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ABSTRACT

The tendency of female students to avoid mathematics and science courses has been of concern to many researchers. The concern stems from the fact that avoidance of these academic areas places young women in a position of reduced choice with respect to careers. This research examined mathematics and science related attitudes and behaviors among male and female university students. The project consisted of three studies. The first involved a follow-up of female university students who had participated in an earlier study. These students were contacted and asked questions about jobs and careers. Analyses were run to determine the adequacy of different measures in predicting the actual career choices of these women with regards to mathematics and science. The second study analyzed the results of a questionnaire given to male and female first-year full-time university students to measure attitudes and intentions about mathematics and science, and background information. Gender differences related to a number of attitudes and behaviors were examined. In the third study, first-year male and female mathematics and science students were questioned in order to investigate the factors predictive of persistence in mathematics and science courses once enrolled. Conclusions are drawn from each of these studies. (CW)

THE ROLE OF GENDER, SELF- AND TASK PERCEPTIONS IN MATHEMATICS AND SCIENCE PARTICIPATION AMONG COLLEGE STUDENTS

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The Role of Gender, Self- and Task Perceptions in Mathematics and Science Participation Among College Students

The tendency of female students to avoid mathematics and science courses has been the cause of much concern over the past decade. The concern stems from the fact that avoidance of these academic areas places young women in a position of reduced choice with respect to careers. Moreover, the positions that are closed to women because of their avoidance of mathematics and science tend to be the higher-paid, prestigious occupations. Thus, the avoidance of mathematics and science by women is linked to economic disadvantage for those women (Eccles, 1987). Much of the research on women's avoidance of mathematics and science has focused on students in the elementary and high school years, although there has been a small flurry of research on the development of programs to combat "math anxiety" among university women (Lantz, 1985; Tobias & Weisbrod, 1980). The research reported here, examined mathematics- and science-related attitudes and behaviours among university students -- female and male -- in an effort to extend previous findings to this population and to determine whether there are interventions that might be useful at this educational level. There are compelling reasons for studying this population, despite findings that gender differences in attitudes about mathematics are present as early as first grade (Entwisle, Alexander, Pallas, & Cadigan, 1987). It is women who come to university who form the pool of women most likely to be encouraged into professional fields that emphasize mathematical and scientific expertise. Furthermore, contrary to popular myth, a large proportion of students entering university have not made a clear decision about career goals. Among those who have, many alter their goals over the course of their undergraduate years, often because of experiences with particular courses or professors.

Eccles (Parsons) and her colleagues proposed and tested a model to predict the intention to enroll in future mathematics courses among students in grades 5 to 11 (Meece et. al, 1982; Eccles et. al, 1985). This model, which accounted for 32% to 36% of the variance in intentions to enroll in future mathematics courses in the sample studied, indicates that intentions to continue studying mathematics are affected by expectancies for success and assessment of the personal value of mathematics. These variables, in turn, are apparently affected by students' perceptions of their own math ability, which are in turn affected by students' perceptions of their parents' and teachers' appraisal of their math ability and of the task difficulty of mathematics for them. Previous math performance affects the latter two perceptions. Lantz and Smith (1981) studying secondary school level students, found support for a model indicating that subjective value of mathematics, math confidence, the attitude of the student's self-selected other person, and socioeconomic status were the strongest predictors of math course participation. The subjective value of mathematics was in turn affected by the mathematics needed for planned career, parental encouragement, liking for mathematics, and the attitude of the significant other person. Several other investigations have also underlined the importance of variables included in the above models, particularly previous math achievement (Boswell, 1985, Brush, 1985; Casserly & Rock, 1985), perceived value of mathematics (Armstrong, 1985; Lantz, 1985; Sherman, 1979; Wise, 1985), and self-perceived math ability (Armstrong, 1979; Lantz, 1985; Sherman, 1979).

A variable that emerges as having particular interest from the above findings is the subjective value of mathematics. Not only is this variable found repeatedly to have strong predictive value for mathematics participation, it is also found fairly consistently to differ for females and males, with males valuing mathematics more highly (Brush, 1979; Casserly & Rock, 1979; Eccles et. al, 1985). These findings dovetail with our own observations that college women frequently give lack of interest as a reason for avoiding mathematics and science courses (Lips, 1984). Subjective value of mathematics may be one of the key variables for understanding the gender difference in mathematics participation. However, the models referred to above, while providing some clues as to factors influencing subjective value of mathematics, offer little help with the question of why gender differences on this variable exist.

The current research project was designed both to test the general models of mathematics participation described above on a university population, and to expand the models to include variables that might explain the frequently-found gender difference in the value attached to mathematics. With respect to the latter goal, the variables of gender role traditionality, expectations for and importance of marriage, family, and career, and the attitudes of male and female peers toward mathematics and science were included in the study. It has been suggested (Chipman & Wilson, 1985) that while women's gender role stereotyping of mathematics itself has not been shown to be important in their decision to enroll or not enroll in mathematics courses, women's gender role stereotyping of future careers <u>might</u> be important in this process. This suggestion is similar to ones made by Hollinger (1983) and by Sherman (1983). To date the idea that the impact of gender role stereotyping on mathematics and/or science participation is mediated through career plans has received little research attention. However, some researchers have suggested that concern for future ability to balance career and family roles leads women, at an early stage in planning their future, to rule out without consideration all vocations that would be difficult to balance with family roles (Corder & Stephan, 1984). Thus, measures of gender role traditionality and of attitudes toward achievement, career and family were obtained in oder to explore these hypotheses.

With respect to peer attitudes, work by Fennema (cited in Tobias & Weissbrod, 1980) suggests that adolescent males are more likely than teachers, parents or others to cite mathematics as an inappropriate activity for girls. Similarly, Fox, Brody and Tobin (1985) found that seventh-grade boys in accelarated mathematics classes in the United States were significantly more likely than their female counterparts to stereotype mathematics as a male domain, and Temple and Lips (1988) found that male university students were more likely than female university students to say that women were not as competent as men in using computers. While a number of investigators have tried and failed to show a correlation between women's mathematics participation and their stereotyping of math as a male domain, no one appears to have investigated the possibility of a link between females' participation and such stereotyping by significant male peers. Thus, the current project included measures of subjects' perceptions of the gender-stereotyping of mathematics and science by both male and female peers.

Although concern has been raised about women's avoidance of both mathematics and science, much of the research has, in fact, focused squarely on mathematics. It may be, however, that the issues with respect to the relationship between gender and science are different from those relating gender and mathematics. In fact, comments by participants in our earlier studies suggested strongly that the perceptions of and attitudes toward mathematics and science were often differentiated. Thus the current project examined both sets of attitudes. The goal of the project was to develop explanatory models for the differential participation of female and male university students in both mathematics and science courses.

The project consisted of three studies. The first involved a follow-up of female university students who had participated in an earlier study in 1983 (Lips, 1986). Most of these students, who had been in their second year of university when they initially participated in the study, had graduated or were close to graduation three years later. They were recontacted and asked to provide information about their plans and actions with respect to jobs and/or graduate school. Based on their responses, these subjects were categorized into groups pursuing math/science-related or non math/science-related career paths, using Hollinger's (1983) categorization method. Using variables measured in 1983 as predictors (self-ratings of math/science performance and ability, Confidence in learning Mathematics, importance-to-self ratings of math/science, BSRI scores (Bem, 1974), number of math and science courses taken) discriminant analyses were run to determine the adequacy of these measures in predicting the actual career choices of these university women with respect to mathematics and science.

In the second study, data were collected from 253 female and 235 male first year fulltime university students. The questionnaire included measures of intent to enroll in mathematics and science courses, of a number of attitudes related to mathematics and science (eg. perceived ability, usefulness, difficulty, gender-stereotyping of math and science), as well as of attitudes about career, family, and the possibility of combining them, perceptions of encouragement and support from parents, peers, and significant other, and demographic information. Data on high school academic background, as well as subsequent data on course credits received during first year and courses attempted during second year were also obtained for these participants. These data were used to examine gender differences in a number of math- and science-related attitudes and behaviors and to test a number of hypotheses about predictors of participation in mathematics and science courses, as well as to develop and test the adequacy of models for participation in mathematics and science for female and male students.

In the third study, 48 male and 56 female students enrolled in first year courses in mathematics, physics and chemistry were recruited for an investigation of the factors predictive of persistence in math and science courses once enrolled. These participants completed the same questionnaire as did the participants in Study 2, with the addition of a short series of questions about their reasons for enrolling in the course. They were also assessed for self-schemas with respect to mathematics and science and math- or science-related careers through an interactive session with a microcomputer, involving a measure of reaction time to various adjectives and careers. At the end of the year, students were recontacted to determine whether or not they had completed the course, and, if they had dropped it, at what point. They were also asked by mail to respond to a questionnaire on confidence in learning mathematics. The questionnaire variables will be used, as in the previous study, to test the adequacy of models for explaining persistence in math or science courses. In addition, the question of whether self-schema is a better predictor of persistence than is a straightforward measure of self-rated ability will be examined. Finally, the relationship between math/science self-schema and changes in confidence in learning mathematics will be examined. Data entry is still in progress for this study, so results will not be discussed in this report.

Study 1

Method

An attempt was made to contact by telephone all 446 female subjects who had participated in the 1983 study and obtain their responses to a short series of questions. Those who could not be reached for a telephone interview were mailed a copy of the questionnire and asked to return it in the stamped, addressed envelope provided. The one-page questionnaire requested information about whether they had graduated, what degree they had received and what major they had chosen. Questions were also included about current employment or graduate work and future plans in this regard. Response frequencies were examined, and discriminant analyses were performed to determine what variables from the 1983 data set were predictive of pursuing math- or science-related occupational paths. Variables measured in 1983 that were used in these analyses included self-ratings of math/science ability and performance, Confidence in Learning

Mathematics, importance-to-self ratings of math/science, and scores on the Bem Sex Role Inventory. In addition, total number of mathematics and science courses taken as of 1986 was included as a discriminating variable.

