest frequencies fell at 45 with 13 students scoring at this level (7 %). Fifty percent of the scores were 48 and below.

The GOT Social scores ranged from a low of 28 to a high of 74. The highest frequencies were at 33 with 11 students scoring at this level (6%) and at 29 with 10 students scoring at this level (6 %). Fifty percent of all scores fell at 43 or below. On the GOT Enterprising scale the scores ranged from a low of 33 to a high of 76. Two of the high frequency points were at 36 and 41 with 12 students each (7 %). Fifty percent of the scores fell at 44 or below. The GOT Conventional score distribution ranged from a low of 30 to a high of 78. The most frequent score was 34 with 19 students scoring at this level (11%). Fifty percent of the students scored from 30 to 40.

The General Occupational Themes preferences are summarized in Table 13. Three General Occupational Themes were statistically significant and associated with gender (Realistic favoring males, and Artistic and Social favoring females). The widest difference was in the Artistic Scale for females' mean score (53) compared to males' mean score (44), followed by males' mean score in Realistic (48) compared to females' score (40), and finally, by females' mean score in Social (49) compared to males' mean score (42).

Table 13.

Participant's Strong Interest Inventory General Occupational Themes

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
GOT Realistic	47.79	09.37	40.29	07.26	44.46	09.26	5.89	.000*
GOT Investigative	42.90	09.77	43.80	10.87	43.30	10.25	-0.58	.560
GOT Artistic	43.96	11.95	53.20	09.22	48.07	11.24	-5.99	.000*
GOT Enterprising	46.08	10.38	47.18	09.20	46.57	09.86	-0.74	.461
GOT Social	41.60	11.19	48.74	10.58	44.77	11.46	-4.36	.000*
GOT Conventional	44.59	10.21	43.18	08.46	43.96	09.47	0.99	.321

*p = < .05

Strong Interest Inventory Basic Interest Scales

The Strong Basic Interest Scales followed a similar pattern to the General Occupational Themes. Of particular interest to the present study were the frequencies for the Basic Interest Scales Data Management Activities and Computer Activities Scales. Data Management ranged from a low of 32 to a high of 70. The highest frequency of scores was 34 with 21 students scoring at this level (12 %). Fifty percent of the participants scored between 32 and 40. The frequencies of the Computer Activities Scale ranged from a low of 34 to a high of 71. The highest frequency of scores was 34, which was the lowest point on the scale (37 %). Fifty-five percent of the participants scored in this lower lever between 34 and 41.

The statistically significant Basic Interest Scales for males and females are summarized in Table 14. Male and female differences were noted on the Nature, Military, Athletics, Mechanical, Medical Science, Music/Dramatics, Art, Culinary Arts, Teaching, Social Service, Medical Service, Data Management, Writing, Applied Arts, and Computer Activities. These 15 out of the 25 Basic Interest Scales had means that were statistically significant and different for males and females.

The highest t scores for the Basic Interest Scale were the Mechanical Activities for males, Culinary Arts Activities, Social Service Activities, and Art Activities for females, and Athletic Activities for males.

The pattern for males in the study were high Athletic Activities mean scale scores (55 v. 47); high Military Activities mean scale scores (54 v. 48); high Mechanical Activities mean scale scores (50 v. 41); higher Computer Activities mean scale scores (48 v. 41); and higher Data Management Activities mean scale scores (45 v. 41).

The pattern for Basic Interest Activities for females was different from that of the males. The females' mean scores on ten scales were statistically significant and higher than male mean scores (Music/Dramatics, Culinary Arts, Art, Social Service, Medical Service, Medical Science, Teaching, Writing, Applied Arts and Nature) as shown in Table 14. Two scales (Military and Athletic) overlapped for males and females. The largest mean scores for females in the sample were Culinary Arts (51 v. 42), Art (54 v. 46), Social Service (53 v. 44), and Music and Dramatics (54 v. 46).

Table 14.

Participant’s Strong Interest Inventory Basic Interest Scales

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**T**	**p-value**
BIS Activities								
BIS Nature	31.76	10.05	43.20	10.36	40.73	10.39	-2.906	.004*
BIS Military	53.97	13.01	48.16	09.26	51.39	11.82	3.368	.001*
BIS Athletic	54.91	10.78	46.75	10.77	51.28	11.49	5.050	.000*
BIS Mechanical	49.69	09.77	41.10	06.87	45.82	09.57	6.585	.000*
BIS Medical Science	43.45	09.11	46.88	10.93	44.97	10.08	-2.293	.023*
BIS Music/Dramatics	46.28	10.55	53.86	09.60	49.65	10.79	-4.986	.000*
BIS Art	44.71	10.84	53.20	08.87	48.48	10.85	-5.651	.000*
BIS Culinary Arts	41.72	10.55	51.31	09.36	45.98	11.10	-6.368	.000*
BIS Teaching	40.10	12.09	46.39	12.32	42.89	12.56	-3.437	.001*
BIS Social Service	43.55	10.79	52.65	11.05	47.59	11.78	-5.562	.000*
BIS Medical Service	43.29	08.82	50.25	12.98	46.38	11.38	-4.271	.000*
BIS Data Management	44.71	09.56	40.58	08.23	42.87	09.20	3.065	.003*
BIS Computer	47.70	11.79	40.64	08.72	44.56	11.08	4.467	.000*
BIS Applied Arts	44.58	10.61	49.08	09.19	45.45	08.31	0.432	.003*
BIS Writing	43.52	11.41	50.29	10.02	46.53	11.30	-4.172	.000*
BIS Science	45.72	10.09	43.74	09.99	44.84	10.07	1.315	.190
BIS Mathematics	45.63	10.28	42.93	08.84	44.43	09.73	1.866	.064
BIS Agriculture	43.69	08.37	43.15	08.26	43.45	08.31	0.432	.666
BIS Religious	46.05	10.17	48.90	10.49	47.32	10.38	-1.842	.067
BIS Public Speaking	46.29	10.85	46.04	09.18	46.18	10.11	1.680	.867
BIS Law/Politics	47.27	11.18	44.69	09.83	46.12	10.65	1.642	.106
BIS Merchandising	45.98	09.93	47.54	09.80	46.67	09.38	-1.051	.294
BIS Sales	50.98	10.85	49.16	08.92	50.17	10.05	1.207	.229
BIS Organiz. Mgmt.	43.51	10.02	41.78	08.49	42.74	09.39	1.234	.219
BIS Office Systems	45.15	08.80	46.14	07.51	45.59	08.24	-0.796	.427

*p = < .05

Strong Interest Inventory Personal Style Scales

For the sample, the Risk Taking scores showed the most differing frequency distribution, ranging from a low score of 30 to a high score of 70. The highest frequency score was 57 with 22 students scoring at this level. There appeared to be two distinct clusters of scores, one at the lower end with scores of 43 (8%), 46 (6%), and 48 (7%) with 38 students scoring at these points. The second cluster included a large percentage of the participants at the upper end of the distribution with scores of 61 (11%), 64 (8%), and 66 (7%) and 47 students scoring at these points. Fifty percent of the students scored between 30 and 57.

The scatter in the distribution of the other Personal Style Scales was even, with the Learning Environment Scale score of 57 having the largest concentration of student's (15) scoring at this level (8%). On the Work Style Scale 12 participants scored 47 (7%) and 9 participants scored 57 (5%). The Leadership Style Scale had 10 students scoring 41 (6%).

The Personal Style Scales for males and females in the study are represented in Table 15. Two of the four Personal Style Scales had means that were statistically significant and different for males than they were for females. The Work Style Sale (56 v. 46) mean scores favored females and the Risk Taking Scale mean scores (58 v. 55) favored males.

Table 15

Participant's Strong Interest Inventory Personal Style Scales

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Work Style	45.49	09.98	55.89	08.79	50.11	10.77	-7.320	.000*
Learning Environment	41.87	11.22	44.45	10.12	43.02	10.79	-1.601	.111
Leadership Style	45.39	11.03	47.88	09.26	46.49	10.33	-1.611	.109
Risk Taking Adventure	57.87	08.71	50.64	09.28	54.66	09.64	5.380	.000*

*p = < .05

Career and College Resources

Career Resources

The use of people and experiences as career resources to meet the counseling and guidance needs of participants are represented in Table 16. Even though none of the statistics for use of career resources had statistically significant t statistics for gender as represented in Table 16, the item dealing with using "hands-on" experiences had the largest mean (4.35), median (5) and mode (5) scores for the distribution. Both males and females responded to this item in a similar manner. When comparing the equality of means using the t test for independent means testing for this variable, both males and females had mean scores of 4.3. Males, however, did have a slightly higher but not statistically significant mean scores (4.36) as compared to female mean scores (4.33).

The mean scores for use of the career resources are analyzed by gender. None of the career resources tested statistically significant for independence for gender. The mean scores all fell in the average and above average range with the highest mean score for both males and females in getting hands-on career experiences. The total mean score of 4.35 was followed by the mean score of 3.69 for the importance of getting classroom experiences in career activities. The next career activities of importance to participants were talking to fathers (3.64), mothers (3.62), counselors and friends (3.54). Females had higher mean scores for talking to counselors (3.62) than males (3.47), mothers (3.79 v. 3.49), career specialist (3.38 v. 3.19), and teachers (3.21 v. 2.91).

Table 16.

Use of Resources for Career Counseling and Guidance Needs*

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Talking to:								
Counselor	3.47	1.13	3.62	1.21	3.54	1.17	-0.827	.409
Career specialist	3.19	3.19	3.38	1.17	3.27	1.22	-0.970	.334
Teachers	2.91	2.91	3.21	1.09	3.04	1.14	-1.737	.084
Father	3.66	1.15	3.61	1.16	3.64	1.15	0.301	.764
Mother	3.49	1.20	3.79	1.06	3.62	1.14	-1.736	.084
Friends	3.57	1.02	3.50	1.06	3.54	1.03	0.459	.647
Experiences:								
Classroom	3.65	1.13	3.76	1.09	3.69	1.11	-0.621	.535
Hands-on	4.36	0.83	4.33	0.83	4.35	0.87	0.262	.794
Electronic data	3.04	1.21	3.12	1.18	3.08	1.19	-0.435	.664
Books/Paper	3.38	1.14	3.46	1.15	3.42	1.14	-0.473	.637

p = < .05
*Means based on importance scale 1 = not important, 5 = extremely important

Information Tools and Experiences in College and Career Planning

Students rated the importance to them of participating in the Differential Aptitude Test (DAT) given at the 9th grade, the Armed Forces Vocational Aptitude Battery (ASVAB) given at the 10th grade, and the Strong Interest Inventory (Strong) given at the 11th grade. Students also rated the importance of participating in the Arlington Career Center classes at the 11th and 12th grades, vocational classes at the High School, high school internships, and middle school career shadowing experiences. The results of these rating of importance, based on a scale of 1 = not important, 5 = extremely important, are represented in Table 17.

Table 17.

Career Information Tools and Experiences**

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
DAT	1.97	1.03	2.16	1.10	2.05	1.06	-1.157	.249
ASVAB	2.23	1.22	2.21	1.09	2.22	1.16	0.079	.937
Strong	2.48	1.25	2.74	1.29	2.60	1.27	-1.320	.189
Arlington Career Center	3.03	1.43	3.49	1.37	3.21	1.42	-1.583	.117
Vocational Classes	3.04	1.24	3.44	1.11	3.20	1.20	-1.827	.070
High School Internships	3.87	1.01	4.28	0.86	4.04	0.97	-2.323	.002*
Middle School Shadowing	2.87	1.39	3.19	1.41	3.01	1.41	-1.382	.169

*p = < .05
**Means based on importance scale 1 = not important, 5 = extremely important

The means for the career information variables ranged from a high of 4.04 for high school internships to a low of 2.05 for the DAT. While the high school internships had a mode of 4.0 and a median of 5, the DAT had a mode of 2 and a median of 1. Other means in order of importance were the Arlington Career Center classes (3.21), the vocational classes at the High School (3.20), the middle school shadowing experiences (3.01), the Strong Interest Inventory (2.60), and the ASVAB (2.22). The career information variables for males and females in the study are also represented in Table 17. Only one of the variables (high school internships) was associated with gender and had a mean that was statistically significant and different favoring females (4.3 v. 3.9).

Choice of College Major and Future Careers

The largest frequency chosen by 42 of the participants (24%) was “undecided” as to their prospective college major. The second highest choice was for multiple choices with 38 participants choosing more than one major (21%). The third highest choice was “Business” with 19 participants choosing this option (11%). The fourth and fifth highest choices were “Computer Science” (11 participants, 6%) and “Art” (11 participants, 6%). These top choices are represented in Table 18. Other popular choices were “Social Sciences” (9 participants, 5.0%), “Pre-Medicine” and “English,” which both had 5 participant’s choose them, and “Science” was chosen by 4 of the participants. All other choices were made by 1 to 3 individuals. Two majors were not chosen by any of the participants. These were “Foreign Language” and “Architecture”. The frequency percentages and Chi-square values for males and females are represented in Table 18.