Occupational choices were coded according to Hollinger's (1983) 6-category system reflecting gender-role traditionality and math/science relevance.

Results

Responses were obtained from approximately 75% of the women in the original sample (n=331). Of these, 187 had graduated, while most of the others were expecting to do so in the future. Table 1 shows educational and employment data for the graduates and non-graduates.

Four categories were created according to major area of study. These were 1) arts, which included education, languages, philosophy, classics, history, english, administrative studies, art, law, theatre, drama and music; 2) social service, which included sociology, anthropology, developmental studies, urban studies, canadian studies, and justice and law; 3) science/social science, including psychology, economics, geography, environmental studies, and recreation and athletics; and 4) math/science, including mathematics, chemistry, physics, biology, nursing, pharmacy, medicine, toxicology, statistics, and dentistry. An attempt was made to relate these categories to participants' educational and career plans. In terms of pursuing additional education, it is clear that students who had majored in mathematics or science were more likely than were those in the other areas to continue their education beyond the first undergraduate degree (see Table 2).

A total of 268 respondents listed career goals that were codeable according to Hollinger's (1983) system. Table 3 shows the classification of these participants' career goals according to that system. An exploratory 6-group stepwise discriminant analysis was run to determine which variables were relevant to predicting category membership. Variables used included age, self-appraised performance in mathematics, Confidence in Learning Mathematics scale score (CLM; Fennema & Sherman, 1976), self-rated mathematics ability, self-rated importance to self-concept of mathematics ability, self-rated science ability, self-rated importance to self-concept of science ability, and the Femininity and Masculinity scale scores from the Bem Sex Role Inventory. The variables that entered were self-rated science ability, CLM score, and BSRI Masculinity score. Based on these results, a direct canonical discriminant analysis was run using only these variables that had entered the function in the exploratory analysis. Two functions were found to discriminate significantly among the six groups. Table 4 shows the canonical structure, standardized canonical coefficients and class means on the significant canonical discriminant functions. The first function, accounting for 76% of the discrimination among the groups, was most heavily weighted by self-rated science ability and made the best discrimination between category 2

(Nontraditional science) and all other groups. The second function, accounting for 18% of the discrimination, was most heavily weighted by CLM score, and made the best discrimination between category 5 (Neutral nonmath) and the other groups. With prior probabilities set proportionally, it was found that 70% of the subjects in category 2 could be classified correctly using these functions. By contrast, none of the other groups could be reliably discriminated by this analysis except for the largest group -- category 6 (Traditional nonmath), for which classifications were correct 87% of the time.

The above analyses were repeated with the addition of another variable: Math/Science Total -- the total number of mathematics and science courses completed by the student by 1986 (three years after the initial data collection). In the exploratory stepwise discriminant analysis, Math/Science total, self-rated science ability, and self-rated mathematics ability were entered into the analysis. These variables were then used in a direct canonical discriminant analysis. Two canonical functions were found to be significant. The first, which accounted for 88% of the discrimination, was most heavily weighted by Math/Science total and made the best discrimination between the first three categories (the three categories that include career goals that involve math or science, and the remaining three, although the one category that stands out best is once again 2 - Nontraditional science. The second function, accounting for 8% of the discrimination, was heavily weighted by both self-rated mathematics and science ability, and made the best discrimination between category 1 (Nontraditional math) and the other groups. This analysis correctly classified 73% of the 41 subjects who were in group 2 and 91% of the 115 who were in group 6, but none of the other categories were reliably discriminated.

Discussion

The results of this study are congruent with findings of earlier analyses that examined the predictors of career goals listed in the second year of university by a subsample (n=116) of these subjects (Lips, 1987). They suggest that self-appraised ability in mathematics and science is more important than a number of other variables, including "femininity" and "masculinity" in predicting whether female university students will pursue nontraditional careers in mathematics and science.

Study 2

Method

At the beginning of the academic year, alphabetical lists of of all first-time entering students (separate lists for females and males) were obtained from the university records office. Students on these lists who met the following criteria were considered eligible for the study: 1) had no prior credits from this or any other univerisity (thus, all transfer students were eliminated); 2) were registered for a minimum of three full courses; 3) were not registered for 32-1201-5 (Introduction to Linear Algebra), as these students were to be used in a separate study; 4) had local addresses and telephone numbers; 5) did not have obviously Asian names or list graduation from a non-Canadian high school (This was done in order to be relatively certain of proficiency in the English language.) This procedure generated two lists of 628 females and 432 males considered eligible for the study. Each list was numbered consecutively and a random numbers table was used to select the students who were asked to participate in the study. Students thus selected were telephoned at home and asked for their participation. They were promised a payment of five dollars. Students who agreed were scheduled for appointments to come to the lab at times convenient to them. Approximately one in twenty of the students contacted refused to participate. No-shows were contacted immediately and rescheduled for another time. Students who failed to show up for three scheduled appointments were not contacted again. Only 5 students fell into this category.

Participants came to the lab at the appointment time and completed a large questionnaire. They were scheduled in groups, generally 8 to 14 at one time. At the start of each session, students were given a brief statement about the purpose of the research and were asked to read and sign a consent form. Included on the consent form was permission from the student for the research team to access her/his academic records.

Instruments. The questionnaire was presented in two separate booklets. The first contained questions about demographic background, high school credits, choices for major subject at university and career goals, intent to enroll in courses in particular academic areas, importance of various factors to their selection of an occupation, expectations for enjoyment of and performance in various academic subjects at university, ratings of past performance in mathematics and science subjects, causal attributions for participation and performance in mathematics courses, amount of encouragement and support provided by parents, same- and other-sex peers, and "significant other" for taking courses in particular academic subjects and for career goals, and ratings of others' appraisal of their abilities in mathematics and science. As well, the questionnaire included, randomly interspersed, the items of the Fennema-Sherman Mathematics Attitudes Scales: Mathematics Effectance, Confidence in Learning Mathematics, Attitudes Toward Success in Mathematics (4 items only), Mathematics as a Male Domain, Usefulness of Mathematics, Teacher (2 items only), and Mathematics Anxiety (Fennema & Sherman, 1976), items from the subjective value of mathematics scale used by Lantz & Smith (1981), from measures of mathematics utility and cost of effort in mathematics used by Parsons (1980), items from the Mathematics Avoidance Scale (Chisholm, 1980) and the Mathematics Self-Concept Scale (Gourgey, 1982), items from the above scales adapted for science rather than mathematics, as well as similar items referring to languages, history, english, and other arts subjects, and items constructed for this study to measure perceptions of the difficulty for women of combining a scientific career with marriage and children. The second booklet contained, randomly interspersed, the items of the Work and Family Orientation Scales (Helmreich & Spence, 1978), and the short form of the Feminism II Scale (Dempewolff, 1974). At the end of the questionnaire was the Knowledge of Women and Work Scale (Holms, 1986). Finally, subjects were presented with 2 open-ended questions about the reasons why women might avoid mathematics and science.

Results

Demographics. Tables 5, 6 and 7 show the frequency distributions of age, father's education and mother's education, respectively, for the whole sample and for females and males separately. The modal age of the sample is 18 years, the modal level of fathers' education is below high school graduation, while that for mothers' education is almost evenly split between high school graduation and below. In order to test for background differences between females and males in the sample, a one-way multivariate analysis of variance was run with age, father's education, mother's education (both coded on a scale of 1 to 7, where 1 represents less than high school completion and 6 represents postgraduate studies), number of older brothers, number of older sisters, number of younger brothers, and number of younger sisters as variables. No significant difference was found between females and males on these combined variables, multivariate $F(7,480)=.76$, $p>.05$.

High School Background. A total of 72.7% of the subjects had graduated from high school in the same year as they started university (the year in which the study was begun), while 14.5% had graduated the year before. The remaining subjects had graduated earlier or had been admitted without high school graduation as mature students. Table 8 shows a frequency distribution of high school credits in various subjects for the whole sample and for males and females separately. It is clear from this table that the females in this sample are as likely as the males to have entered university with a credit in Math 300 (university-entrance-level mathematics) and Chemistry 300, but that males are much more likely than are females to have entered with credits in Physics 300 and Computer Science 305, while females are considerably more likely than males to have entered with a credit in Biology 300. Also noteworthy is that females are far more likely than males to have credit for French 300.

High school achievement in particular academic subjects was coded on a 0 to 5 scale, where 0 represented no attempt at the course, and 1 through 5 represented grades of F through A respectively. To examine female-male differences in high school achievement, a one-way multivariate analysis of variance was performed, using high school biology, chemistry, english, mathematics, and physics as variables. A significant gender difference was found; using Wilks' criterion, multivariate F $(5,478)=12.20$, $p<.0001$. Table 9 shows the means and univariate F values for the 5 academic areas. It is difficult to evaluate univariate F's in a multivariate context, but in 3 of the five cases (biology, english and physics) the F values would have been considered significant in a univariate context, and Bonferroni *t* tests for the differences between the individual means classified all three of these differences as significant at the .05 level. (Bonferroni tests control for Type I experimentwise error rate, but do not control for the lack of independence among correlated measures.) In the case of biology and english, females had the higher academic achievement, while males had higher achievement in physics. There was no evidence for gender differences in high school achievement in mathematics or chemistry. When subjects were asked to rate their previous performance in mathematics and in science on grade scales that ranged from F to A+, there was no evidence for gender differences in ratings of past performance for either mathematics (female mean=4.91; male mean=4.80) or science (female mean=5.32; male mean=5.11), multivariate $F(2,485)=0.65$, $p>.52$.

Gender and Perceived Encouragement. Tables 10, 11, 12, and 13 show the mean ratings given by subjects of the amount of encouragment/support they received from parents, same-sex peers, opposite-sex peers, and "significant other" respectively to take courses in specific academic areas. Ratings were made on a 5-point scale, with 1 meaning "strongly discouraged" and 5 meaning "strongly encouraged". A significant gender difference was found for perceived parental encouragement, multivariate $F(14,473) = 4.47$, $p<.0001$. Univariate F values are included in Table 10. Bonferroni *t* tests for differences between individual means indicated that gender differences were significant at the .05

level for perceived parental encouragement in the areas of biology, english, languages, psychology and sociology, with females perceiving more parental encouragement than males in all of these areas.

A significant gender difference was found for perceived encouragement from same-sex peers, multivariate $F(14,473)=8.10$, $p<.0001$. Univariate F values are included in Table 11. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level for perceived encouragement from same-sex peers in the areas of biology, education, english, languages, psychology and sociology (with females perceiving more encouragement than males) and in computer science, mathematics, physics, and political science (with males perceiving more encouragement than females).

A significant gender difference was found for perceived encouragement from opposite-sex peers, multivariate $F(14,473)=2.18$, $p<.008$. Univariate F values are included in Table 12. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level only for biology and sociology, with females perceiving more encouragement than males in both cases.

A significant gender difference was also found for perceived encouragement from "significant other", multivariate $F(14,473)=4.05$, $p<.0001$. Univariate F values are included in Table 13. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the

.05 level for biology, education, english, languages, psychology and sociology, with females perceiving more encouragement than males in all of these cases.

Gender Differences in Expectancies and Attitudes. Table 14 provides response frequencies for subjects' ratings of how well they expect to like or enjoy future courses in particular areas of study. Responses were made on a 5-point scale, with 1 meaning "I expect to dislike it very much" and 5 meaning "I expect to like it very much". A multivariate analysis of variance on these responses indicated a significant gender difference, multivariate $F(14,473)=10.21$, $p<.0001$. Group means and univariate F values are shown in Table 15. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level for biology, education, english, languages, psychology and sociology (with females expecting to like these areas more than males) and for computer science, geography, mathematics, physics and political science (with males expecting to like these areas more than females).

Table 16 provides response frequencies for subjects' ratings of how well they think they would do in courses in particular academic areas. Responses were made on a 5-point scale, with 1 meaning a failing grade of "F" and 5 meaning an excellent grade of "A". A multivariate analysis of variance on these responses indicated a significant gender difference, multivariate $F(14,473)=6.73$, $p<.0001$. Group means and univariate F vlaues are shown in Table 17. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level for biology and languages (with females expecting higher grades in these areas than males) and for chemistry, computer science, geography, mathematics, physics and political science (with males expecting higher grades in these areas than females).

Table 18 provides response frequencies for subjects' ratings of how difficult, relative to others in the class, they would find the course material in particular academic areas. Ratings were made on a 5-point scale, with 1 meaning "much more difficult than most people would" and 5 meaning "a lot less difficult than most people would". A multivariate analysis of variance on these responses indicated a significant gender difference, multivariate $F(14,473)=7.79$, $p<.0001$. Group means and univariate F values are shown in Table 19. Bonferroni *t* tests for differences between individual means, indicated that gender differences were significant at the .05 level for languages, with females saying they would find it less difficult than did the males, and for chemistry, computer science, geography, mathematics, physics and political science, with males saying they anticipated less difficulty than did the females.

A multivariate analysis of variance was performed to examine gender differences in mathematics attitudes, as measured by the five Fennema-Sherman Mathematics Attitudes Scales that were included in their entirety on the questionnaire. The analysis showed a significant overall gender difference, multivariate

F(5,406)=9.52, p<.0001. Group means and univariate F values are shown in Table 20. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level for all scales except Usefulness of Mathematics. Females scored as more anxious than males on the Mathematics Anxiety Scale and scored higher than males on the Mathematics as a Male Domain Scale (a high score means low agreement that mathematics is a male domain), while males scored higher than females on the Confidence in Learning Mathematics and Effectance scales.

Causal Attributions for Participation in Mathematics. Table 21 provides response frequencies for subjects' ratings of the importance of various reasons why they choose to take mathematics courses (when they do). Ratings of each reason were given on a 4-point scale, with 1 meaning "of no importance" and 4 meaning "of major importance". A multivariate analysis of variance indicated a significant overall gender difference in these ratings, multivariate F(8,479)=3.14, p<.002. Group means and univariate F values are shown in Table 22. Bonferroni t tests for individual differences between means indicated that gender differences were significant at the .05 level only for ratings of the importance of "program requirement" as a reason for taking mathematics courses, with females rating this reason as more important than males did.

Table 23 provides response frequencies for subjects' ratings of the importance of various reasons why they choose not to take mathematics courses (when they do not). As above, ratings of each reason were given on a 4-point scale. A multivariate analysis of variance indicated no significant overall gender difference in these ratings, multivariate $F(9,478)=1.66$, $p>.05$.

Causal Attributions for Performance in Mathematics. Table 24 provides response frequencies for subjects ratings of the importance of various reasons why they do well in mathematics courses, when they do. As in the previous questions, ratings were made using 4-point scales, with 1 meaning "of no importance' and 4 meaning "of major importance". A multivariate analysis of variance indicated no overall significant gender difference in these ratings, multivariate $F(10,477)=1.83$, $p<.054$.

Table 25 provides response frequencies for subjects' ratings of the importance of various reasons why they do not do well in mathematics courses, when they do not. A multivariate analysis of variance indicated a significant gender difference in these ratings, multivariate $F(10,477)=1.98$, $p<.033$. Group means and univariate F values are shown in Table 26. Bonferroni *t* tests for differences between individual means indicated that gender differences were significant at the .05 level for low ability and for discouraged by others, with females rating both reasons as more important than males did.

Intent to Take More Mathematics and Science Courses. Subjects were asked to rate, on 5-point scales, their agreement with the statements that in future years they intended to take more courses in mathematics, and in science. A multivariate analysis of variance on the three items (2 for mathematics and one for science) revealed a significant effect of gender on the combined variables, multivariate F (3,484)=2.80, $p<.04$, with males stating stronger intentions to take courses. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level for only one of the three items: "In future years I intend to take more courses in mathematics."

Career Goals. Subjects were asked to rate, on a 4-point scale, the importance of training in each of mathematics/statistics, use of computers, writing skills, and science to their career goals. Table 27 provides response frequencies for these questions. A multivariate analysis of variance on these items revealed a significant effect of gender on the combined variables, multivariate F (4,483)=4.09, $p<.003$. Table 28 shows the group means and univariate F values for the individual items. Bonferroni t tests for differences between individual means indicated that gender differences were significant for only one of the items: rated importance to career goals of training in the use of computers. Males rated this item higher than females did.

Table 29 provides response frequencies for a question which required subjects to rate the importance of a list of factors to be considered in selecting their job or career. Ratings were made on 4-point scales, ranging from "not important"(1) to "very important"(4). A multivariate analysis of variance indicated a significant overall gender difference, multivariate F(16,471)=6.06, $p<.0001$. Group means and univariate F values are shown in Table 30. Bonferroni *t* tests for differences between individual means indicated that, at the .05 level, males rated the opportunity to earn a high salary as significantly more important than did females, while females rated the following factors as more important than did males: the cost of education required, belief that I can do the job well, belief that I will enjoy the job, belief that the job will be interesting to me, opportunity to use my special abilities to the fullest, availability of many job openings in the field, opportunities to be helpful to others or useful to society, chance to work with people rather than things, and the ability to combine career and family.

Attitudes Toward Women in Science Careers. In a series of 8 questions, subjects were asked to indicate their agreement or disagreement on a 5-point scale with statements about the difficulty for women of combining marriage and family life with a career in science. Table 31 shows the response frequencies for males and females to each item. A multivariate analysis of variance on these items indicated a significant overall gender difference, multivariate F(8,476)=4.44, $p<.0001$. Group means and univariate F values are given in Table 32. Bonferroni *t* tests for differences between individual means indicated that, at the .05 level, males and females differed in their responses to 4 items, with females disgreeing more strongly than males that it is difficult for a woman to combine a scientific career and family life, that a woman chemist or physicist who takes time off from her career to have children will never catch up again, that a woman planning a career as a mathematician or scientist should plan not to have children, and that a woman dedicated to a career in science or mathematics would not be able to devote much time to her family.

Peer attitudes toward women in math and science. Subjects were asked to respond to a series of items about the attitudes of their male and female peers toward women in mathematics and science. A multivariate analysis of variance on the 6 items regarding male peers indicated a significant overall effect of gender on the combined measures of the perceived attitudes of subjects' male peers, multivariate $F(6, 475)=6.13$, $p<.001$. Group means and univariate F values for the individual items are shown in Table 33. Bonferroni t tests for differences between individual means indicated that gender differences were significant at the .05 level for only two items: "Most of my male peers think that females are as good as males in geometry" and "Most of my male peers think girls who enjoy studying math are a bit peculiar", with females disagreeing more strongly than males with both items.

A multivariate analysis of variance on the 5 items regarding female peers indicated a significant overall gender difference for the combined measures of the perceived attitudes of subjects' female peers, multivariate $F(5,476)=3.15$, $p<.008$. Group means and univariate F values for the inidividual items are shown in Table 34. Bonferroni _t_ tests for differences between individual means indicated a gender difference at the .05 level for only one of the items: "Most of my female peers would expect a woman mathematician to be a masculine type of person", with females disagreeing more strongly than males.

Factor Analysis of Attitude Items.

Items that were not part of one of the Fennema-Sherman scales and that measured attitudes toward various aspects of mathematics, science, arts and languages were used in a factor analysis in order to form composite variables for some of the remaining analyses. Principal components analysis with oblique (promax) rotation resulted in the identification of 5 well-defined factors that collectively explained 28% of the variance in the items: Perceived Mathematics Ability (Factor 1), Perceived Arts Ability/Value (Factor 2), Perceived Science Ability/Value (Factor 3), Perceived Value of Mathematics (Factor 4), and Perceptions of Peer Acceptance of Females in Mathematics and Science (Factor 5). Table 35 shows the item loadings (the factor structure matrix) and communalities on the five factors, and Table 36 shows the inter-factor correlation matrix.