The Chi-square statistics for Computer Science and Pre-Medicine did show a statistically significant association with gender. Computer science was not only one of

Table 18.

Gender Associations in Choice of College Majors

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	N	**%**	**N**	**%**	**N**	**%**	**χ^2**	**p-value**
Business							0.530	.467
Yes	12	12.1	07	08.8	19	10.6		
No	87	87.9	73	91.3	100	87.4		
Comp. Sci.							6.010	.014*
Yes	10	10.1	01	01.3	11	06.1		
No	89	89.9	79	98.8	168	93.9		
Undecided							0.625	.429
Yes	21	21.2	21	26.3	42	23.5		
No	78	78.8	59	73.8	137	76.5		
Art							0.001	.972
Yes	06	06.1	05	06.3	11	06.2		
No	92	93.9	75	93.8	167	93.8		
Pre-Med.							4.959	.026*
Yes	01	01.0	06	07.5	07	03.4		
No	98	99.0	74	92.5	172	96.1		
More than one choice							0.532	.466
Yes	23	23.2	15	18.8	38	21.2		
No	76	76.8	65	81.3	141	78.8		

*p = < .05

the top choices of all college majors with a total of 11 participants choosing this major (6%), but the Chi-square statistic produced the most statistically significant association with gender (χ^2 = 6.010, p = .014). Ten males (10%) and one female (1%) chose this major. Conversely, six females (8%) and one male (1%) chose pre-medicine as a college major (χ^2 = 4.959, p = .026) indicating that this choice of major was associated with gender. Since many of the participants (23) chose more than one college major these numbers were lower than would be expected.

To determine if the choice of college majors means for males and females were different, t tests for independence of means were used to analyze the data. Because of the coding (1 = Yes; 2 = No), the higher mean scores are for not choosing the college major. The mean scores for Pre-Medicine were lower (more student's chose this item) for females indicating higher choice (t = 2.246, p = .026). For Computer Science, male mean scores were lower (more males chose this item) indicating higher choice (t = -2.480, p = .014). The results of these operations are shown in Table 19.

Table 19.

College Majors (Pre-Medicine and Computer Science)

	Males N = 100 (55.5%)		Females N = 80 (44.5%)		Total N = 180			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
College Major (1 = Yes; 2 = No)								
Pre-Med.	1.99	0.10	1.93	0.27	1.96	0.19	2.246	.026*
Computer Science.	1.90	0.30	1.99	0.11	1.94	0.24	-2.480	.014*

*p = < .05

Importance of Variables Involved in College Major and Career Choice

The highest mean score for the participants was the importance of interests (4.7), followed by aptitudes (4.5), and the opportunity to have fun (4.3) in choosing college majors and careers. The highest mean score was 4.7 for interests and next highest for aptitudes (4.5). The modes for both interests and aptitudes were “extremely important” as were the median values. The opportunity to have fun was ranked as extremely important by 91 of the participants (51%) and the mean score was 4.3, with a mode and median of 5. Participants chose average importance (29%), above average importance (29%), and extremely important (23%) the most often for salary and financial rewards. The mean importance level for salary and financial rewards was 3.5, the mode 3, and the median 4. For the opportunity for career growth in a college major or career the largest percentage of participants (36%) chose extremely important. The mean importance level for career growth was 3.9, the mode 4, and the median 5. Prestige in the college major or career had the highest frequency of choice of importance at the average level (37%) with a mean score of 3.5, and mode and median values of 3. The opportunity to help others had the highest frequency of choices at “extremely important” (29%), with a mean of 3.6, mode of 4, and median of 5. The importance of an attractive work environment was ranked at above average importance (33%) with a mean of 3.9, and a mode and median of 4.

The mean scores and standard deviations of the importance (based on a scale of 1 = not important, 5 = extremely important) of variables involving college major and career choices for males and females in the study are represented in Table 20. There were gender differences in the rankings, but only two variables were statistically significant for gender. Salary was statistically significant favoring males (3.7 v. 3.2) and having the opportunity to help others favoring females (4.0 v. 3.2).

Table 20.

Important Variables in College Major and Career Choice**

	Males N = 100 (55.5%)		**Females N = 80 (44.5%)**		**Total N = 180**			
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**p-value**
Salary	3.66	1.11	3.24	1.30	3.47	1.21	2.332	.021*
Career Growth	4.01	0.99	3.76	1.25	3.90	1.12	1.479	.141
Interests	4.65	0.85	4.81	0.58	4.72	0.74	-1.493	.137
Aptitudes	4.38	0.93	4.63	0.70	4.49	0.84	-1.915	.057
Prestige	3.54	1.10	3.35	1.23	3.45	1.16	1.061	.290
To Help Others	3.26	1.24	3.99	1.13	3.59	1.24	-4.040	.000*
To Have Fun	4.30	0.86	4.34	0.84	4.32	0.85	-0.294	.769
Attractive Work Environment	4.01	0.91	3.85	1.10	3.94	0.98	1.052	.294

*p = < .05

**Means based on 1 = not important, 5 = extremely important

Summary of Findings

The results of this study indicated that there were several statistically significant findings using Chi-square tests of association and t tests of independence of means. The results are presented in Tables 21-24 where they are summarized and grouped by statistical significance and effect sizes to standardize the mean differences by the average standard deviations. Effect sizes of .1 to .4 are considered small; .5 and .6 medium; and .7, .8, and .9 are considered to be large (Glass, 1981). According to Glass, effect size was used in experimental studies, but the term has also been used in other studies to describe the differences between means in a standardized format. This procedure allows researchers to understand numerical differences between groups in standard deviation terms. The effect size is obtained by converting the means into a standard score by dividing the score differences between the two means by the average standard deviation.

The findings of this descriptive case study produced ten variables that had meaningful effect sizes of .7 and above. Four of the variables favored males (BIS Mechanical, .979; GOT Realistic, .902; PSS Risk Taking /Adventure, .804; and BIS Athletic, .754). Another six variables favored females (BIS Culinary Arts, .963; PSS Working with others, .903; GOT Artistic, .873; BIS Art, .862; BIS Social Service, .833; and BIS Music/Dramatics, .752). Further, nine variables had effect sizes of .5 and .6. Two of these variables favored males (BIS Computer Activities, .688; and BIS Military, .522). Seven variables favored females (GOT Social, .656; BIS Writing, .632; BIS Medical Services, .631; BIS Nature, .569; the importance of helping others in choice of college major or careers, .538; ACT, participants' feeling that they cannot keep up with the technical advances in computer technology, .524; and BIS Teaching, .515).

Tables 21-24 show the results of the statistical tests run on the data from the research questions, which are organized in columns showing statistical significance in the male or female column containing the higher mean score. Both probability and effect size statistics are listed as well as the t scores for each variable.

Table 21.

Summary of Findings: Research Questions Numbers 1, 2, and 3

	Males N = 100 (55.5%)	**Females N = 80 (44.5%)**			
Variable	**Statistical Significance**	**Statistical Significance**	**t**	**p**	**Effect size**
Question 1					
Demographics					
Educational aspirations					
Aptitude/SAT I & PSAT					
Academics/GPA		Significant	t = -3.210	.002*	.469
Question 2 (Comp Use)					
Father's use of computer					
Mother's use computer					
Student's use computer					
For chat rooms	Significant		t = 2.340	.020*	.372
For playing games	Significant		t = 2.116	.036*	.335
Question 3 (Classes)					
# of math classes					
# Comp. Sci. Classes					
Participation Comp Sci.	Significant		t = -2.010	.046*	.309
" Keyboarding		Significant	t = 0.249	.014*	.306

*p = < .05

**Effect Size High = > .70

Table 22.

Summary of Findings: Research Question Number 4

Variable	Males N = 100 (55.5%) Statistical Significance	Females N = 80 (44.5%) Statistical Significance	t	p	Effect size
Question 4 (Strong)					
GOT Realistic	Significant		t = 5.89	.000*	.903**
GOT Investigative					
GOT Artistic		Significant	t = -5.99	.000*	.873**
GOT Enterprising					
GOT Social		Significant	t = -4.36	.000*	.656
GOT Conventional					
BIS Military	Significant		t = 3.37	.000*	.522
BIS Athletic	Significant		t = 5.05	.000*	.757**
BIS Mechanical	Significant		t = 6.59	.000*	.979**
BIS Data Management	Significant		t = 3.07	.003*	.464
BIS Computers	Significant		t = 4.47	.000*	.688
BIS Nature		Significant	t = -2.91	.004*	.569
BIS Medical Science		Significant	t = -2.29	.023*	.342
BIS Music/Dramatics		Significant	t = -4.97	.000*	.752**
BIS Art		Significant	t = -5.65	.000*	.862**
BIS Culinary Arts		Significant	t = -6.37	.000*	.963**
BIS Teaching		Significant	t = -3.44	.001*	.515
BIS Social Service		Significant	t = -5.56	.000*	.833**
BIS Medical Service		Significant	t = -4.27	.000*	.631
BIS Agriculture					
BIS Science					
BIS Mathematics					
BIS Applied Arts		Significant	t = -3.00	.003*	.454
BIS Writing		Significant	t = -4.17	.000*	.632
BIS Religious					
BIS Public Speaking					
BIS Law/Politics					
BIS Merchandising					
BIS Sales					
BIS Organizational Mg.					
BIS Office Services					

*p = < .05 (Significance shown in column with highest mean score)
**Effect Size High = > .70

Table 23.

Summary of Findings: Research Questions Numbers 4 (PSS), 5 and 6

	Males N = 100 (55.5%)	**Females N = 80 (44.5%)**			
Variable	**Statistical Significance**	**Statistical Significance**	**t**	**p**	**Effect size**
Question 4 (Continued)					
PSS Work Style/with others		Significant	t = -7.32	.000*	.903**
PSS Learning Environment					
PSS Leadership Style					
PSS Risk Taking/Adventure	Significant		t = 5.38	.000*	.804**
Question 5 Resources					
People (counselors/others)					
Printed material					
Electronic data/Internet					
Experiences (classes, ACC, DAT, Strong, ASVAB)					
Internships		Significant	t = -2.323	.002*	.450
Question 6 College Major					
Business					
Computer Science	Significant		t = -2.480	.014*	.429
Art					
Pre-Medicine		Significant	t = 2.246	.026*	.316
Undecided					
More than one choice					
Variables (career growth, Interest, aptitudes, fun, Prestige, environment)					
Salary/financial rewards	Significant		t = 2.332	.021*	.347
Helping others		Significant	t = -4.040	.000*	.538

*p = < .05 (Significance shown in column with highest mean score)
**Effect Size High = > .70

Table 24.

Summary of Findings: Research Questions Numbers 7 and 8

Variable	Males N = 100 (55.5%) Statistical Significance	Females N = 80 (44.5%) Statistical Significance	t	p	Effect size
Question 7 Future Computer Use					
Current/future personal, Academic, to increase IQ, and future career					
Current job/ job Searching	Significant		t = 2.422	.016*	.367
Question 8 Computer Attitudes, Anxiety and Self-Efficacy					
Computer needs No restrictions	Significant		t = 3.257	.001*	.480
CARS		Significant	t = -2.504	.013*	.376
MRCARS		Significant	t = -2.911	.004*	.427
ACT		Significant	t = -2.085	.006*	.424
Item A Can't keep up		Significant	t = -3.438	.001*	.524
Item SE Not the type		Significant	t = -3.101	.002	.463

*Statistically Significant at the p = < .05
**Effect Size High = > .70

Summary of Analyses

Research Questions

How do young men and women at a small elite suburban High School that sends 95% of the student body on to higher education differ with respect to gender (based on t tests of equality of means, probability, and effect size) and demographic and academic characteristics?

- There were no statistically significant differences between gender and the demographic variables of grade, ethnic/race categories, and family characteristics (occupational levels, income, and work outside of the home, parent's educational levels, residency in the City of Falls Church) and gender among the sample (Tables 1, 2, 3, and 4, using Chi-square analyses of association)
- There was a statistically significant difference but non-meaningful effect size favoring females between the gender and the mean GPA of the participants. Females had somewhat higher mean GPA than did males in the sample (Table 9, using t tests for independence of means).
- There were no statistically significant differences between gender in standardized test mean scores (Total SAT I scores, Verbal SAT I scores, Math SAT I scores, and the PSAT selection index scores) among study participants (Table 9, using t tests for independence of means).

Extent of use of computers by participants and their fathers and mothers:

- In the sample, there were no statistically significant differences between gender and father and mother's use of computers at home for preparing taxes, budgeting, using the Internet, using E-mail, and playing computer games, and mother's use of computers for other tasks, however, there was a statistical significant probability of father's use of computers for other tasks favoring males (Tables 5 and 6, using Chi-square analysis of association).
- In the sample, there was no statistically significant association between gender and the participant's use of computers at home (Table 7, using Chi-square analysis of association).

- In the sample, there was a statistically significant difference but a non-meaningful effect size between gender and participant's mean score rankings for perceived time spent using computers for chat rooms and for playing computer games favoring males (Table 8, using t tests for independence of means).
- In the sample, there were no statistically significant differences between gender and participant's mean scores for time spent using computers for the Internet, looking up information, using E-mail, word processing, doing assignments, and for career planning (Table 8, using t tests for independence of means).

Number of computer, computer science, and math classes taken at the High School:

- There was a statistically significant difference but non-meaningful effect size between gender and student's participation in Keyboarding computer classes. Females had lower mean scores (1 = participated, 2 = non-participation) than males in the sample (Table 9, using t tests for independence of means).
- There was a statistically significant difference but non-meaningful effect size between gender and student's participation in Computer Science classes. Males had lower mean scores (1 = participated, 2 = non-participation) than females in the sample (Table 9, using t tests for independence of means).
- There were no statistically significant differences between gender and the number of math or computer science classes the participants took in high school (Table 9, using t tests for independence of means).
- There was no statistically significant difference between gender and student's participation in IB Information Technology (Table 9, using t tests for independence of means).

Strong Interest Inventory career themes, activities and personal style variables.

- There was a statistically significant difference and a meaningful effect size between gender and the Strong Interest Inventory Realistic and Artistic General Occupational Themes and a statistically significant difference but non-meaningful effect size between gender and the Social General Occupational Theme mean scores. The male's mean score for the Realistic Occupational Theme was higher than the female's mean score for this theme. The female's mean scores for the Artistic and Social themes were both higher than the male's mean scores for these themes in the sample (Table 13, using t tests of independence for means).
- In the sample, there were no statistically significant differences for gender and the mean scores on the Investigative and Conventional Occupational Theme Scales on the Strong Interest Inventory (Table 13, using t tests for independence of means).
- In the sample there were statistically significant differences and meaningful and non-meaningful effect sizes between gender and the Strong Interest Inventory Basic Interest Scale mean scores on 13 of the 24 scales. On five of the scales males had higher mean scores than females (Military, Athletic, Mechanical, Data Management, and Computer Activities). There was a meaningful effect size difference for the Mechanical and Athletic Scales, a non-meaningful difference for the Military and Computer Activities Scales, and a non-meaningful effect size difference for the Data Management Scale. On ten of the scales (Medical Science, Music/Drama, Art, Culinary Arts, Teaching, Social Service, Writing, Applied Arts, Nature, and Medical Service) females had higher mean scores than males. A meaningful effect size was noted on the Social Service, Culinary Arts, Art, and the Music/Dramatics Scales, a non-meaningful effect size on the Medical

Service, Teaching, Writing, and Nature Scales, and a non-meaningful effect size on the Medical Science and Applied Arts Scales (Table 14, using t tests for independence of means).

- In the sample there were no statistically significant differences between gender and the Agriculture, Science, Math, Religious, Public Speaking, Law/Politics, Merchandising, Sales, Organizational Management, and Office Services Activities mean scores on the Strong Basic Interest Scales (Table 14, using t tests for independence of means).
- In the sample there were statistically significant differences and meaningful effect sizes between gender and the Strong Interest Inventory Personal Style Scales for Work Style and Risk Taking /Adventure mean scores. Males had higher mean scores than females for Risk Taking/Adventure. Females had higher mean scores than males for the Work Style Scale (Table 15, using t tests for independence of means).
- There were no statistically significant differences between gender and the Personal Style Scales for Learning Environment and Leadership Style mean scores in the sample (Table 15, using t tests for independence of means).

Use of career resources including: (1) people such as counselors, teachers and other human sources of information; (2) printed materials such as books, magazines, newspapers and journals; (3) electronic media including Internet resources, commercial database programs such as Choices, ExPAN and College View; (4) experiences such as shadowing, internships, participating in vocational and interest testing and classes:

- There was a statistically significant difference but a non-meaningful effect size between gender and the mean score importance ratings of the use of high school internships as a career resource experience favoring females in the sample (Table 16, using t tests for independence of means).

- In the sample, there were no statistically significant differences between gender and the mean score importance ratings of the use of human sources of information, printed materials, electronic media, middle school shadowing, participating in vocational, and interest testing (DAT, ASVAB, and Strong) and classes including the Arlington Career Center program as career resources (Tables 16 and 17, using t tests for independence of means).
- There were no statistically significant differences between gender and the mean score rating participant's gave to the importance of talking to counselors, career specialists, teachers, fathers or other male relatives, mothers or other female relatives, friends, learning about careers in classes, and having hands-on career experiences in the study (Table 16, using t tests for independence of means).

With respect to choice of college major:

- In the sample, there was a statistically significant association and difference, but a non-meaningful effect size between gender and female's choices of a college major. Females had higher frequency and mean scores for choosing Pre-Medical studies than did males (Tables 18 and 19, using Chi-square analysis of association and t tests for independence of means with effect size based on t tests).
- In the sample, there was a statistically significant association and difference, but a non-meaningful effect size between gender and male's choices of college majors. Males had higher frequency and mean scores for choosing Computer Science than did females

(Tables 18 and 19, using Chi-square analysis of association and t tests for independence of means with effect size based on t tests).

- In the sample, there were no statistically significant associations between gender and the choices of college majors for males and females for business, art, undecided, and multiple choices of majors (Table 18, using Chi-square analysis of association).
- In the sample, there were statistically significant differences, but non-meaningful effect sizes between gender and the mean score importance ratings participants gave to reasons for choosing college majors and careers. Males had higher mean scores for salary and other financial rewards than did females. Females had higher mean scores for college majors and careers involving helping people (Table 20, using t tests for independence of means).
- In the sample, there were no statistically significant differences between gender and the mean scores for importance participants placed in the choice of college majors or careers, for the opportunity for career growth, for interests, for aptitudes, for prestige, for the ability to have fun, and for an attractive work environment (Table 20, using t tests for independence of means).

Likelihood of advanced computer use in college and careers:

- There was a statistically significant difference but a non-meaningful effect size between gender and males and females' mean score rankings of the importance of current computer use for current job or job searching. Males had higher mean scores than females ranking the importance of computers for current job or job searching in the sample (Table 10, using t tests for independence of means).

- In the sample, there were no statistically significant differences between gender and the participant's mean score ratings of the importance of computers in their current and future personal and academic lives, future career, and to make them smarter and more knowledgeable (Table 10, using t tests for independence of means).

Attitudes and anxiety concerning computers and computer use:

- There was a statistically significant difference and a non-meaningful effect size between gender and the mean scores of participants concerning restrictions to computer use at the High School. Males in the study had higher mean scores than females regarding wanting no restrictions on the use of computers in the sample (Table 10, using t tests for independence of means).
- In the sample, there were no statistically significant differences between gender and the mean score attitudes about doubling the number of computers, being required to use computers to turn in word processed papers, and spending more time teaching computer and information technology at the High School (Table 10, using t tests for independence of means).
- In the sample, there were statistically significant differences, but non-meaningful effect sizes between gender and the total mean scores for the CARS, MRCARS, and ACT measures of computer anxiety and computer self-efficacy. Females had higher mean scores than males on all measures indicating higher computer anxiety, avoidance, and lower computer self-efficacy (Table 11, using t tests for independence of means).
- In the sample, there were statistically significant differences, but non-meaningful effect sizes between gender and the mean scores on 10 specific items of the CARS and ACT measures of computer anxiety and computer self-efficacy. Females had a medium, but

non-meaningful effect size (.5 to .6) in not thinking they could keep up with computer advances. The effect sizes of the other statistically significant results for not thinking they would find the computer useful on the job; thinking they would make mistakes that they could not correct; thinking that they would destroy information by hitting the wrong computer key; avoiding computers because they saw computers as intimidating and unfamiliar; feeling that they were not the type for computer use; feeling threatened by the impact of computer technologies; not seeing the computer as helpful to create materials to enhance their jobs; and being anxious about something going wrong with the computer that they could not understand had weak and non-meaningful effect sizes (.1 - .4) differences (Table 12 using t tests for independence of means).

- In the sample, there were no statistically significant differences between gender and twelve CARS items saying that they felt: not everyone can learn computers, practice will not enable everyone to learn computers, dislike for computers because they are smarter than individuals, computers were not helpful with schoolwork, they have to be a genius to understand computers, apprehensive about computers, insecure about reading computer printouts, computers are not a necessary tool, the challenge of computers is not exciting, they cannot learn a programming language, they do not want to learn more about computers, and afraid of becoming dependent on computers, and three ACT items saying that they felt: that computers mean more work, they will be less productive using computers, and computers are of no use (Table 12, using t tests for independence of means).

CHAPTER V

SUMMARY OF THE CASE STUDY

This chapter presents the conclusions of the descriptive case study, which are based on the findings from the analyses of the data and the implications these conclusions have for research and practice. The goal of the study was to examine the participants' demographics, academic and career exploration characteristics and experiences, attitudes toward computers, counseling and guidance resources, and other variables for statistically significant gender differences.

The answers to the research questions revealed a number of statistically significant findings involving gender differences in computer attitudes and usage, with ten of these findings having meaningful effect sizes of .7, .8, and .9. Research Question 4, which contained the Strong Interest Inventory differences in mean scores, contained all ten of these findings. Many of the items had statistically significant findings, but non-meaningful effect sizes, but a discussion of these variables is still necessary. The differences in effect sizes pointed out the variations in the male and female characteristics for the sample, which are of great interest. The summary of the answers to the research questions and implications are as follows:

Research Question One

Are there statistically significant gender differences in 11th and 12th graders demographic and academic characteristics? Yes, there were statistically significant differences.

Educational Aspirations

More males than females in the study indicated that they did not know what their educational aspirations were. In fact, there were no females in the study who did not know what their educational aspirations were. Educational aspirations are important characteristics for 11th

and 12th graders approaching college and career choices. However, planning often is not an important consideration for some individuals. Many males who were risk takers and adventurers on the Strong Interest Inventory in the sample may prefer not to plan but to take things as they come. Females, however, who tended not to be risk-takers on the Strong in the sample may feel as though they have to carefully consider and plan their career paths. This may be because of the discrimination that Gysbers (1998) described has occurred against females. The author noted that females have been discriminated against in many occupations and thought not to be as capable as males, while males have had many opportunities in all fields. This planning for females has helped females to earn more Bachelor's and Master's degrees than men ("Women Earn More," 1999). Now women apparently are planning and entering higher education in unprecedented numbers, as compared to many years ago when men dominated college campuses and graduate schools.

The implications for this finding relate to what Freeman and Aspray (1999) found when they reported that many male high school computer programmers are being lured into industry without even finishing high school, because of the high paying jobs offered to them. As the authors noted, this has not been a wise move for these young men, as it has limited their future career possibilities because they have not continued to study and learn. Perhaps this reliance on going with quick jobs and the money has influenced males not to make too many plans ahead, but to take what comes along.

<u>Academic Achievement.</u>

Females in the study had somewhat higher mean GPA scores than males, but a non-meaningful effect size, indicating that this variable is probably not that different from males mean GPA scores. GPA mean scores were grouped into male and female percentages at the 25th, 50th, and 75th grouping by using Tukey's Hinges. According to Jaegar (1993), this was a procedure developed in the late 1970s and early 1980s by John Tukey to summarize data using exploratory data analysis. This data analysis emphasizes the visual display of a set of data including the "box-and-whisker" chart, which divides the data into quartiles (p. 17). In each grouping, the females had higher mean GPA scores than males (3.01 vs. 2.55 at the 25%; 3.41 vs. 3.03 at the 50%; and 3.71 vs. 3.56 at the 75%). Making good grades appeared to be important and of value to the females in the sample. This result also seems to indicate that females appear to know what to do to get good grades and may be more comfortable in the academic setting than males are, even though their confidence levels may be lower.

Since there were no statistically significant differences in female and male SAT I and PSAT scores, converse to the national scores where males score higher than females (Educational Testing Service, 1999), other factors such as values, beliefs, attitudes and skills concerning academic achievement appeared to be operating (Burns, 1989; Ellis, 1985, Gilligan, 1982; Hogan, 1978). This high achievement of females in the sample occurred in spite of the literature concerning females having less confidence in their abilities and achievements than males have (Chu, 1990; Gilligan, 1982; Gustafson & Magnusson, 1991; Gysbers, Heppner, & Johnston, 1998; Hamid & Lok, 1995; Harrington, 1990, Melamed, 1996).