A multivariate analysis of variance on the factor scores for these 5 factors showed a significant overall effect of gender on the combined variables, multivariate F (5,442)= 3.86, $p<.002$. Table 37 shows the group means and univariate F values for scores on the individual factors. Bonferroni _t_ tests for differences between individual means indicated gender differences at the .05 level of significance for Factor 1 (Math Ability), Factor 2 (Arts Ability/Value) and Factor 5 (Peer Acceptance of Females in Math and Science), with males scoring higher on Factor 1 and females scoring higher on Factors 2 and 5.

Predictors of Intent to Pursue Mathematics and Science

Subjects were asked to indicate their first, second and third choices for a major subject at university. Of the 251 females who responded, only 11 indicated any of mathematics, physics, chemistry, computer science or statistics as a first choice; while 29 of the 233 males who responded chose one of these areas. Thirty-five females chose biology, microbiology or zoology, while only 21 males did so. Geography or economics were chosen by 10 women and 33 men. Psychology or sociology were chosen by 58 women and 31 men, while arts and languages (English, history, French or German) were selected by 49 of the females and 30 of the males. The remaining subjects (88 females and 89 males) chose majors other than those listed above.

Separate stepwise discriminant analyses were carried out for female and male subjects to determine what variables might predict into which of the 6 categories above their first choice of major subject would fall. In the first set of analyses, predictor variables included were high school grades in biology, chemistry, mathematics, physics and english, father's education, and mother's education. For female subjects, high school grades in chemistry (partial R squared=0.181), biology (partial R squared=0.081), physics (partial R squared=0.062), and english (partial R squared =0.049) entered the discriminant function. With these four variables entered, the average squared canonical correlation was .073. A canonical discriminant analysis using these four variables produced two significant discriminant functions. The first, which accounted for 67% of the discrimination among the six categories of majors, was most heavily weighted by high school chemistry and physics grades, and made the best discrimination between category 1 choices (math, chemistry, physics, computer science or statistics) and all other groups. The second function, which accounted for 22% of the discrimination, was most heavily weighted by high school biology grades, and made the best discrimination between categories 2 (biology) and 5 (psychology/sociology) on the one hand and the other 4 categories of major choice on the other. Table 38 shows the canonical structure, standardized canonical coefficients, and class means on the canonical variables for the two significant functions. With prior probabilities set proportionaly, the correct classification rates were somewhat better than chance: 27.3% of subjects in category 1, 40% of those in category 2, none of those in category 3, 38% of those in category 4, 24.5% of those in category 5, and 52.3% of those in category 6 correctly classified.

For male subjects, a stepwise discriminant analysis resulted in the entry of 5 variables: high school chemistry (partial R squared=.240), high school english (partial R squared=.118), high school biology (partial R squared=.115), high school physics (partial R squared=.074), and father's education (partial R squared=.036). With all 5 variables entered, the average squared canonical correlation was 0.111. A canonical discriminant analysis using these 5 variables produced two significant discriminant functions. The first, which accounted for 68% of the discrimination, was most heavily weighted by high school chemistry and physics, and made the best discrimination between category 1 (math/physics etc.) and all other groups. The second function, which accounted for 18% of the discrimination, was most heavily weighted by high school biology, and made the best discrimination between category 2 (biology) and all other groups. Table 39 shows the canonical structure, standardized canonical coefficients, and class means on canonical variables for the two significant functions. With prior probabilities set proportionaly, 65.5% of subjects in category 1 were classified correctly by this analysis, as were 28.6% of those in category 2, 15% of those in category 3, 16% of those in category 4, 23.3% of those in category 5, and 74% of those in category 6.

Stepwise discriminant analyses were conducted separately for females and males using the 5 factor scores described in the previous section as variables and the 6 categories of major described above as groups. For females, Factors 1, 2 and 3 entered to produce a significant discrimination among groups, F (15,684)=8.19, $\underline{p}<.001$. With these 3 variables entered, the average squared canonical correlation was 0.0914. For males, Factors 2, 3, and 4 entered to produce a significant discrimination among groups, F(15,624)=10.18, p<.001. With these 3 variables enterd, the average squared canonical correlation was 0.1179.

Canonical discriminant analyses were conducted separately for females and males, using the three factor scores that entered the function in the stepwise analyses as variables and the six categories of major as groups. For females, the analysis produced two significant discriminant functions. The first, which accounted for 88% of the discrimination, was most heavily weighted by Factor 3 (Science Ability/Value), and made the best disrimination between categories 1 and 2 (math/phsics etc. and biology) and the other categories. The second function, which accounted for 9.5% of the discrimination, was most heavily (negatively) weighted by Factor 1 (Math Ability) and made the best discrimination between categories 1 and 3 (math/physics, etc. and geography or economics) and all others. Table 40 shows the canonical structure, standardized canonical coefficients, and class means on the canonical variables for the two significant functions. With prior probabilities set proportionaly, 36.4% of the subjects in category 1 were classified correctly, as were 41.2% of those in category 2, none of those in category 3, 33.3% of those in category 4, 26.2% of those in category 5 and 60.2% of those in category 6.

For males, the canonical analysis produced 2 significant discriminant functions. The first, which accounted for 89.5% of the discrimination, was most heavily weighted by Factor 3 (Science Ability/Value) and made the best discrimination between categories 1 and 2 (math/physics etc. and biology) and the other categories. The second, which accounted for 9.2% of the discrimination, was most heavily (negatively) weighted by Factor 4 (Value of Mathematics), and made the best discrimination between categories 3 and 1 (geography or economics and math/physics etc.) and the other categories. Table 41 shows the canonical structure,, standardized canonical coefficients, and class means on the canonical variables for the two significant functions. With prior probabilities set proportionaly, 68% of subjects in category 1 were classified correctly, as were 35% of those in category 2, 14.3% of those in category 3, none of those in category 4, 7.1% of those in category 5, and 77.4% of those in category 6.

Causal models for intent to pursue mathematics and science. A series of causal models were developed and tested to explain females' and males' intent to take future courses in mathematics and science. These models, based on an expectancy-value theory of achievement motivation (i.e. motivation to achieve in a specific arena is a joint function of the perceived probability of success and the perceived value of success), were tested separately for females and males in the sample. The models described here represent only the first stage of model-building for these data, and concern only mathematics. Future reports will describe further models.

A series of models of increasing complexity were developed and tested to describe the interrelationships among the factors that contribute to intentions to take future courses in mathematics. Tables 42A and 42B show the correlation matrix for 11 input variables used in these analyses. Several of the variables required transformation in order to achieve normal distributions or to bring the magnitude of their variances in line with the other input variables. Causal analyses were performed using LISREL version 6.6 (Joreskog & Sorbom, 1985).

Model 1, the most basic of the models tested, postulated two latent constructs: Eta 1 (Self-perceived mathematical ability) and Eta 2 (Perceived Usefulness of Mathematics) having reciprocal relationships of equal strength and each having a positive relationship on Eta 3 (Intent to take future mathematics courses). This model is diagrammed in Figure 1.

Table 43 shows, separately for females and males, the standardized measurement model coefficients and indicator variable reliabilities for this model as well as for two "null" models - more restrictive but still theoretically defensible models with which Model 1 can be compared. Null Model 1A contains no link between Eta 1 and Eta 2, while Null Model 1B contains no path from Eta 1 to Eta 3. The measurement model coefficients are analogous to pattern or factor score coefficients in nonorthogonal factor analysis, representing the regression of observed variables Y1 to Y7 onto the factors or latent constructs. The reliabilities indicate how well the observed variables serve as measurement instruments for the latent constructs. All of the reliabilities are above Dillon and Goldstein's (1984) suggested cutoff value of 0.5.

Table 44 shows the standardized structural (Beta) coefficients for Model 1 and Null Models 1A and 1B. Within a model, the relative size of these coefficients allows for a comparison among pathways as to their strength or importance. Standardized latent variable residuals and latent variable reliabilities for the models are shown in Table 45.

Model 1 is a very good fit to the data for female subjects and fits somewhat less well (although still an acceptable fit) for males. According to the estimated reliability for the "Intent to take Math Courses" variable, 88.9 percent of the estimated variance in this construct is accounted for by the model in the female half of the sample, while 97.1 percent is accounted for in the male half of the sample. For the females, the chi squared value for the difference between the observed covariance matrix and that predicted by the model is 16.93 (df 11), which produces a nonsignificant p value of 0.110. The adjusted goodness of fit index (AGFI) is 0.946 and the root mean square residual (RMSR) is 0.012, further indicating that the proposed model is congruent with the data.

For the males, the chi squared value is 32.53 (df 11), producing a significant p value of 0.001. However, the large sample size mitigates against achieving a nonsignficant p value (Dillon & Goldstein, 1984), and the other indices of fit are good: AGFI = .899, RMSR = 0.010. For both males and females, Model 1 fits the data better than do either of the alternative "null" models. Fit statistics for all models are shown in Table 46.

Parameters that are estimated in causal modeling can be tested for significance using their t-values (critical ratios computed by dividing the parameter estimate by its standard error). The t-values for the Beta coefficients in Model 1 are all large and significant, as seen in Table 47.

In Model 2, another latent construct was added to those in Model 1: Enjoyment of Mathematics. When this construct was added, different models were found to fit best for females and males. Figure 2 shows the versions of the model taht fit best for females (Model 2F) and males (Model 2M). These models were compared with a more restrictive null model (Model 2A) in which the only path allowed to Eta 4 (Intent to take Future Mathematics Courses) was from Eta 2 (Perceived Usefulness of Mathematics).

Table 48 shows the standardized measurement model coefficients and indicator reliabilities for the above 3 models. Table 49 shows the standardized structural (Beta) coefficients for the models, and standardized latent variable residuals and latent variable reliabilities for the models are shown in Table 50. Goodness of Fit statistics are shown in Table 51. None of the three models acheives a nonsignficant chi squared value, but the fit for Models 2M and 2F is quite good according to the other indices of fit.

The differences between Models 2M and 2F arise from the fact that nonsignficant pathways were dropped from each model. Thus, there is a significant link between "Enjoyment of Mathematics" and "Intent to Take More Math Courses" for males but not for females, and a significant link between "Perceived Math Ability" and "Intent to Take More Math Courses" for females but not for males. Also for the females only, there is no direct link between "Perceived Ability" and "Perceived Usefulness" once the "Enjoyment" variable is added to the model. Rather the effect of "Perceived Ability" on "Usefulness" is mediated through "Enjoyment". The t-values for the Beta coefficients in Models 2F, 2M and 2A are shown in Table 52.

The models described in this section represent only a beginning attempt to develop acceptable models for large portions of the data collected in this study. Models remaining to be tested involve more constructs and some are designed to predict outcomes other than intent to study more mathematics. These models will be addressed in future papers.

<u>Gender and Actual Course Participation</u>

Of the 235 males in the study, 63 did not register for courses in the following year (September,1987), while 82 of the 2[illegible]3 females did not return to university.

Table 53 shows a breakdown of the number of mathematics courses completed, failed or withdrawn from by males and females by the end of their first year, as well as the number of mathematics courses for which students registered in the fall term of their second year. It can be seen that many more males than females attempted and completed mathematics courses in first year, while the gender difference in the number of such courses attempted is considerably smaller at the beginning of the second year.

Several analyses were carried out in an attempt to discern whether there were gender differences in predictors of actual mathematics course participation. Stepwise multiple regression analyses used the three items that measured intent to study mathematics and science in the future as predictors of the number of mathematics credits completed in first year and of the number of mathematics courses signed up for in second year. For females, only one of the items (Would you take more math or statistics courses if you didn't have to?) entered the equation to predict the number of mathematics credits earned in first year. The equation accounted for 6.64% of the variance in math credits and was significantly predictive of that variable, $F(1,250)=17.78$, $p<.001$. The same item was the only one to enter the equation to predict the number of mathematics course registered for by females in second year. That equation explained 10.86% of the variance in second-year mathematics course registrations, and was significantly predictive of that variable, $F(1,250)=30.47$, $p<.001$.

For male subjects, the above item along with the item measuring intent to take science courses (In future years I intend to take more courses in science) entered the equation to predict the number of mathematics credits completed in first year. The partial R squared for the first item was .1727, while that for the science item was .0097, allowing the equation to account for 18.23% of the variance in mathematics credits obtained. The equation was significantly predictive of the criterion variable, $F(2,231)=48.41$, $p<.001$. For the equation prediciting the number of mathematics courses registered for in second year, both the first (Would you take more math...?) and second (In future years I intend to take more course in mathematics) "math intent" variables entered the equation. That equation explained 20.45% of the variance in the males' mathematics registrations in second year (partial R squared for the first variable was .1899; for the second was .0145). The equation was significantly predictive of the criterion variable, $F(2,231)=54.40$, $p<.001$. These analyses suggest that stated intent to pursue the study of mathematics may be more predictive of the actual behavior for males than for females at this university level.

Stepwise multiple regression analyses were also performed to test the relationship between mathematics course participation in first year and registrations for mathematics courses in second year. The criterion variable was mathematics course registrations in second year; the predictor variables were the number of mathematics credits obtained in first year, the number of failures in mathematics courses in first year, and the number of withdrawals from mathematics courses in first year. For female subjects, the only variable to enter the equation was the number of mathematics credits obtained in first year. The equation was significantly predictive of the criterion variable, $F(1,250)=39.42$, $p<.0001$, accounting for 13.6 percent of the variance.

For male subjects, both mathematics credits obtained in first year and mathematics course failures in first year entered the regression equation (partial R squared .396 and .022 respectively). The equation was significantly predictive of the criterion variable, $F(2,231)=154.23$, $p<.0001$, accounting for 41.8 percent of the variance. It appears that mathematics course participation in the first year of university is a much stronger predictor of continued participation for males than it is for females. As well, for males but not for females, first year failures are predictive of second year attempts. This finding may indicate that the males are more likely than females to be taking the mathematics courses in first year because they need them for a particular major -- thus failure does not necessarily result in giving up on mathematics.

Discussion

Much more analysis of the data from this study remains to be done. However, certain patterns are evident at this stage. The females and males in this sample entered university with academic backgrounds in mathematics that were virtually equivalent. In the sciences, males were stronger in physics, females in biology, and there were no apparent differences in chemistry. Also noteworthy is that the female students entered university with stronger backgrounds in English and French than did males.

Despite their similar backgrounds in mathematics, females and males differed in the amount of encouragement they perceived from others to pursue this academic area, with males perceiving more encouragement from same-sex peers than did females for taking courses in mathematics. In the area of science, the findings are more complex, with females perceiving more encouragement than did males from all sources to take courses in biology, and males perceiving more encouragement from same-sex peers than did females to take courses in physics and computer science. Clearly mathematics and science are not lumped together in these students' perceptions, nor is "science" seen as a unitary entity. This conclusion is strengthened by the findings for gender differences in expectancies and attitudes toward various academic subjects. Females expected to enjoy and to do well in biology more than males did, while males expected to enjoy and to do well in mathematics, computer science, and physics more than females did.

Interestingly, males' higher expectations than females for performance in mathematics occured despite a lack of gender differences in academic background in mathematics or in self-rated past performance in this area. The males' higher expectations were congruent with scores on the Mathematics Attitudes Scales: females scored higher than males on Mathematics Anxiety, while males scored higher than females on

Confidence in Learning Mathematics and on Effectance in Mathematics. Perhaps one reason for the males' confidence in the area of mathematics is that they believed more strongly than the females did that mathematics is a male domain (as indicated by gender differences on the Mathematics as a Male Domain scale.) The males also apparently believed more strongly than did the females that science careers are for men -- or at least that they are more difficult for women than for men -- as evidenced by their responses to the items measuring attitudes toward women in science careers. Apparently, women at university are surrounded by male peers who think that mathematics and science are more difficult (and perhaps even not suitable) for women than for men. This finding is no doubt a clue to the difficulty that women experience in pursuing mathematics and some types of science at the university level.

The findings for gender differences in perceived encouragement, expectations and attitudes may help to explain the gender differences in causal attributions for participation and performance in mathematics. Females were more likely than males to rate "program requirement" as an important reason for taking mathematics courses -- indicating that they were studying mathematics as a matter of necessity rather than choice. Furthermore, when explaining poor mathematics performance, females rated their own low ability and discouragement by others as more important reasons than did males. Despite having entered university with academic mathematics backgrounds that were equal to those of the males, and despite their general disagreement with the notion that mathematics is a male domain, the women in this university sample had formed, and seemed to be encouraged to hold, atitudes and expectations that they were not capable in the area of mathematics. Not surprisingly, given the other findings, females indicated less intent to study more mathematics than did males.

Further analyses of these data will explore the links between students' perceptions of science and mathematics, as well as connections between their perceptions of their skills in English and languages and their intent to pursue mathematics and the sciences. For example, the data tabulated in this report suggest that males are far less likely than females to have strong backgounds in English and French. It may be as true to say that males, by taking mathematics, phsyics and computer science, are avoiding courses that require verbal skills as to say that females are avoiding mathematics, physics and computer science. Further exploration will also be done of female students' comfort with biology as a science. Clearly, the blanket statement that "women avoid science" is simply inaccurate, as the women in this sample were more comfortable than men were with biology and were more likely than the males to expect to enjoy and do well in this academic area. It is an interesting commentary on the perception of biology as a science, and perhaps on the perception of women as well, that the stereotype of women's avoidance of science persists in the face of their strong participation in biology, at least at the undergraduate level.

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Table 1

Frequency Distribution for Female Graduates or NonGraduates of Educational Degree Obtained or Expected and Current or Expected Employment-Categorization According to Hollinger's (1983) System

	Degree											
Employment	B.A. Grad	B.A. NonGrad	B.Sc. Grad	B.Sc. NonGrad	B.A. (Honours) Grad	B.A. (Honours) NonGrad	B.Sc. (4 yr.) Grad	B.Sc. (4 yr.) NonGrad	B.Ed. Grad	B.Ed. NonGrad	Unknown Grad	Unknown NonGrad
Full Time	48	36	9	6	6	1	2	0	17	1	1	4
Part Time	28	15	4	4	5	5	2	3	12	16	0	5
Not Employed	23	24	11	7	5	3	7	2	5	6	0	3
No Answer	0	1	1	0	0	1	1	0	0	1	0	0
Total	99	76	25	17	16	10	12	5	34	24	1	12
Current Job/Career												
Nontraditional Math Career	5	2	1	0	0	0	0	0	1	0	0	1
Nontraditional Science Career	0	0	1	0	0	0	1	0	0	1	0	1
Neutral/Traditional Math & Science Career	6	6	4	5	1	1	1	1	1	2	0	1
Nontraditional Nonmath Career	0	0	1	0	0	0	0	0	1	0	0	0
Neutral Nonmath Career	15	9	3	1	3	0	1	1	2	1	1	0
Traditional Nonmath Career	47	33	3	3	7	5	1	1	24	14	0	6
Not Codeable	26	26	12	8	5	4	8	2	5	6	0	3
Total	99	76	25	17	16	10	12	5	34	24	1	12

Table 1 (continued)

Expected Job/Career												
Nontraditional Math Career	7	4	2	2	0	0	0	0	0	0	0	1
Nontraditional Science Career	5	2	10	9	1	1	6	3	2	2	0	0
Neutral/Traditional Math & Science Career	13	9	5	3	4	5	4	2	2	3	0	0
Nontraditional NonMath Career	11	5	2	0	1	0	0	0	1	1	0	0
Neutral Nonmath Career	13	12	0	0	4	0	0	0	3	1	0	5
Traditional Nonmath Career	31	24	3	3	5	2	2	0	25	17	0	3
Not Codeable	19	20	3	0	1	2	0	0	1	0	1	3
Totals	99	76	25	17	16	10	12	5	34	24	1	12

TABLE 2

Female Students' Major Area of Study and their Current +/or Future Education and Career Plans - Study 1