The implications are that the females in the sample seem to be well equipped to succeed in academic endeavors and they have high academic aspirations. The problem for this sample is that these aspirations do not appear to contain IT pursuits. This lack of interest in IT by both females and males, but especially females, is uncalled for due to their academic achievement and ability (Freeman & Aspray, 1999). This disparity is a loss to them, to the IT industry, and to society.

Research Question Two

Are there statistically significant gender differences in the extent of computer use by the participants and their fathers and mothers? Yes, there were statistically significant differences in the Chi-square scores of male's whose fathers used computers for "other uses; and for male participant's who used the computer for chat rooms and for playing computer games.

Father's Use of Computers for Other Tasks

Males in the study had higher percentages of fathers who used the computer for "other tasks" than did females. Several authors (Brosnan, 1998; Brunner & Bennett, 1998); Chen, 1986; Colley, Gale & Harris; Freeman & Aspray, 1999; Siaan, Macleod, Glisson, & Durndell, 1990; Turkle, 1995) note that males had a higher rate of computer use. Males tend to use computers more often than females for a variety of tasks and seem to enjoy computers more than females do (Hanor, 1998; Harrington, 1990, Harris, 1989; King, 1995; Levin & Barry, 1997; Mauer, 1994; Morahon-Martin, Olinsky, & Schumacher, 1992; Necessary & Parish, 1996).

The implications for this finding are while more father's of males used computers for other tasks, three fourths of the mothers used computers and used them almost as much as the fathers used them, but in different ways. Since the use of "other tasks" did not include most of the standard uses, as did the other categories in the question, this finding does not appear to be of great importance. Therefore, for this sample, the use of computers was much more of a difference in the kinds of computer activity males and females participate in while using computers.

Participant's Use of Computers for Chat Rooms

This result duplicates the findings in the literature indicating that males used computers more than females and ventured out into the Web to connect with like-minded individuals

(Turkle, 1988). There were several references to males intimidating females in this realm and how males would "blaze" females or neophytes in chat rooms (Brosnan, 1998, Crow, 1998; "Geek Factor", 1999; Turkle, 1995; Weinman, & Haag, 1999). Quittner (1999) noted that the Web was the realm of the future, but since males mostly inhabit the Web, this again puts females at a distinct disadvantage.

The implications for this finding are that females tend not to use computers for the many activities available especially in cyber-space. Crow (1998) feels that the Internet is politicized and male dominated, and therefore he encourages women to get on line to share the wealth of knowledge on the Web. Turkle (1995) portrays exciting adventures for females using virtual reality on the Web. She sees many opportunities for females to explore different identities and form new and interesting relationships on the Web. If females do not enter this new realm or catch up with the new technology, they will once again be disenfranchised and miss new and exciting developments.

Participant's Use of Computers for Computer Games

This finding was well documented in the literature where males were portrayed as game playing "nerds" who spend a great deal of time in these activities, while females do not participate in or enjoy these activities (Eberts & Geisler, 1993; Hanor, 1998; Hawkins, 1985; Melamed, 1996). Hanor (1998) chronicled how girls in early elementary grades only enjoy computer games if they are played with others. The girls in Hanor's study became easily bored with the repetitious and violent games boys seemed to enjoy. Since males overall seem to enjoy computers more than females, playing computer games may be a part of this enjoyment. Hutchins (1998) states that times are changing and that females should be able to move as swiftly through the Web as males, because the future pursuits of males and females will be dominated by technology.

The implications for this finding are that young girls do not tend to see the computers in their home and in the school as fun. Females seem to be unnecessarily afraid of computers and have anxieties about looking foolish and ruining things (Brosnan, 1998). This reticence to enjoy the computer and computer games may be due to the male focus of most of these games (Ivinski, 1997). However, now that female owned, operated Web sites, and companies are introducing female friendly games and activities, females may become as enchanted with computers as the males have traditionally been. The need is for computer games that appeal not only to males, but also to females. These games need to excite their curiosity by teaching both males and females valuable new skills and introduce them to new and exciting higher level problem solving.

Research Question Three

Are there statistically significant gender differences in the number of math, computer science, and computer technology classes 11th and 12th graders have taken at the High School? Yes, there were statistically significant but non-meaningful effect sizes in gender differences in the self-reported number of computer classes (including computer science classes) taken at the High School by 11th and 12th graders; the number computer technology (Keyboarding) classes; and the number of computer and computer science classes taken at the High School. These weak effect sizes for computer science and computer technology participation indicate that there does not seem to be a meaningful difference between the males and female’s participation. Only the number of computer classes taken for males seems to be closer to a strong effect size.

Number of Computer and Computer Science Classes Taken at the High School

Males in the study took more computer classes than females. When these classes were examined as to how many classes were taken, the distribution of scores showed females clustering at the "one class" level. This most likely accounts for the large number of females who take Keyboarding as a 9th grade elective. Male's scores clustered at the upper limits, taking three, four, and five computer and computer science classes. Since there are only three classes (Keyboarding, Word Processing, and IB Information Technology), that would be considered computer technology classes, the higher numbers most likely are computer science classes. This finding supports the literature (Brosnan, 1999; Flowers, 1998; Freeman & Aspray, 1999; Melamed, 1996), which indicated that men dominate in computer science classes, computer science majors, and computer science degrees awarded.

The implications for this finding are that in a technologically advanced elite High School, where females have somewhat higher GPA's, take as many if not more math classes as males, and have high educational aspirations at the graduate level, there is a disparity concerning advanced computer science and technology study. Females do not seem to be interested in computer or computer science study that is above the basic Keyboarding, Basic Programming, or first year of computer science level. Since the mean scores for participating (1 = participating, 2 = not participating) in computer science classes for males and females were not statistically different, it appears as though in this High School females may try out computer science for a year, but very few continue on to further study in the field. This is not only a waste for society, but also a waste for the talented and capable females who are excluding themselves from this exciting career of the future.

Participation in Computer Science Classes

Males in the study took a little over twice the number of computer science courses than did females. When the number of computer science classes taken was compared by gender, there was no statistically significant difference in mean scores, because the average number of courses was 1.67 for males and 1.06 for females ($t = .1579$, $p = .126$ with 27 degrees of freedom). However, when the actual participation of males and females in one or more computer science classes was compared to no courses in computer science there was a small statistically significant p value of .046. This result indicates that there may be a small difference in male and female participation in computer science classes favoring males and this result was well documented in the literature (Brosnan, 1999, Flowers, 1998; Freeman & Aspray, 1999; Melamed, 1996).

The implications for this finding are exactly as Freeman and Aspray (1999) reported, that if the number of men and women studying and taking jobs in IT were equal, there would be no shortage of IT workers in America. However, this elite High School, the second best high school America (Matthews, 2000), will not be able to contribute much to this equalization.

Participation in Computer Technology Classes

There appears to be a much larger number of females (73.8%) than males (56.0%) who participate in the computer technology classes at the High School. This result seems to indicate that females prefer to take Keyboarding and Word Processing classes rather than delve into computer programming. From the literature research, females are seen as not as rational and capable of succeeding in higher level classes such as computer science (Gysbers, et al. 1998). While males prefer computer programming, females prefer computer applications (Devlin, 1991). Females have tended to see learning to use the computer as a skill to gain proficiency, so that they may use it as a tool, much like a typewriter was or as a conduit to e-mail. On the other hand, males see the computer not so much as a tool, but as a process and way of thinking and working toward an end or goal (Turkle, 1988).

Implications for this finding are that females have remained as tied to the computer for word processing as they used to be tied to the typewriters for the same tasks. Females in this study have not ventured out in any statistically significant numbers into using the computer for programming or other tasks, but have remained on the sidelines much as the literature portrayed them (Gustafson & Magnusson, 1991). Gelernter (1999) would support these findings and perhaps comment that females at the High School know their place, and it is not in the higher technological realms of academia.

Research Question Four

Are there statistically significant gender differences in the participants' Strong Interest Inventory General Occupational Themes, Basic Interest Scale Activities, and Personal Style Scales? Yes, there were statistically significant differences between the male and female mean scores in the General Occupational Themes of Realistic for males and Artistic and Social for females; in the Basic Interest Scales for males of Military, Mechanical, Athletic, Data Management, and Computers, and for females in Nature, Medical Science, Music/Dramatics, Art, Culinary Arts, Teaching, Social Service, Medical Service, Writing, and Applied Arts; and for females in the Personal Style Scales of Work Style and for males in the Personal Style Scales of Risk Taking/Adventure.

The data from the Strong Interest Inventory presents a statistically significant picture of what males and females in this study want and like to do and how they like to do these things. With 20 statistically significant variables in the General Occupational Themes, Basic Interest

Activities and Personal Style Scales, gender differences proved to be an extremely important variable for career and college major choices, rather than just a stereotypical view of how males and females are different.

General Occupational Realistic Theme

The statistically significant difference in means for males and females in the Realistic theme suggests that males tend to be much more interested in and likely to enjoy and succeed in technical, physical, mechanical, and outdoor activities. Since technology interests are a part of this scale, this result supports the literature findings that males dominate in the field of computer technology (Brosnan, 1998, Flowers, 1998; Freeman & Aspray, 1999; Melamed, 1996). This finding suggests that females would be less likely to be interested in and choose occupations that were technologically orientated (Borgen, 1972). The literature also strongly supported this finding (Brosnan, 1998; Flowers, 1998; Freeman & Aspray, 1999; Hansen & Campbell, 1985; Harrington, 1990; Melamed, 1996).

Implications for this finding are that this was one of the strongest levels of statistical significance and agreed with previous Strong results indicating that the Realistic Occupational Theme was a male orientated theme (Hansen & Campbell, 1985). This result is certainly true for the High School where the males tend to dominate the computer science classes as well as the career choices in the field of computer science. Although there are two female teachers for computer science, this has not seemed to have lured any more females into the classes. For whatever reason, even if females do take beginning computer studies they rarely go on to advanced computer science study at the High School (Columbia School System, 1990-1999).

General Occupational Artistic Theme

The scores for this theme revealed the opposite pattern from the Realistic Theme for males and females. Females showed above average interest in music, art, writing, drama, or other creative activities. These female interests appeared to be interests that do not fit well with computer science activities, except for perhaps the creative aspects of programming and creating new approaches and design to computer technology. Females tend to make connections through art, music, writing, and drama, and these connections or associations are of primary value to females (Gilligan, 1983; Gilligan, Lyons, & Hanmer, 1989).

The implications for this finding are that females tend to cluster in the arts and other creative activities, and that females do not seem to see the possibilities of the creative use of technology to fill some of these needs. Perhaps if more females could begin at earlier ages learning how to create using the computer, this situation might change. Interestingly, females do not seem to perceive computer programming as creative, whereas males do (Turkle, 1988).

General Occupational Social Theme

The scores for this theme also produced higher mean scores for females, but not at the level of the Artistic Theme. Females most likely chose this theme because of their interest and skill in working with or helping others in social service fields (Gilligan, Lyons, & Hanmer, 1989). The strong interest in this theme for women has caused them to concentrate in the social service fields, and therefore females are often at the lowest end of the economic scale, due to the low pay scale for these jobs (Brosnan, 1998; Freeman & Aspray, 1999; Gsybers et al., 1998).

Implications for this finding are that females see computer work as an isolating and solitary occupation (Freeman & Aspray, 1999). There are not as many opportunities to socialize and few social norms involving women in the computer profession, therefore females tend not to want to be a part of this male oriented field. Females often see computing as mechanical, unfeeling, and robbing them of their social needs and interests, and therefore it is difficult to interest females in either computer classes or computer careers. The fact that only one female in the study choose computer science as a major seems indicative of the feelings females have about this “unsociable” profession and field.

Basic Interest Scales

The Strong Basic Interest Scales measure what activities, types of people and school subjects students prefer. Males mean scores for the Military, Athletic, Mechanical, Data Management, and Computer Activities Basic Interest Scales were higher than female mean scores in these areas. The males highest mean scores compared to female highest mean scores were for the Athletic Activities, Military Activities, Mechanical Activities, Computer Activities, and Data Management. The activities involved in all of these scales have been classified as male areas of interest (Borgen, Campbell, Harmon, 1994) and show general preference for working with things, technology, mechanical activities, and organizing sorting and following standardized procedures.

In contrast, the female Basic Interest Scale highest mean scores were in the Music/Drama, Art, Social Service, Culinary Arts, Medical Service, Military, Medical Science, Athletic, Teaching, and Nature. The lowest female mean score was for Data Management activities. From these scores, although there is some overlap with male’s preferences (Military and Athletic) the females as a group had the lowest scores in the areas where males had the highest scores (Mechanical, Computer, and Data Management). These results seem to represent a bipolar distribution that is supported in the literature (Brosnan, 1998; Gilligan, 1982; Gustafson & Magnusson, 1991; Freeman & Aspray, 1999; Melamed, 1996).