Educational & Career Plans	Major Area of Study: Graduates: Arts	Graduates: Social Service	Graduates: Science/ Social Service	Graduates: Mathematics/ Science	Non Graduates: Arts	Non Graduates: Social Service	Non Graduates: Science/ Social Service	Non Graduates: Mathematics/ Science
<u>Currently pursuing education/training</u>								
Yes	48.78	37.50	47.17	60.47	38.60	22.22	57.69	43.48
No	26.83	28.13	35.85	30.23	14.04	18.52	15.38	17.39
No Response	24.39	34.38	16.98	9.30	47.37	59.26	26.92	39.13
<u>Nature of current education/training</u>								
Completion of first or second undergraduate degree.	19.51	6.25	11.32	20.93	28.07	18.52	46.15	13.04
Graduate School	14.63	21.88	22.64	34.88	5.26	3.70	3.85	26.09
Special Courses/ Training	8.54	6.25	11.32	6.98	1.75	0.00	3.85	0.00
Personal Interest	1.22	6.25	1.89	0.00	1.75	0.00	0.00	0.00
No Reponse	56.10	59.38	52.83	37.21	63.16	77.78	46.15	60.87

TABLE 2 (continued)

Educational & Career Plans	Major Area of Study: Graduates — Arts	Graduates — Social Service	Graduates — Science/ Social Service	Graduates — Mathematics/ Science	Non Graduates — Arts	Non Graduates — Social Service	Non Graduates — Science/ Social Service	Non Graduates — Mathematics/ Science
Planning further education/training in the future								
Yes	64.63	40.63	67.92	48.84	57.89	59.26	80.77	52.17
No	10.98	12.50	15.09	13.95	10.53	14.81	0.00	26.09
Possibly	7.32	12.50	3.77	11.63	15.79	22.22	11.54	8.70
No Response	17.07	34.38	13.21	25.58	15.79	3.70	7.69	13.04
Nature of future education/training								
Completion of first or second undergraduate degree	31.71	25.00	15.09	4.65	17.54	29.63	11.54	8.70
Graduate School	21.95	12.50	33.96	39.53	17.54	11.11	38.46	39.13
Special Courses/ Training	6.10	0.00	7.55	4.65	12.28	11.11	23.08	0.00
Personal Interest	2.44	0.00	3.77	0.00	3.51	0.00	0.00	4.35
No Response	37.80	62.50	39.62	51.16	49.12	48.15	26.92	47.83

TABLE 3

Classification of Female Students' Career Goals
According to Hollinger's (1983) System

Category	Frequency (N=268)
Nontraditional Math Careers	15
Nontraditional Science Careers	40
Neutral/Traditional Math and Science Careers	50
Nontraditional Nonmath Careers	20
Neutral Nonmath Careers	38
Traditional Nonmath Careers	105

TABLE 4

Canonical Discriminant Analysis of Variables Predicting Category Membership in Hollinger's (1983) System

Canonical Structure

Canonical Variables	Canonical Correlation	Adjusted Canonical	Squared Canonical	Proportion	Likelihood Ratio	Approx. F	df	Probability
1	.476	.456	.227	.757	.705	6.450	15,718	.0001
2	.257	.228	.066	.183	.913	3.055	8,522	.0023
3	.151	.141	.023	.060	.977	2.042	3,262	N.S.

Standardized Canonical Coefficients

Variable	Can 1	Can 2
Science Ability	.997	.507
Confidence in Learning Mathematics	.283	-.955
BSRI-Masc	-.065	.614

Class Means on Canonical Variables

Class	Can 1	Can 2
Nontraditional Math Careers	.305	-.415
Nontraditional Science Careers	1.077	.003
Neutral/Traditional Math and Science Careers	.280	-.041
Nontraditional Nonmath Careers	-.331	.104
Neutral Nonmath Careers	-.194	.588
Traditional Nonmath Careers	-.454	-.155

TABLE 5

Frequency Distribution of Age broken down by sex of subject

Age	Male (N=234)		Female (N=254)		Total (N=488)	
	Freq.	%	Freq.	%	Freq.	%
16	2	0.9	-	-	2	0.4
17	21	8.9	32	12.6	53	10.8
18	119	50.6	143	56.3	262	53.6
19	44	18.7	37	14.6	81	16.5
20	18	7.7	12	4.7	30	6.1
21	10	4.3	14	5.5	24	4.9
22	4	1.7	-	-	4	.8
23	6	2.6	3	1.2	9	1.8
24	3	1.3	1	0.4	4	.8
25	-	-	1	0.4	1	.2
26	1	0.4	2	0.8	3	.6
27	2	0.9	2	0.8	4	.8
28	1	0.4	1	0.4	2	.4
29	1	0.4	1	0.4	2	.4
30	1	0.4	1	0.4	2	.4
31	-	-	2	0.4	2	.4
33	-	-	1	0.4	1	.2
34	1	0.4	1	0.4	2	.4
40	1	0.4	-	-	1	.2

TABLE 6

Frequency Distribution of Fathers' Education
broken down by sex of subject

Level of education	Male (N=234)		Female (N=254)		Total (N=488)	
	Freq.	%	Freq.	%	Freq.	%
Did not complete High School	71	30.2	90	35.4	161	32.9
High school graduate	48	20.4	44	17.3	92	18.8
At least one year University	15	6.4	11	4.3	26	5.3
Community College	9	3.8	12	4.7	21	4.3
Special certificate or diploma	19	8.1	22	8.7	41	8.4
University graduate	37	15.7	46	18.1	83	17.0
Postgraduate Studies	22	9.4	15	5.9	37	7.5
No father or male guardian	12	5.1	12	4.7	24	4.9
Missing data	2	0.9	2	0.8	4	0.8

TABLE 7

Frequency Distribution of Mothers' Education
broken down by sex of subject

Level of education	Male (N=234)		Female (N=254)		Total (N=488)	
	Freq.	%	Freq.	%	Freq.	%
Did not complete High School	67	28.5	78	30.7	145	29.7
High school graduate	78	33.2	64	25.2	142	29.0
At least one year University	12	5.1	19	7.5	31	6.3
Community College	12	5.1	19	7.5	31	6.3
Special certificate or diploma	26	11.1	32	12.6	58	11.8
University graduate	31	13.2	31	12.2	62	12.7
Postgraduate Studies	5	2.1	8	3.1	13	2.6
No mother or female guardian	2	0.9	1	0.4	3	.6
Missing data	2	0.9	2	0.8	4	.8

TABLE 8

Frequency Distribution of High School Credits

broken down by sex of subject

High School Credits	Male (N=234)		Female (N=254)		Total (N=488)	
	Freq.	%	Freq.	%	Freq.	%
Biology 300	115	48.9	168	66.1	283	57.9
Chemistry 300	111	47.2	124	48.8	235	48.1
Computer Science 305	36	15.3	9	3.5	45	9.2
Dramatics 305	9	3.8	4	1.6	13	2.6
Economics 301	19	8.1	7	2.8	26	5.3
English 301	47	20.0	31	12.2	78	15.9
English 300	135	57.4	162	63.8	297	60.8
French 300	44	18.7	102	40.2	146	29.9
Geography 300	71	30.2	54	21.3	125	25.6
History 300	81	34.5	72	28.3	153	31.3
Math 301	55	23.4	56	22.0	111	22.7
Math 300	144	61.3	152	59.8	296	60.6
Math (Topics) 305	21	8.9	19	7.5	40	8.1
Math (Stats) 305	10	4.3	10	3.9	20	4.0
Physics 300	100	42.6	64	25.2	164	33.6

TABLE 9

Multivariate Analysis of Variance for Gender Differences in High School Achievement in Particular Academic Areas

Dependent Variable	Male Group Means (N = 233)	Female Group Means (N = 251)	Univariate F	df
Biology	1.652	2.363	17.15***	1/482
Chemistry	1.584	1.777	1.26	1/482
English	2.502	3.199	24.90***	1/482
Mathematics	1.987	2.247	2.33	1/482
Physics	1.012	1.434	6.32**	1/482

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p < .05; **p < 01; ***p < .001

TABLE 10

Multivariate Analysis of Variance for Gender Differences in Amount of Encouragement/Support Received from Parents to take courses in Specific Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	3.038	3.169	3.24	1/486
Biology	3.319	3.644	13.58***	1/486
Chemistry	3.259	3.344	0.87	1/486
Computer Sc.	3.300	3.198	1.44	1/486
Education	3.195	3.352	2.83	1/486
English	3.400	3.676	8.60**	1/486
Geography	3.043	3.170	2.72	1/486
History	3.132	3.265	2.41	1/486
Languages	3.315	3.696	14.90***	1/486
Math/Stats	3.400	3.241	2.97	1/486
Physics	3.166	3.079	0.95	1/486
Political Sc.	3.111	3.016	1.50	1/486
Psychology	3.336	3.605	11.70***	1/486
Sociology	3.191	3.443	10.53***	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 11

Multivariate Analysis of Variance for Gender Differences in Amount of Encouragement/Support Received from Same-Sex Peers to take courses in Specific Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	2.983	3.075	1.45	1/486
Biology	3.098	3.423	13.65***	1/486
Chemistry	3.068	2.972	1.20	1/486
Computer Sc.	3.060	2.846	7.15**	1/486
Education	3.068	3.336	9.85**	1/486
English	3.170	3.399	7.29**	1/486
Geography	3.017	3.032	0.04	1/486
History	3.077	3.095	0.05	1/486
Languages	3.043	3.423	18.73***	1/486
Math/Stats	3.128	2.901	6.54**	1/486
Physics	2.983	2.711	9.25**	1/486
Political Sc.	3.064	2.866	6.40**	1/486
Psychology	3.357	3.688	19.44***	1/486
Sociology	3.132	3.498	22.41***	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 12