The implications are that males and females tend to show very different patterns of basic interests, which are tied to career interests and choices. Although males and females appear to be so different in these areas, this difference should not be looked at as a negative factor, but as one in which differences can be celebrated and capitalized upon. Every occupation and field of study should welcome the diversity that both males and females bring to the table. This diversity of interest and ways of looking at the world will do nothing but enrich the fields. However, if women are relegated to the service industries and careers because of the gender preference differences, then their talent will be lost to the careers of the future in technology and science. An excellent example of this difference being capitalized on is the emerging growth of females in E-commerce and in the non-programming parts of the computer industry (Quittner, 1999).

Personal Style Scales

Since these scales measure personality factors that are related to educational and career planning, they are important scales to analyze in terms of gender differences. The Work Style high scorers like to work with people as compared to the low scorers who like to work with ideas, data, or things. One would assume that females would be higher scorers on this scale. In the present study, this characteristic was validated for the study as evidenced by the meaningful effect size demonstrating that the variable was statistically significant for females. These scores also support the Basic Interest Scale Activities scores for the Culinary Arts, Art, Social Service and Music/Dramatics, as well as for the Artistic and the Social Themes favoring females, compared to the Realistic Theme, which favored males.

The implications are, however, again if women are concentrated in the social service industries in low paying jobs because of their preferences of working with people, this appears to be a form of gender stereotyping and discrimination. This preference for working with people and not with machines will also tend to move females away from the computer industry and especially computer programming, because it is seen as such an isolating field of endeavor.

The Risk Taking/Adventure Scale is an interesting scale, because it measures the subject's level of taking chances (high scorers) as compared to playing it safe (low scorers). One would assume from the other profiles that males would be more high risk/adventure takers, while females would prefer to play it safe. This characteristic was supported in the present study, because males did have higher mean scores in Risk Taking/Adventure, while females had lower mean scores. Harmon (1994) indicated that the Personal Style Scales correlated highly with the General Occupational Themes, especially the Realistic Scale and the Risk Taking/Adventure scale. Campbell (1972), however, cautioned that the Personal Style Scales do not have the validity of the Occupational Scales and should be used with caution and always by trained individuals.

The implications for this finding appear to present somewhat stereotypical views of females as cautious, non-risk taking, afraid of computers, and perhaps suffering from technophobia (Brosnan, 1998). Risk-taking and adventure are just two components of the personal style scales and often indicate just a desire to have fun and adventure. As previous research has shown, young boys seem to enjoy computers more than young girls do, because computers are "fun" for them and provide ways for them to seek adventure. Although females may not want to take risks they, too, want to have fun with computers, and this has not happened for most of them.

Harmon et al. (1994) indicated that these differences on the Strong have been widely criticized as stereotyping and unfair to females. However, it is important to note that when a study such as the one in the present study shows such an overwhelming difference in the females and males preferences, something noteworthy is operating. When females' prefer Social and Artistic General Occupational Themes; Basic Interest Activities in the Musical/Dramatic, Artistic, Social Service, Culinary Arts, and Medical Service; and Personal Style characteristics involving working with people and being cautious, these are interests, values, and themes that are not often considered part of the technological revolution. These characteristics may often cause females to be on the "outskirts" of the revolution (Vehvilainen, 1997).

Research Question Five

Are there statistically significant gender differences in the use of career resources (people, printed materials, electronic media, and shadowing experiences, internships and participating in vocational and interest testing and classes)? Yes, there were statistically significant differences and non-meaningful effect sizes between gender and mean score ratings of the importance of high school internships. This finding indicates that for this sample the differences between gender and high school internships were not real differences but probably caused by wide dispersion of the data.

Internships

The female mean score was statistically significant and higher than the male mean score, but had a non-meaningful effect size. This result means that for females in the study the career information tool and experience that was most important to them was participating in internships and getting to know what a career or profession was really all about. Females seem to need to have this one-on-one experience to gain information (Gilligan, 1982). They need to know about the work environment, associations and connections on the job, and what the people who do these jobs are really like (Gysbers et al., 1998). Even though the male mean score for internships was not as high as the females' mean score, it was the highest mean score of all of the variables for the males, so by default the most important for them also.

High school and middle school internships exist at the High School on an informal basis and are handled by the Business and Industry Coordinator, who finds businesses in the community who want to have interns and then matches the businesses with the interns. Students usually spend six to eight weeks in the business and many summer jobs and eventual career opportunities have resulted from these arrangements. Students also can participate in internships through their churches, synagogues, or mosques. They may also have these experiences through organizations such as the Boy Scouts and Girl Scouts, and other organizations that help young people find opportunities for growth and achievement. In that both females and males rated this as a valuable tool sends the message that no matter what their basic differences are, both males and females want hands-on experiences in the real world of work and relationships (Gilligan, 1982).

The implications are that for females as well as males actually trying out jobs and having on-the-job experiences are vitally important career resources. Since these internships have been informal situations involving no high school credit, it appears to be all the more important as a variable from the student's point of view. The students seem to value the experiences because they portray real life and hands-on working conditions. The other interesting implication involved the students not rating as important the use of electronic databases such as College Board ExPAN, Choices, and the Internet as career resources. This may indicate that the participants do not see computer technology as helping them with future college and career searches, despite the use of these tools in a two-day seminar sponsored by the counselors in the High School English classes during the spring semester of the student's junior year.

Research Question Six

Are there statistically significant gender differences in the participants' choice of college majors? Yes, there were statistically significant gender differences for males and computer science and for females and pre-medicine. There were also gender differences in the reasons participants gave for choosing college majors and careers. These included salary for males and helping others for females. Choosing computer science as a college major was associated with gender favoring males, whereas the females favored pre-medicine. Although the numbers were small for each of the college majors chosen, the findings gave an indication of the types of college majors and careers males and females chose. Only one male chose pre-medicine as compared to six females, and only one female chose computer science as compared to ten males. Actually, computer science had not only a statistical significance for males, but it was one of the top choices of all college majors (6%).

The levels of importance participants gave for choosing college majors or careers profiled again the differences in male and female characteristics. The males' mean scores for importance of salary and other financial rewards as compared to females' mean scores resulted in a small statistical significance for gender. In contrast, the females' mean score for helping others compared to males' mean score resulted in a statistically significant measure for gender with a larger effect size. However, both of these effect sizes were below the .7 level that is considered meaningful, so consequently do not show real differences between males and females.

Pre-Medical Studies

This choice echoed the Strong Basic Interest Scale scores where females chose Medical Service as their fifth choice and Medical Science as seventh choice. For females the medical field appears to represent helping others and being involved in something that they feel is worthwhile and of help to mankind (Gsybers et al., 1998; Hansen & Campbell, 1985; Harmon et al., 1994). The working environment in medicine is very cooperative and operates using a team approach, which again is appealing to females.

The implications of this finding seem to indicate that for females the important aspects of college major choice do involve working with people and helping others. It is interesting that the females in this elite High School did not choose teaching, social work, or other helping professions. They have excellent math and science skills and most likely want to put them to good use in a professional and prestigious field that also meets their needs for connection and helping others.

Computer Science

As has been discussed throughout this study, computer science is a male dominated career and college major (Brosnan, 1998; Flowers, 1998; Freeman & Aspray, 1999; Melamed, 1996). The solitary working environment, the high risk-taking and adventure aspects of computer science work seem to appeal to males far more than to females. While females tend to look for connections and association, males tend to look for quick answers and solutions to problems (Gilligan, 1982). Females do not tend to like the environment of computer programmers and have expressed fears about their safety concerning the late hours and solitary work (Freeman & Aspray).

The implications of this trend strengthen the argument that computer science is a male occupation, although females have all of the skills needed to be a success in the field. With only one female choosing this college major at a technologically advanced High School, the outlook for more females following her lead looks bleak.

Importance of Salary and other Financial Rewards

This variable echoed what Freeman & Aspray (1999) noted in their summary of information technology jobs, the salaries are extremely high, especially in the state of Washington where Microsoft is located. Males' higher mean scores for this item seem to indicate that for males salary is an extremely important reason for choosing a college major and career. Perhaps it is because males have traditionally been considered the "bread-winners" and need to bring home enough money to support the family. However, today with dual incomes, this desire for high salaries may mean more than just bread-winning. Men in general seem to want to "win the game" and be amply rewarded (Gilligan, 1982). Males dominate the boardrooms of all major corporations in America and there are only a few female CEO's of major corporations (Quittner, 1999). Computer science is certainly a field that will bring men the kinds of financial rewards that will put them on Forbes' top 400 list (Galewitz, 1999).

The implications for this finding are that the high salaries of computer programmers and scientists will lure males into the field. However, for females these high salaries will not make up for the lack of interest they feel in the computing world. So, high salaries alone will not entice females into the field, but IT will have to become female friendly and provide the connections and associations females want.

Importance of the Opportunity for Helping People

In the same way that males rated the importance of salary and financial rewards in college major and career choice, females rated helping others as most important for them. This female characteristic of helping and connecting with others is prevalent in the literature (Brosnan, 1998; Gilligan, 1982; Gysbers et al., 1998; Melamed, 1996). Females seem to want and need to be involved in relationships that are meaningful to them, and this then becomes an important consideration for them when choosing a college major or career. Females tend to be more altruistic (Gilligan, 1982). The implications again are that altruism, sets females up for lower paying jobs in the social services as has been discussed, but for females, this has not seemed to matter compared to the intrinsic rewards they receive from helping others. As females do not tend to see the computer industry as one that is helpful to others, this may be another reason for them to avoid it.

Research Question Seven

Are there statistically significant gender differences in the likelihood of participants' advanced computer use in college and careers? Yes, there was a statistically significant difference between males' mean importance ranking score and females' mean importance ranking score. The non-meaningful effect size indicates however, that for this study the difference was not a real difference, but instead, could have been the result of the range of dispersion of the male and female scores.

Use of Computer for Current Job and Job Searching

While use in future academic life was the combined male and female mean score, males ratings for using the computer for the student's current job and job searching achieved a statistical significance for gender, there was a non-meaningful effect size. This finding may indicate either that more males hold jobs outside of school or that they spend more time on the computer looking at job prospects. Females, then, may not be using computers for such activities and this may hinder them in future job-searching activities. The implications are again that males use the computers for many other tasks, while females tend to use the computer as a tool for word processing and e-mail. Culley (1988) saw this difference in the early grades in schools, and it appears to have carried over to the high school years.

Research Question Eight

Are there statistically significant gender differences in the computer attitudes, anxiety, and self-efficacy of 11th and 12th graders? Yes, there were statistically significant differences between the male mean score compared to the female mean score concerning attitudes toward computers. This variable included restrictions of use with the higher mean scores indicating a preference for few restrictions. There were also statistically significant differences between the female mean scores compared to the male mean scores on the computer anxiety and self-efficacy scales (CARS, MRCARS, and ACT). However, as distressing as these attitudes and anxiety over computers were for the females in the sample, the mean differences did not appear to be meaningful differences between males and females. These differences would be closer to what Heinssen found in his original study (1987). The problem, however, is that if females have not progressed in positive computer attitudes and less anxiety than in 1987, the state of computer training and education for females is and has been sorely lacking.

Attitudes Concerning Computer Limitations

The ranking for males as evidenced by their higher mean scores concerning not limiting computer access seems to fit well with the high risk-taking/adventure scores on the Personal Style Scales of the Strong for males. Males most likely feel that they should have freer reign with the computers, and that they should not be hampered by artificial restrictions. These higher mean scores may also be the result of wanting to play computer games or participate in chat rooms on the school computers, which are both restricted. Females, on the other hand, seem to be more cautious and, had lower mean scores on risk taking/adventure on the Strong, and thus may see lifting these restrictions as moving out of their comfort zone.

Implications from these findings include organizing the computer labs in ways that are female friendly and safe, while allowing males to have separate spaces where they can be more free to work in ways they feel comfortable. Most schools do not take into account these gender differences when setting up computer programs, labs, and training. Females are also pushed aside in many computer labs, because males take over and even harass females for not being as good, fast, or competent as males when using computers (Hanor, 1998).

Computer Anxiety (CARS and MRCARS)

The female mean scores for the CARS, MRCARS, and ACT all had weak statistically significant and higher (more anxiety) than the male mean scores. These mean score differences indicated that for females in this study, computer anxiety was higher than for males and computer self-efficacy was lower than for males.

Since the CARS is one of the most used and valid of the anxiety scales (Bowers & Bowers, 1996), the female mean score for anxiety on this measure was statistically significant and even though not as high as on the original CARS, is cause for concern. After 13 years when the original CARS was developed, there have been tremendous gains in the use and understanding of computers. These advances, to some degree, should have alleviated a great deal of anxiety females have toward computers. However, for this study, the same anxiety issues were as present as they were in 1987 when the original CARS was normed. The females in the current sample have had ample experience, exposure, and understanding about computer use and should not be evidencing the amount of anxiety as indicated in the results.

The MRCARS is the shortened version of the CARS containing seven items from the CARS to measure high and low anxiety. The same pattern emerged with the female mean score statistically significant and higher than the male mean score. The distribution of high anxiety for females and lower anxiety for males seems to indicate that the shortened form of the CARS showed the same pattern as the CARS. To understand the computer anxiety evidenced by the CARS and MRCARS, a closer look at the significant anxiety producing items was needed.

Important Computer Anxiety Survey Items from CARS

The largest difference in mean scores of males and females on CARS was with the item that measured how participants felt about their ability to keep up with the advances in computer technology. It appears as though the exact advances in computer technology that should make things easier and less anxiety producing for females have had somewhat of an opposite effect. Females' higher mean scores in this study seem to indicate that they feel overwhelmed by computer technology and technical advances, so much so that they feel anxious, because they cannot keep up with these advances. The other item dealing with the technology aspect of computers also had statistically significant gender differences for females. The female mean score for having difficulty understanding the technical aspects of computers was higher than the male mean score. Females' also had higher mean score on feeling intimidated by computers, for fearing that they will make uncorrectable mistakes or destroy information by hitting the wrong key, and not looking forward to using a computer on the job. These responses were further indications of their lack of confidence about computer abilities and skills compared to males' mean scores.

The implications for these findings are grim. These responses are being rated by females who have higher mean scores on the SAT I and PSAT, have attained somewhat higher mean GPAs than males, and have higher rates of desiring post-graduate study than males. Therefore, something appears to be terribly wrong. This situation is certainly not what one would expect, and it is not only sad, but it is alarming.

Self-Efficacy Measures (ACT)

The shortened Delcourt & Kinzie (1993) ACT scale measuring computer self-efficacy followed the same pattern as the CARS and MRCARS. The males' mean scores were lower than the females' mean scores and indicated that for this study males' mean scores for computer self-efficacy were lower and showed more self-confidence than females' mean scores. How a person feels about his or her ability to handle computers and computer technology is an important construct and as such is an important variable to study.

The specific items measuring computer self-efficacy that had the strongest statistical significance and were higher for females than for males included: (1) discomfort with the technology aspect of computers, (2) feeling threatened by the impact of computer technology, (3) feeling anxious about something going wrong with the computer that they did not understand, (4) not feeling like they were the type for computers, and (5) feeling that the computer would not be helpful to create materials to enhance the job.

The implications for these findings indicate that these self-efficacy measures combined with the anxiety measures put females in this study at risk for serious computer anxiety and avoidance or technophobia. The females in the study had higher mean scores on all of these items, indicating that many females, despite their high scores in standardized testing, GPAs, educational aspirations, but still seem to lack computer self-efficacy more so than males.

Conclusions

This study presented the picture of an elite High School where all things were in place for all students to have positive computer attitudes, expectations, and usage. An examination of the demographic characteristics; computer use of participants and their parents; computer and math classes taken; Strong Interest Inventory measures; the use of career resources; the participant's choices of college majors and the variables that were important to these choices; the likelihood of future computer use; and the participants' computer attitude, anxiety, and self-efficacy measures provided rich data. These data resulted in a number of statistically significant findings but meaningful differences (as indicated by large effect sizes) were discovered only in relation to the Strong General Occupational Themes, Basic Interest Activities and Personal Style Scales.

The results indicated that at this elite High School the females had somewhat higher GPA levels, as well as higher levels of computer anxiety and low computer self-efficacy than the males. Females in the study chose Pre-Medicine and indicated that helping others was very important to them in making career choices. Females tended to say they participate in computer technology or keyboarding classes, while males tended to say they participate in computer science classes and took more computer and computer science classes than females.

Males and their father's used computers for different tasks than females and their mothers did. Even though more males in the study were unsure about their educational aspirations, some chose college majors in computer science and others indicated that salaries and other financial rewards were the most important to them. Males in the sample used the computer for their current job and job searching, to access chat rooms, to play computer games, and were opposed to computer restrictions at the High School.

The males and females in the sample had very different Strong Interest Inventory preferences in general occupational themes and basic interest activities. Males were more realistic and technically and mechanically orientated, and liked the athletic, mechanical, technical, data management, computer, and military activities. Female's preferences in general occupational themes centered in the social and artistic areas and they liked the artistic, dramatic, social, medical science and services, culinary arts, teaching, social service, and music and drama activities. The personal style preferences for males were for risk taking and adventure as compared to females who preferred working with people.

The Strong scales gave the profile of a typical male computer user (Realistic Occupational Theme, Mechanical, Data Management, Athletic, Military and Computer Basic Interests, and high Risk Taking), who planned to major in computer science in college. Females in the study simply did not fit this profile at all. Because of the female's needs for connections, helping others, artistic and creative endeavors, and their lack of comfort about using and keeping up with computer technology they were very unlikely to participate in or plan careers in computer science or technology.

The conclusions are that females at this elite High School appear to suffer from higher levels of computer anxiety and apprehension than do the males. The females tend to see computers as machines not to be trusted and certainly not to consider as areas for careers or even significant use. These females seem to see computers as tools to help them get their school assignments done, but not as providing "fun" activities or for other uses. Females at the High School do not participate in computer science classes at the same rate as the males and for them computers may appear to be more of a "necessary evil."

One of the most important findings of this study involved the statistically significant and high effect sizes noted in Strong Interest Inventory variables, which presented very different male and female preferences, interests and personal styles. These preferences, interests, and personal styles may appear to be somewhat stereotyped, but are an actual representation of what 11^{th} and 12^{th} grade females in an elite and technologically advanced High School chose. Therefore, if schools and IT industries want to have an equal representation of females in computer classes and computer occupations, both will have to provide opportunities for females to be able to meet their basic interest, activity, and personal style needs. Yes, males and females may be different, but instead of making the females change to fit the male pattern of interests, activities, and personal styles, it seems to be more the responsibility of the schools, training institutions, colleges and universities, and industries to provide females with the kinds of environments and activities that will satisfy their personal preferences and strengths. After all, the computer industry is run by and for people, and since females show such a preference for working with people, the match should be a good one.

The above implications may be carried out in two major areas:

Implications for Practice

1. Because of the Strong Realistic male orientated profile of computer users and computer science majors, perhaps the schools in the City of Falls Church could include early training and introduction to mechanical and technical methods for all students. Females especially would benefit from this type of training. The magnet school for technology in the Northern Virginia region, has a required freshman level course, which does just this in order to prepare all the students to participate equally in technology.

2. Introduce computer games that appeal to girls early in elementary school to help them learn how to have fun with computers. Identify fun things for females to do with computers early in their schooling. Use Web sites such as www.girl.com to explore ideas on how to interest girls in technology. Teacher training will be an important part of this practice, for if the teachers do not view the computers as “fun” they will not be able to help the students, especially the girls, see this aspect of technology.

3. Make the Middle School computer programming class one that also includes

computer applications and creative approaches to computing that use the female's strengths in the artistic and social areas. Females seem to prefer applications, working cooperatively, and creating rather than programming and dealing with computer hardware.

4. Since females in the study had a preference for internships, provide IT internships particularly for Middle School and High School females, so that they can see the variety of career possibilities in IT.

5. Establish a mentoring program for computer literate and liking high school girls to act as mentors for elementary and Middle School females that do not like computers (Evans, 1992).

6. To deal with the computer anxiety and technophobia that appears to be present in the population the counseling staff should institute a computer anxiety training program. This program should begin to work with ninth graders when they enter the high school to help them overcome their computer fears and avoidance.

7. The counseling program should stress cognitive behavioral methods to help the young women look at computer technology in a more favorable light. This will help to dispel the untrue beliefs many of the females have about computing and their abilities in this area. The material Yoo (1998) described in the study concerning the social cognitive analysis of gender differences in science careers of high school students would be helpful to counselors.

8. Set up the computer technology and computer science classes so that they are female friendly and provide for cooperative learning and connections to real life situations. Since the Strong results indicated that females preferred social and artistic occupational themes, this may be one reason why females do not like computer science, as they do not see computer science as being either social or artistic (Robinson, 1998). Additionally, the way in which females process

information through association and like to work in cooperative groups goes against how most computer science classes are structured.

9. Make serious efforts in the computer science department to do away with the "male dominated" attitude of the classes and of the males who dominate these classes. These attitudes foster beliefs that females are not as capable, fast, or as effective as the males are.

10. For females to participate in computer science classes, they should not feel threatened, stupid, or not as good as the males in the class. Simply because they have different attitudes and handle computers in different ways than the males do, does not make females inferior to males in computer science classes (Zimbardo, Ebbesen, & Maslach, 1997).

11. Experiment with single sex computer classes at the elementary, middle or high school, or have separate female computer stations and male computer stations perhaps even in separate areas.

12. School counselors and other personnel who meet with females need to be trained concerning the parts of the computer and the things to do when something happens. A team of female helpers who can assist younger females when things go wrong could perform this training.

13. Utilize the strong artistic and creative preferences of females by incorporating more artistic and creative activities in computer technology and computer science classes.

14. Since females tend to like writing, they should also like computer programming. This is a form of writing, if it is taught as a writing process rather than a mechanical process.

15. Use the Strong Risk Taking scores by finding high risk taking females in order to encourage them to become interested and involved with computers.

16. Utilize community support by having volunteers from the community, especially females, come and speak to the classes about the importance of computers in their futures and give specific examples of how computers have helped them in their careers.

17. Since females seem to want to enter the helping professions and males want high pay and adventure, until this equalized there will be gender splits and unequal distribution of resources. Perhaps high schools and counselors could begin to work with students by considering the options people have for "success." Actually talking with people in various fields and hearing about the external as well as the internal rewards of various occupations would be helpful to young people. These would be very good topics for group counseling sessions and career programs.

18. Many parents as well as counselors do not understand the career opportunities in IT fields (Freeman & Aspray, 1999). Counselors need to study and find out about the field so that they can adequately advise their counselees and their parents, as well as help them to make realistic and practical college major and career decisions.

19. Using an inventory such as the Strong would be helpful to open up these kinds of discussions with students. The counselor should individually interpret the Strong results to the students, so that they understand what the interest inventory means for them in their particular situation according to gender differences (Conoley & Impara, 1995).

20. Job searching activities were ranked as more important for males in this study. Therefore, to help females see the importance of this career activity, counselors and guidance personnel need to work with females to show them how to do these activities. Seminars, groups, or other activities in and out of school will help females gain the expertise that males have, so that

females are not at a disadvantage because they do not know the “tricks of the job searching trade”.

21. Use computer assisted learning programs (Chu, 1997).

22. Make the process of learning computers for females one that is built on success rather than on intimidation using suggestions from Mouzes (1995).

23. The school and counselors need to try and decrease the gender bias in computers in classes, computer labs, computer clubs, and choosing computer aides (Persichette, 1993)

24. Teachers of computer science need to have special training and certification in the subject, as a separate subject rather than a math or a computer class (O’Lander, 1994).

25. Introduce the ethical aspects of computing into computer science classes as this is an area that is of interest to females.

26. Reduce the programming tasks in computer science classes, which females do not like, or find more female friendly ways of teaching this process.

27. Encourage females to participate in all types of computer classes, computer technology, computer science, IB Information Technology, and any others that will give females the skills they need to become successful and enjoyable computer users.

28. School counselors need to be proficient in computers, because they will not be able to adequately advise or understand these problems if they themselves are not computer literate and understand the “fun” of computers.

29. Counselors at all levels in the school system need to learn to learn to play with students using computers by following some of the suggestions of Yost (1998) concerning computers and crayons.

30. Girls should be treated with respect when it comes to computer instruction. Hanor

(1998) suggests that teachers let girls “mess around” with computers, form computer clubs, and treat computer learning like learning to play the piano. Hanor also says that it often takes girls more time to complete tasks when working with computers, which should not be penalized.

31. Use Virtual Reality to interest females in computer technology and have them understand feedback and control concepts (Turkle, 1995).

32. Generally allow females more time in the computer lab, provide more computers that work, and realize that all students don’t process at the same level, and that boys are usually faster, so don’t let them block girl’s access.

33. Teachers should concentrate on aesthetic aspects of computer and use computers as theater, which would greatly appeal to females.

34. Counselors and teachers need to understand learning styles (Gardner 1983), so that they can help females and males learn to use and enjoy computers according to their particular styles of learning.

35. Have both counselors and classroom teachers relate computer skills to the world of work for students by infusing computer technology into all academic disciplines.