Multivariate Analysis of Variance for Gender Differences in Amount of Encouragement/Support Received from Opposite-Sex Peers to Take Courses in Specific Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	2.949	3.075	3.26	1/486
Biology	3.123	3.462	16.43***	1/486
Chemistry	3.077	3.166	0.99	1/486
Computer Sc.	3.034	3.107	0.82	1/486
Education	3.157	3.170	0.02	1/486
English	3.281	3.324	0.26	1/486
Geography	2.983	3.083	1.99	1/486
History	3.055	3.138	1.11	1/486
Languages	3.157	3.304	3.01	1/486
Math/Stats	3.094	3.150	0.40	1/486
Physics	2.991	3.000	0.01	1/486
Political Sc.	3.013	3.040	0.13	1/486
Psychology	3.472	3.518	0.39	1/486
Sociology	3.174	3.348	5.28*	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 13

Multivariate Analysis of Variance for Gender Differences in Amount of Encouragement/Support Received from a "Significant Other" to take courses in Specific Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	2.775	2.945	2.80	1/486
Biology	3.123	3.427	6.87**	1/486
Chemistry	2.923	2.878	0.14	1/486
Computer Sc.	2.906	2.798	0.97	1/486
Education	2.992	3.261	5.93*	1/486
English	3.323	3.577	5.33*	1/486
Geography	2.877	2.878	0.00	1/486
History	3.034	3.032	0.00	1/486
Languages	3.021	3.344	8.17**	1/486
Math/Stats	2.983	2.822	1.98	1/486
Physics	2.74	2.577	2.01	1/486
Political Sc.	2.864	2.783	0.58	1/486
Psychology	3.400	3.913	30.41***	1/486
Sociology	3.170	3.632	22.91***	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 14

Frequency Distribution of Students' Ratings of how well they think they would like or enjoy future courses

Area	Expect to Dislike it Very Much		Expect to Dislike it Somewhat		Expect to be indifferent		Expect to like it Somewhat		Expect to Like it Very Much	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Anthropology										
Males	15	6.4	29	12.3	65	27.7	80	34.0	30	12.8
Females	9	3.5	23	9.1	71	28.0	97	38.2	39	15.4
Total	24	4.9	52	10.7	136	27.9	177	36.3	69	14.1
Biology										
Males	23	9.8	42	17.9	45	19.2	69	29.4	41	17.5
Females	20	7.8	23	9.0	45	17.7	73	28.7	87	34.2
Total	43	8.8	65	13.3	90	18.4	142	29.1	128	26.2
Chemistry										
Males	61	26.0	56	23.9	41	17.5	41	17.5	22	9.4
Females	85	33.4	45	17.7	44	17.3	46	18.1	15	5.9
Total	146	29.9	101	20.7	85	17.4	87	17.8	37	7.6
Computer Sc.										
Males	52	22.2	36	15.3	64	27.3	45	19.2	21	8.9
Females	73	28.7	54	21.3	63	24.8	36	14.2	9	3.5
Total	125	25.6	90	18.4	127	26.0	81	16.6	30	6.1
Education										
Males	14	5.9	28	11.9	75	32.0	64	27.3	36	15.3
Females	13	5.1	19	7.4	60	23.6	69	27.1	77	30.3
Total	27	5.5	47	9.6	135	27.7	133	27.3	113	23.2
English										
Males	25	10.6	40	17.0	57	24.3	59	25.2	38	16.2
Females	9	3.5	26	10.2	50	19.6	86	33.8	71	27.9
Total	34	6.9	66	13.5	107	21.9	145	29.7	109	22.3
Geography										
Males	14	6.0	30	12.8	65	27.7	68	28.9	45	19.1
Females	26	10.2	34	13.4	85	33.5	63	24.8	31	12.2
Total	40	8.2	64	13.1	150	30.7	131	26.8	76	15.6
History										
Males	23	9.8	33	14.0	45	19.1	71	30.2	47	20.0
Females	22	8.7	33	13.0	69	27.2	73	28.7	42	16.5
Total	45	9.2	66	13.5	114	23.4	144	29.5	89	18.2
Languages										
Males	30	12.8	40	17.0	54	23.0	70	29.9	21	8.9
Females	16	6.2	29	11.4	60	23.6	83	32.6	52	20.4
Total	46	9.4	69	14.1	114	23.3	153	31.4	73	14.9

Math/Stats										
Males	69	29.4	43	18.3	44	18.8	46	19.6	23	9.8
Females	97	38.1	41	16.1	45	17.7	38	14.9	18	7.0
Total	166	34.0	84	17.2	89	18.2	84	17.2	41	8.4
Physics										
Males	75	32.0	51	21.7	44	18.8	34	14.5	18	7.6
Females	128	50.3	37	14.5	37	14.5	24	9.4	11	4.3
Total	203	41.6	88	18.0	81	16.6	58	11.9	29	5.9
Poli Sci										
Males	27	11.5	27	11.5	62	26.4	68	28.9	35	14.9
Females	44	17.3	50	19.7	70	27.6	53	20.9	22	8.7
Total	71	14.5	77	15.8	132	27.0	121	24.8	57	11.7
Psychology										
Males	5	2.1	14	6.0	34	14.5	97	41.3	79	33.6
Females	1	.4	3	1.2	19	7.5	84	33.1	144	56.7
Total	6	1.2	17	3.5	53	10.9	181	37.1	223	45.7
Sociology										
Males	11	4.7	20	8.5	45	19.1	103	43.8	47	20.0
Females	3	1.2	17	6.7	39	15.4	103	40.6	85	33.5
Total	14	2.9	37	7.6	84	17.2	206	42.2	132	27.0

TABLE 15

Multivariate Analysis of Variance for Gender Differences in How Students Expect to Like/Enjoy Future Courses in Specific Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	3.149	3.348	2.78	1/486
Biology	3.081	3.656	20.23***	1/486
Chemistry	2.426	2.225	2.40	1/486
Computer Sc.	2.553	2.198	8.28**	1/486
Education	3.115	3.510	9.45**	1/486
English	2.996	3.577	21.05***	1/486
Geography	3.255	2.976	5.15*	1/486
History	3.166	3.130	0.07	1/486
Languages	2.804	3.324	16.52***	1/486
Math/Stats	2.182	2.498	5.96*	1/486
Physics	2.281	1.818	14.58***	1/486
Political Sc.	3.038	2.656	9.03**	1/486
Psychology	3.902	4.411	30.92***	1/486
Sociology	3.549	3.901	10.58**	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p < .05; **p < .01; ***p < .001

TABLE 16

Frequency Distribution of Self rating on how well subjects say they would do in courses in various areas

Area	Excellent (A)		Above Avg (B)		Average (C)		Marginal Pass (D)		Failure (F)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Anthropology										
Males	19	8.1	98	4.7	84	35.7	13	5.5	3	1.3
Females	16	6.3	103	40.9	108	42.5	10	3.9	1	.4
Total	35	7.2	202	41.4	192	39.3	23	4.7	4	.8
Biology										
Males	36	15.3	73	31.1	83	35.4	22	9.4	8	3.4
Females	50	19.6	89	35.0	79	31.1	22	8.6	11	4.3
Total	86	17.6	162	33.2	162	33.2	44	9.0	19	3.9
Chemistry										
Males	26	11.1	44	18.2	72	30.7	52	22.2	28	11.9
Females	8	3.1	52	20.4	69	27.1	63	24.8	49	19.2
Total	34	6.9	96	19.7	141	28.9	115	23.6	77	15.8
Computer Sc.										
Males	25	10.6	53	22.6	75	31.9	42	17.9	25	10.6
Females	6	2.3	35	13.7	91	35.8	69	27.1	39	15.3
Total	31	6.4	88	18.0	166	34.0	111	22.7	64	13.1
Education										
Males	28	11.9	100	42.6	75	31.9	16	6.8	1	.4
Females	31	12.2	119	46.9	81	31.9	11	4.3	1	.4
Total	59	21.9	219	44.9	156	31.9	27	5.5	2	.4
English										
Males	38	16.2	74	31.5	79	33.6	25	10.6	4	1.7
Females	28	11.0	112	44.1	85	33.5	16	6.3	3	1.2
Total	66	11.9	186	33.6	164	29.6	41	8.4	7	1.4
Geography										
Males	46	19.6	96	40.9	67	28.5	11	4.7	1	.4
Females	22	8.7	104	40.9	93	36.6	22	8.7	2	.4
Total	68	13.9	200	40.9	160	32.8	33	6.8	2	.4
History										
Males	42	17.9	80	34.0	74	31.5	21	8.9	3	1.3
Females	30	11.8	89	35.0	99	39.0	21	8.3	3	1.2
Total	72	14.8	169	34.6	173	35.5	42	8.6	6	1.2
Languages										
Males	21	8.9	55	23.4	81	34.5	44	18.7	15	6.4
Females	30	11.8	79	33.7	89	35.0	38	14.9	7	2.7
Total	51	10.5	134	27.5	170	34.8	82	16.8	22	4.5

Math/Stats										
Males	31	13.2	45	19.1	72	30.6	47	20.0	29	12.3
Females	21	8.2	37	14.5	71	27.9	50	19.6	59	23.2
Total	52	10.7	82	16.8	143	29.3	97	19.9	88	18.0
Physics										
Males	23	9.8	44	18.7	56	23.8	53	22.6	44	18.7
Females	12	4.7	29	11.4	54	21.2	63	24.8	83	32.6
Total	35	7.2	73	14.9	110	22.5	116	23.8	127	26.0
Poli Sci										
Males	22	9.4	88	37.4	78	33.2	31	13.2	3	1.3
Females	11	4.3	57	22.4	108	42.5	49	19.3	13	5.1
Total	33	6.8	145	29.7	186	38.1	80	16.4	26	5.3
Psychology										
Males	52	22.1	113	48.1	58	24.7	6	2.6	-	
Females	62	24.4	129	50.8	57	22.4	5	2.0	-	
Total	114	23.4	242	49.6	115	23.6	11	22.5	-	
Sociology										
Males	41	17.4	93	39.6	77	32.8	14	6.0	1	.4
Females	40	15.7	125	49.2	76	29.9	8	3.1	-	
Total	82	16.8	218	44.7	153	31.4	22	4.5	1	