36. Since it is anxiety that causes technophobia, making the computer experience pleasant would be a help, especially to females (Gos, 1996).

37. Introduce programming only when students are ready for it and do only simplified programming for females. If there is too much diversity in abilities in the computer class, this may be discouraging for females.

38. When there are too few computers to go around, teachers, counselors and technology specialists need to make sure that boys do not dominate the computer stations.

39. Encourage females to consider non-traditional careers using the strategies outlined in

Degee (1996).

40. Develop computer software that is not linear focused and action orientated, but designed to be more associative and circular to meet the needs and interests of females.

41. The results of the AAUW study (Tech-Savvy: Educating Girls in the New Computer Age, 2000) recommendations present excellent opportunities for more equal female participation including:

a) Transform pink software: Software does not need to be specifically designated for girls or boys. Software for both classroom and home should focus on the many design elements and themes that engage a broad range of learners, including both boys and girls, and students who don't identify with the "computer nerd" stereotype. b) Look to girls and women to fill the IT job shortage: Girls are an untapped source of talent to lead the high-tech economy and culture. Curriculum developers, teachers, technology experts, and schools need to cultivate girls' interest by infusing technology concepts and uses into subject areas ranging from music to history to the sciences in order to interest a broader array of learners.

d) Prepare tech-savvy teachers: Professional development for teachers needs to emphasize more than the use of the computer as a productivity tool. It must give teachers enough understanding of how computer technology works and its basic concepts so that they are empowered users. e) Educate girls to be designers, not just users: Educators and parents should help girls imagine themselves early in life as designers and producers of new technology. Engage girls in "tinkering" activities that can stimulate deeper interest in technology; provide opportunities for girls to express their technological imaginations.

f) Change the public face of commuting: Media, teachers, and other adults need to make the public face of women in computing correspond to the reality rather than the stereotype. Girls tend to imagine that computer professionals or those who work heavily with information technology live in a solitary, antisocial world. This is an alienating—and incorrect—perception. g) Create a family computer: Among other things, place computers in accessible home spaces. Think about shared or family-centered activities on the computer, rather than viewing its use as an individual or isolated activity. h) Set a new standard for gender equity: Equity in computer access, knowledge, and use—across all races, sexes, and classes—cannot be measured solely by how many people use e-mail, surf the Net, or perform basic functions on the computer. The new benchmark for gender equity should emphasize computer fluency: girls' mastery of analytical skills, computer concepts, and their ability to imagine innovative uses for technology across a range of problems and subjects.

Implications for Research

1. More research is needed on females in other settings, such as in girls' schools, in Silicon Valley, California and in Redmond, Washington, where Microsoft is located. This research would point out if these young women are experiencing the same kinds of computer anxiety and attitudes found in the present study.

2. Similar studies at the elementary and middle school feeder schools to the High School would be helpful to see if the same types of computer attitudes, anxiety, and usage exists, before instituting a plan for remediation.

3. Replication of the study in high schools in larger communities, in private schools, in a school with a larger ethnic minority population, and in an inner city school with a lower socioeconomic population would add important data to the field.

4. A follow-up study of this population after they have finished a year or two of college would be helpful to see what their computer attitudes, interests, and usage are, as well as examining qualitatively the reasons for their computer anxiety.

5. Consideration of a longitudinal study to see if females who are out in the work force continue to have the same levels of computer anxiety and technophobia as found in the present study.

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APPENDICES

APPENDIX A

Letter to the School

May 12, 1999

Dear Mr. Snee:

As a doctoral candidate at Virginia Polytechnic Institute and State University at the Northern Virginia Graduate Center in Falls Church, VA, I am conducting a study about student's attitudes and interest in computer and information technology. I would like to conduct this study with students at the High School. The purpose of this study is to examine students' uses of computers and participation in technology classes, as well as their plans to major in or enter careers in computer technology. A survey questionnaire will ask for some demographic information about race and academic grades. The students will also be rating the career information they have received and tell what they would have liked to receive. This study will help not only the High School students but also other schools improve their career counseling and better serve the needs of the students.

The project would require that I visit the classroom prior to the study to explain the research and pass out consent forms and letters to parents (see the attached letter). Students would then be required to return a consent form, which has been read and signed by both the student and a parent before being allowed to participate. Confidentiality of the research is also a concern and that is why no personal information other than age, grade level, and academic grades will be included on the survey questionnaire. My academic advisors and I will be the only people who will have access to the information from the questionnaire and after the study is completed, the data will be destroyed. The questionnaire that I developed will not include names and addresses of the participants or their parents. The consent forms and simple questionnaires will be securely stored until they become obsolete, at which point they will be destroyed.

My research proposal will be sent to Virginia Tech's Institutional Review Board for Research Involving Human Subjects (IRB) and will not be acted upon without approval from them. The IRB requires that one letter accompany my research proposal from your school and another one from the Falls Church school district, each indicating your agreement to participate in the project. I recognize that there are negative aspects to taking students away from academic pursuits, but I believe the benefits of this study could be educational in the future for students. I would appreciate having the opportunity to speak with you more about this study and to answer any questions you may have about the study.

Thank you for your attention to this petition.

Sincerely,

Marilyn J. Anderson
Researcher

APPENDIX B

Consent Statement from School District and School

May 14, 1999

STATEMENT FROM SCHOOL AND SCHOOL DISTRICT

I have read the case study survey research proposal to study the attitudes and characteristics of students toward computer and information technology, which Marilyn Anderson would like to carry out at the High School. I agree that the proposal has merit to our school and therefore give her my permission to:

1) Go to the 10th, 11th, and 12th grade English classes to inform and explain to the students the nature of the research project and hand out letters to be taken home to the parents for their signatures, which are to be returned to the English teachers. (Time: 5 minutes)
2) Conduct a pilot survey to one of the 12th grade English classes to the students who are 18 years old and therefore do not require parents' signatures. (Time: 10 minutes)
3) Perform a focus group discussion with this class to determine what if any parts of the survey were not understandable or useful. (Time: 15 minutes)
4) Revise survey research questionnaire based on the feedback of the focus group's ideas and comments.
5) Collect consent forms from the English teachers and contact students who have not returned forms.
6) Notify teachers and students of survey time, 9:55 a.m., and place, Mustang Café, on Tuesday, June 8th.
7) The High School counselor will administer survey questionnaires to all students who have returned signed parent permissions slips in the Mustang Café after Nutrition Break on Tuesday, June 8th. (Time: 15 minutes)
8) Collect the questionnaires from the High School counselor and perform statistical analysis on the data.
9) Prepare an executive summary of the results for the High School to be used in career counseling and guidance.

____

Mr. Robert Snee, Principal

____

Mary Ellen Shaw, Superintendent

APPENDIX C

Letter to Parents

May 24, 1999

Dear Parent:

I am conducting a study about the attitudes, characteristics, interests, and experiences of students with computers and information technology and what their career goals and aspirations are. The purpose of this study is to better understand the needs and interests of students to improve career-counseling services especially in the areas of computer and information technology at the High School. This study will be important to you both as a community member and as a parent because of the impact that computers and information technology have on all of our lives and work. Your child's participation will help us quantify the needs and career aspirations of our students so that we may plan appropriate programs and services.

Since your child is being asked to take part in this study, I would like to take a few moments of your time to describe the process and ask you to co-sign the Consent Form for your child to participate. The Consent Form must be returned to the student's English teacher in order for the student to participate in the **15 minute survey** to be held in the George Mason **Mustang Café on Tuesday, June 8th, immediately after Nutrition Break**. Two copies of the Consent Form have been sent home with your student, one is for your records, the other is to be returned to school after you and your student have signed them. I suggest that you take a few moments to read the Consent Form with your student before making your decision.

This study will be presented for approval by the Virginia Polytechnic Institute and University Institutional Review Board. An authorization for the survey has been obtained from both the Superintendent of Schools, Mrs. Shaw, and the Principal of the high school, Mr. Snee. Other steps to ensure the quality of the study and the confidentiality of the participants are explained in the Consent Form. Phone numbers are also given so that you may contact my advisors or me if you have any questions. The general procedures and information about the questionnaire are also provided in the Consent Form.

Thank you for your time and I appreciate your help in providing support for this important career-counseling project. Please feel free to call if you have any concerns or unanswered questions.

Sincerely,

Marilyn J. Anderson
Researcher

APPENDIX D

Informed Consent Form: Computer Attitudes

INFORMED CONSENT FORM

Title of the Study: Gender Differences in Computer Attitudes, Interests, and Usage in an Elite High School.

Investigator: This study is being conducted by Marilyn Anderson, candidate for the Doctor of Philosophy in Counseling at the Virginia Polytechnic Institute and State University. Her advisors are Dr. Octavia Madison-Colmore and Dr. Gabriella Belli.

I. Study Purpose: The purpose of this study is to examine the factors that encourage or discourage young men and women from taking advanced courses in computer and information technology and choosing this as a career field. It is expected that the students will participate in a survey by filling out a questionnaire at the High School on June 8, 1999 after Nutrition Break in the Mustang Café.

II. Procedures: In giving your son/daughter permission to participate in the study, you have consented to let your child complete a questionnaire regarding his or her thoughts and perceptions about computer and information technology. The questionnaire will be given out by the High School counselor to members of the junior and senior classes and should take about 15 minutes to complete. When the students complete the questionnaire, the counselor will collect the forms. The questionnaire includes structured multiple response items that students must choose, check, or rate.

III. Risks: There will be no risks to the participants in this study.

IV. Benefits of the Project: The goal of this project is to help teachers, counselors, and other interested individuals understand what students think about computer and information technology. We hope to find out what would help motivate students and particularly young women, to consider careers in computer and information technology, so that the counselors and the schools can be more effective in preparing young men and women for careers in the 21st century. We will summarize these findings and will be happy to share this information with you at the conclusion of the study. Please contact Marilyn Anderson at the number given on this form if you would like to receive this summary.

V. Confidentiality: All information that is offered to this project will be treated with complete confidentiality. Only the researcher and her advisors will have access to the completed questionnaires and consent forms. These will be kept under lock and key until the completion of the study at which time they will be destroyed. All data will be analyzed in group form so that responses of any individual cannot be known. Reports will only include summaries of group data.

VI. Compensation: Other than our sincere appreciation, no guarantee of benefits is being made to encourage you to participate in this study, however, refreshments may be served to students who complete this questionnaire.

VII. Freedom to Withdraw: If at any time you or your child change your minds about participating in the study, you are encouraged to withdraw your consent and to cancel your participation. There will be no negative repercussions to your child if you should choose to withdraw.

VIII. Participant's Responsibilities: I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I thereby acknowledge the above and give my voluntary consent for participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

_________________________________ _________________________

Student's signature Date

X. Parental Consent: I have had all of my questions answered and hereby give my consent for my child to participate in this project.

_________________________________ _________________________

Parent's signature Date

Should I have any questions about this research, I will contact:

Marilyn Anderson, Researcher

Dr. Octavia Madison-Colmore, Faculty Advisor, EDCO, VA Tech

Dr. Gabrielli Belli, Faculty Advisor, EDRE, VA Tech

Dr. Jerry Cline, Chairman, Institutional Review Board, VA Tech

APPENDIX E

Computer Attitude Survey Questionnaire

COMPUTER ATTITUDE SURVEY

____

NAME

____

GRADE LEVEL

This is a survey to measure High School students' attitudes about computers and computer technology. Please give your honest opinion for each of the questions. This survey will be used to better understand student needs in the area of computer and information technology. **Thank you for your participation!**

Section A: Indicate to what extent you agree with the following statements. Please circle the appropriate number at the right, from 1 = Not at All to 5 = To a Great Extent.

To what extent do you agree with the following statements:	Not at All				To a Great Extent	
1. I am confident that I can learn computer skills.	1	2	3	4	5	A-1
2. I hesitate to use a computer for fear of making mistakes that I cannot correct.	1	2	3	4	5	A-2
3. I feel that I will be able to keep up with the advances happening in the computer field.	1	2	3	4	5	A-3
4. I have avoided computers because they are unfamiliar and somewhat intimidating to me.	1	2	3	4	5	A-4
5. Anyone can learn to use a computer if they are patient and motivated.	1	2	3	4	5	A-5
6. I have difficulty in understanding the technical aspects of computers.	1	2	3	4	5	A-6
7. Learning to operate computers is like learning any new skill—the more you practice the better you become.	1	2	3	4	5	A-7
8. I dislike working with machines that are smarter than I am.	1	2	3	4	5	A-8
9. I could use computer technologies to access many types of information sources for my schoolwork.	1	2	3	4	5	A-9
10. You have to be a genius to understand all the special keys contained on most computer terminals.	1	2	3	4	5	A-10
11. I feel apprehensive about using computers.	1	2	3	4	5	A-11
12. I look forward to using a computer on my job.	1	2	3	4	5	A-12
13. I feel insecure about my ability to interpret a computer printout.	1	2	3	4	5	A-13
14. I feel computers are necessary tools in both educational and work settings.	1	2	3	4	5	A-14
15. It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key.	1	2	3	4	5	A-15
16. The challenge about learning about computers is exciting.	1	2	3	4	5	A-16
17. I do not think I would be able to learn a computer programming language.	1	2	3	4	5	A-17

To what extent do you agree with the following statements:	Not at All				To a Great Extent	
18. If given the opportunity, I would like to learn more about and Use computers.	1	2	3	4	5	A-18
19. I am afraid that if I use computers I will become dependent Upon them and lose some of my reasoning skills.	1	2	3	4	5	A-19
20. I feel comfortable about my ability to work with computer technologies.	1	2	3	4	5	A-20
21. Using computer technologies in my future job will only mean more work for me.	1	2	3	4	5	A-21
22. I am not the type to do well with computer technologies.	1	2	3	4	5	A-22
23. If I can use word processing software, I will be more Productive.	1	2	3	4	5	A-23
24. I am anxious about computer technologies because I don't Know what to do if something goes wrong.	1	2	3	4	5	A-24
25. With the use of computer technologies, I can create materials to enhance my performance on the job now and in the future.	1	2	3	4	5	A-25
26. I do not have any use for computer technologies on a day-to-day basis.	1	2	3	4	5	A-26
27. I do not feel threatened by the impact of computer technology.	1	2	3	4	5	A-27

Section B: Consider the importance of the following items in your career guidance and counseling needs. Indicate the importance of each person or activity by circling the appropriate number at the right, from 1= Not Important to 5 = Extremely Important. Select "N/A" for each item if the question does not apply to you.

How important is each item in your career activities?	Not Important				Extremely Important		
1. Meeting with your counselor	1	2	3	4	5	NA	B-1
2. Meeting with the career specialist	1	2	3	4	5	NA	B-2
3. Talking to your teachers about careers	1	2	3	4	5	NA	B-3
4. Learning about careers in your classes	1	2	3	4	5	NA	B-4
5. Getting hands-on career experiences	1	2	3	4	5	NA	B-5
6. Talking to your father or other male relative/guardian about careers	1	2	3	4	5	NA	B-6
7. Talking to your mother or other female relative about careers	1	2	3	4	5	NA	B-7

How important is each item in your career activities?	Not Important				Extremely Important		
8. Talking to your friends about careers	1	2	3	4	5	NA	B-8
9. Using electronic searches such as ExPAN, Choices and College View To find out about careers.	1	2	3	4	5	NA	B-9
10. Using books, pamphlets, and other paper resources to find out About careers.	1	2	3	4	5	NA	B-10

Section C: What factors and career information tools did you find useful? Please circle the appropriate number at the right, from 1 = Not Important to 5 = Extremely Important and "NA" if Not Applicable.

How important was each tool in your career planning?	Not Important				Extremely Important		
1. The Differential Aptitude Test (DAT) given at the 9th grade	1	2	3	4	5	NA	C-1
2. The Armed Forced Vocational Aptitude Battery given at the 10th grade	1	2	3	4	5	NA	C-2
3. The Strong Interest Inventory given at the 11th grade	1	2	3	4	5	NA	C-3
4. The Career Center's hands on classes	1	2	3	4	5	NA	C-4
5. Middle school shadowing experiences	1	2	3	4	5	NA	C-5
6. Vocational classes at the High School	1	2	3	4	5	NA	C-6
7. High school internships	1	2	3	4	5	NA	C-7

Section D: How much do you and your parents use a computer? Please circle the appropriate number at the right, from 1 = None to 4 = A Lot. Select "N/A" for any question that identifies something that is not applicable to you and your situation.

How many hours did you spend last week on the computer:	None			A Lot		
1. Using the Internet	1	2	3	4	5	NA
2. Looking up information	1	2	3	4	5	NA
3. Word processing	1	2	3	4	5	NA
4. Participating in chat rooms	1	2	3	4	5	NA
5. Using E-mail	1	2	3	4	5	NA
6. Playing computer games	1	2	3	4	5	NA

7.	Doing required assignments	1	2	3	4	5	NA
8.	For career exploration and planning	1	2	3	4	5	NA

Please check all the following for which your parents/guardians use the computer for personal or work related tasks.

Dad or other male guardian	Mom or other female guardian
To do taxes________________	To do taxes__________________
Budget____________________	Budget______________________
Internet____________________	Internet______________________
E-mail______________________	Email_______________________
Word Processing____________	Word Processing_______________
Play games_________________	Play games___________________
Other______________________	Other________________________
Does not use computer________	Does not use computer__________

Section E: How important are computers to you as a tool in the following areas? Please circle the appropriate number at the right, from 1 = Not Important to 5 = Extremely Important.

How important are computers to you in these areas:	**Not Important**				**Extremely Important**	
1. Current personal life	1	2	3	4	5	E-1
2. Current academic life	1	2	3	4	5	E-2
3. Current job or job searching	1	2	3	4	5	E-3
4. Future college academic life	1	2	3	4	5	E-4
5. Future college personal and social life	1	2	3	4	5	E-5
6. Future career	1	2	3	4	5	E-6
7. To make me smarter and more knowledgeable	1	2	3	4	5	E-7

Section F: Planning a career or college major while in high school is hard. How important is each of the following in helping you decide? Please circle the appropriate number at the right, from 1 = Not Important to 5 = Extremely Important.

How important is each of the following in your choosing a career or college major?	**Not Important**				**Extremely Important**	
1. Salary and financial rewards	1	2	3	4	5	F-1
2. Opportunity for career growth	1	2	3	4	5	F-2
3. Interests (What I like to do)	1	2	3	4	5	F-3

How important is each of the following in your choosing a career or college major?	Not Important				Extremely Important	
4. Aptitudes (What I am good at doing)	1	2	3	4	5	F-4
5. Prestige in your work and work setting	1	2	3	4	5	F-5
6. Opportunity to help others	1	2	3	4	5	F-6
7. Opportunity to have fun	1	2	3	4	5	F-7
8. Attractive work environment	1	2	3	4	5	F-8
9. Other____						

Section G: Please give some of the demographics for you and your family. Confidentiality is guaranteed.

Please check the appropriate response.

1. My father's occupation is what may be called:
   White Collar Blue Collar Not Sure
   G-1
2. My mother's occupation is what may be called:
   White Collar Blue Collar Not Sure
   G-2
3. My family's income level is considered generally to be:
   High Medium Low Not Sure
   G-3
4. Does your father work outside of the home? Yes No Not Sure G-4
5. Does your mother work outside of the home? Yes No Not Sure G-5
6. Does your father use a computer at home? Yes No Not Sure G-6
7. Does your mother use a computer at home? Yes No Not Sure G-7
8. Do you use a computer at home? Yes No Not Sure G-8

Section H: Please answer the following conditions by filling in the blank spaces below:

(1) If you could have any career you would desire, regardless of the money you would make or the training required what would it be?

____

____

(2) What would computer and information technology have to do with this career?

____

____

Section I: If could change anything at the High School having to do with computers and information technology, what would it be? Please answer the following questions by circling the appropriate number at the right, from 1 = Disagree to 5 = Strongly Agree.

To what extent do you agree with these statements:	**Disagree**				**Strongly Agree**	
1. There should be double the number of computers available To students at the High School.	1	2	3	4	5	I-1
2. There should be no restrictions on computer usage at school.	1	2	3	4	5	I-2
3. Students should not have to use computers or turn in word processed papers at the High School.	1	2	3	4	5	I-3
4. There should be more time spent teaching computer and information technology at the High School.	1	2	3	4	5	I-4
5. Other____						

Section K: Please complete the following demographic information about you and your family by checking the appropriate box. Please check only one for each question. Confidentiality is assured.

1. I am: Male Female

2. I consider myself to be:

   White African American Asian Hispanic American Indian Other

3. How much schooling do you expect to attain?

   Less than high school HS 2 yr. College 4 yr. college Post grad Don't know

4 How much schooling did your father attain?

   Less than high school HS 2 yr. College 4 yr. college Post grad Don't know

5. How much schooling did your mother attain?

   Less than high school HS 2 yr. College 4 yr. college Post grad Don't know

6. I plan to major in:

   Business Art Social Work Math Counseling
   Foreign Language P.E. Education Music Engineering
   Physical Therapy Pre-Med. Social Sciences Pre-Law English
   Computer Science Science Architecture General Arts and Sciences
   Undecided

7. The number of computer and technology classes (including computer science) I have taken at the High School is:

   One Two Three Four or more None Don't Remember

VITA

VITA

MARILYN JOAN WHINNERAH ANDERSON

EDUCATION:

Doctor of Philosophy (Ph.D.), Counseling, Virginia Polytechnic Institute and State University, Northern Virginia Graduate Center, VA, May 2000.

Master of Arts (M.A.), Social Sciences, San Jose State University, San Jose, CA, January 1968.

Bachelor of Arts (B.A.) Distributed Studies (Social Sciences, English, and Secondary Education), cum laude in General Honors Studies, University of Colorado, Boulder, CO, June 1958.

PUBLICATIONS:

Anderson, M. and Tyson, D., 1996. Using Charting in Selective College Admissions. Counseling Practitioner. Arlington, VA: National Association for College Admissions Counseling.

Anderson, M. J., 1995. In Furthering the Recognition and Acceptance of the International Baccalaureate Program. Contact, 14-15.

Anderson, M., Kaufman, A., and Kaufman, N., 1976. Use of the WISC-R with a Learning Disabled Population: Some Diagnostic Implications. Psychology in the Schools, 13,(4), 381-386.

Anderson, M. J., 1968. The Lawyer and the President: A Psychological Study of a Realistic Secretary of State, Robert Lansing, and a Moralistic President, Woodrow Wilson, and the Effect on the League of Nations. Master's Thesis, San Jose State University.

PRESENTATIONS AND HANDBOOKS:

Counseling the IB Student, Armand Hammer United World College, Montezuma, New Mexico Summer Programs, 1993-2000.
Outcome Based K-12 Guidance Program, Falls Church Public Schools K-12 Program, 1993-1999.
Directions Handbook: A Handbook for Parents and Students, Falls Church City Schools, 1987-1999.
High School Course Descriptions, 1987-1999.
The International Baccalaureate: A Program That Works, American Federation of Teachers' Conference, Washington D. C., July 1998.

School Partnerships That Work: Virginia Tech and Falls Church City Schools, A Cooperative Program with the High School Counseling Department and Virginia Polytechnic and State University Counselor Education Department. Virginia Counselor's Association Conference, April 1998.
Dr. Dorothy Blum, acknowledged for contributions to The School Counselor's Book of Lists, (p. iii) Simon & Schuster Co., 1998.
Results of Technology in the Counseling Program, NOVA Technology Conference, Woodbridge High School, May 1995.
Technology and Guidance, Governor's Round-Table, Richmond, VA, December 1994.
The Teacher Advisor System at the High School, T. C. Williams High School, Alexandria, VA, September 1994.
Experience Is an Even Better Teacher if It Is Charted, National Association of College Admissions Counselors, New Orleans, LA, 1992.
Can My Child Get into Harvard: What are the Odds? VA Technology Conference, Teaming for Tomorrow, December 1991.
Alternative Education at the High School: A Program That Works, Northern Virginia Association of School Boards, 1990.
Race and Ethnic Relations at the High School, George Mason University, 1989.
Teaching the Bi-lingual Dyslexic Child, Tri-Services Center, Chevy Chase, MD, 1986.
Sampling the WISC-R in the State of Hawaii: Dr. Alan Kaufman. New York: The Psychological Corporation, 1974.
Elementary Guidance Project, Newport Public Schools, Newport, RI, May 1970.
Ability and Achievement Test Results Using the Otis-Lennon Ability and Achievement Tests: Implications, Monroe County Department of Education, Key West, FL, 1969.
Handicapped and Vocational Education in Monroe County, FL, San Jose State University, CA, 1968.
Client Centered Therapy, San Jose State University, 1967

PROFESSIONAL MEMBERSHIPS:

American Counseling Association
American Education Association
Association for Marriage and Family Therapy
Phi Kappa Phi Honor Society, Virginia Polytechnic Institute and State University

CERTIFICATES AND LICENSES:

Licensed Mental Health Counselor (L.M.H.C.), State of Florida # MH 5947
Licensed Marriage and Family Therapist (L.M.F.T.), State of Florida # MT 1817
National Counselor's Certificate (N.C.C.) # 40372
Virginia Secondary Counselor and Teacher of Social Studies
California Lifetime Teaching Credential (PK-12) and Pupil Personnel Credential
Career Development Facilitator Curriculum Instructor Certification