TABLE 17

Multivariate Analysis of Variance for Gender Differences in How Well Students Think They Will Do In Courses In Particular Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	3.281	3.308	0.07	1/486
Biology	3.306	3.530	4.39*	1/486
Chemistry	2.787	2.470	7.37**	1/486
Computer Sc.	2.860	2.431	14.47***	1/486
Education	3.409	3.526	1.32	1/486
English	3.311	3.451	1.73	1/486
Geography	3.566	3.344	4.56*	1/486
History	3.396	3.332	0.34	1/486
Languages	2.860	3.210	9.51**	1/486
Math/Stats	2.877	2.451	11.91***	1/486
Physics	2.600	2.142	14.34***	1/486
Political Sc.	3.238	2.822	15.55***	1/486
Psychology	3.821	3.964	3.22	1/486
Sociology	3.566	3.715	2.70	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 18

Frequency Distribution of Subject's ratings on how difficult they would find course material in given areas, relative to other students broken down by sex of subject

Area	Much More Difficult		A Little More Difficult		About the same		A Little Less Difficult		A Lot Less Difficult	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Anthropology										
Males	7	(3.0)	15	(6.4)	131	(55.7)	52	(22.1)	19	(8.1)
Females	2	(.8)	23	(9.1)	160	(63.0)	50	(19.7)	10	(3.9)
Total	9	(1.8)	38	(7.8)	291	(59.6)	192	(20.9)	29	(5.9)
Biology										
Males	7	(3.0)	38	(16.2)	98	(41.7)	59	(25.1)	24	(10.2)
Females	14	(5.5)	40	(15.7)	89	(35.0)	82	(32.2)	26	(10.2)
Total	21	(4.3)	78	(15.9)	187	(38.3)	141	(28.9)	50	(10.2)
Chemistry										
Males	38	(16.2)	74	(31.6)	70	(29.8)	34	(14.5)	12	(5.1)
Females	76	(29.9)	68	(26.7)	65	(25.5)	27	(10.6)	8	(3.1)
Total	114	(23.4)	142	(29.1)	135	(27.7)	61	(12.5)	20	(4.1)
Computer Sc.										
Males	27	(11.5)	66	(28.1)	80	(34.0)	36	(15.3)	18	(7.7)
Females	53	(20.8)	94	(37.0)	73	(28.7)	22	(8.6)	2	(.78)
Total	80	(16.4)	160	(32.8)	153	(31.3)	58	(11.9)	20	(4.1)
Education										
Males	2	(.9)	16	(6.8)	131	(57.0)	55	(23.4)	15	(6.4)
Females	1	(.4)	22	(8.7)	124	(48.8)	79	(31.1)	19	(7.5)
Total	3	(.6)	38	(7.8)	255	(52.2)	134	(27.5)	34	(6.9)
English										
Males	12	(5.1)	33	(14.1)	99	(42.3)	50	(21.3)	32	(13.6)
Females	7	(2.7)	26	(10.2)	113	(44.4)	66	(25.9)	34	(13.3)
Total	19	(3.9)	59	(12.1)	212	(43.4)	116	(23.7)	66	(13.5)
Geography										
Males	2	(.9)	13	(5.5)	91	(38.7)	83	(35.3)	37	(15.7)
Females	5	(2.0)	27	(10.6)	131	(51.6)	64	(25.2)	20	(7.9)
Total	7	(1.4)	40	(8.2)	222	(45.5)	147	(30.1)	57	(11.6)
History										
Males	7	(3.0)	26	(11.1)	91	(38.7)	68	(28.9)	34	(14.5)
Females	9	(3.5)	28	(11.0)	121	(47.6)	68	(26.8)	11	(8.3)
Total	16	(3.3)	54	(11.1)	212	(43.4)	136	(27.9)	55	(11.3)
Languages										
Males	20	(8.5)	61	(26.0)	87	(37.1)	48	(20.5)	9	(3.8)
Females	13	(5.1)	47	(18.5)	97	(38.1)	60	(23.6)	28	(11.0)
Total	33	(6.8)	108	(22.1)	184	(37.7)	108	(22.1)	37	(7.6)

Math/Stats										
Males	38	(16.2)	54	(23.0)	74	(31.6)	44	(18.8)	21	(8.9)
Females	78	(30.7)	55	(21.6)	54	(21.2)	42	(16.5)	16	(6.2)
Total	116	(23.8)	109	(22.3)	128	(26.2)	86	(17.6)	37	(7.6)
Physics										
Males	60	(25.6)	63	(26.9)	58	(24.7)	36	(15.3)	13	(5.5)
Females	110	(43.3)	68	(26.7)	40	(15.7)	21	(8.2)	7	(2.7)
Total	170	(34.8)	131	(26.8)	98	(20.1)	57	(11.7)	20	(4.1)
Poli Sci										
Males	14	(6.0)	40	(17.0)	104	(44.3)	49	(20.9)	23	(9.8)
Females	28	(11.0)	58	(22.8)	121	(47.6)	36	(14.2)	2	(.8)
Total	42	(8.6)	98	(20.1)	225	(46.1)	85	(17.4)	25	(5.1)
Psychology										
Males	1	(.4)	17	(7.2)	93	(39.6)	88	(37.4)	33	(17.2)
Females	-		3	(1.2)	125	(49.2)	102	(40.2)	24	(9.4)
Total	1	(.4)	20	(4.1)	218	(44.7)	190	(38.9)	57	(11.7)
Sociology										
Males	3	(1.3)	17	(7.2)	112	(47.7)	74	(31.5)	22	(9.4)
Females	-		9	(3.5)	144	(56.7)	83	(32.7)	16	(6.3)
Total	3	(1.3)	26	(5.3)	256	(52.5)	157	(32.1)	38	(7.8)

TABLE 19

Multivariate Analysis of Variance for Gender Differences in How Difficult, Relative to Others, Students Would or Do Find Course Material In Specific Academic Areas

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Anthropology	3.132	3.059	0.67	1/486
Biology	3.132	3.221	0.80	1/486
Chemistry	2.528	2.174	11.11***	1/486
Computer Sc.	2.694	2.190	25.45***	1/486
Education	3.123	3.253	2.00	1/486
English	3.132	3.273	1.82	1/486
Geography	3.481	3.178	10.38***	1/486
History	3.294	3.166	1.63	1/486
Languages	2.728	3.060	10.04**	1/486
Math/Stats	2.770	2.344	13.41***	1/486
Physics	2.430	1.897	24.66***	1/486
Political Sc.	3.051	2.597	22.87***	1/486
Psychology	3.536	3.577	0.31	1/486
Sociology	3.319	3.391	0.84	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 20

Multivariate Analysis of Variance for Gender Differences in Mathematics as Measured by the Five Fennema-Sherman Mathematics Attitude Scales

Dependent Variable	Male Group Means (N=228)	Female Group Means (N=244)	Univariate F	df
Effectance	35.732	33.598	4.25*	1/470
Anxiety	36.969	33.574	10.39***	1/470
Confidence	39.439	33.914	21.67***	1/470
Male Domain	53.132	56.693	19.44***	1/470
Usefulness	39.163	37.623	2.56	1/470

Significance levels cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p <.05; **p <.01; ***p <.001

TABLE 21

Frequency Distribution of Importance of Reasons for Choosing to take Math Course

Reason	No Importance Freq.	No Importance %	Minor Importance Freq.	Minor Importance %	Moderately Important Freq.	Moderately Important %	Major Importance Freq.	Major Importance %
Program Requirement								
Male	17	7.2	16	6.8	83	35.3	108	46.0
Female	2	.8	21	8.3	68	26.8	153	60.2
Total	19	3.9	37	7.6	151	30.9	261	53.5
Interest in Course Content								
Male	40	17.0	59	25.1	80	34.0	43	18.3
Female	48	18.9	69	27.2	82	32.3	43	16.9
Total	88	18.0	128		162	26.2	86	17.6
Good Ability								
Male	30	12.8	71	30.2	83	35.3	38	16.2
Female	32	12.6	75	29.5	86	33.9	49	19.3
Total	62	12.7	146	29.9	169	34.6	87	17.8
Have done well in the past								
Male	34	14.5	60	25.5	75	31.9	53	22.6
Female	41	16.1	51	20.1	88	34.6	63	24.8
Total	75		111		163		116	
Expect to do well								
Male	27	11.5	48	20.4	103	43.8	43	18.3
Female	40	15.7	58	22.8	100	39.4	45	17.7
Total	67	15.4	106	21.7	203	41.6	88	18.0
Curious about the topic								
Male	72	30.6	67	28.5	53	22.6	30	12.8
Female	70	27.6	76	29.[illegible]	69	27.2	28	11.0
Total	142	29.1	143	29.3	122	25.0	58	11.9
Important to career goals								
Male	31	13.2	23	9.8	61	26.0	107	45.5
Female	29	11.4	36	14.2	63	24.8	115	45.3
Total	60	12.3	59	12.1	124	35.4	222	45.4
Enjoyment of the class								
Male	56	23.8	68	28.9	65	27.7	33	14.0
Female	48	18.9	71	28.0	72	28.3	51	20.1
Total	104	21.3	139	28.5	137	28.1	84	17.2

	Males		Females		Total	
I Have Never Taken These Courses	14	6%	20	7.9%	34	6.9%

TABLE 22

Multivariate Analysis of Variance for Gender Differences in Reasons Why They Choose to Take Courses in Mathematics

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Program requirement	3.111	3.383	8.42**	1/486
Interest in course content	2.426	2.376	0.24	1/486
Good ability	2.447	2.498	0.27	1/486
Have done well in the past	2.523	2.589	0.39	1/486
Expect to do well	2.574	2.498	0.60	1/486
Curious about the topic	2.064	2.130	0.45	1/486
Important to career goals	2.928	2.953	0.05	1/486
Enjoyment of the class	2.209	2.399	3.44	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 23

Frequency Distribution of Importance of Reasons for Choosing Not to Take Math Course

Reason	No Importance Freq.	No Importance %	Minor Importance Freq.	Minor Importance %	Moderately Important Freq.	Moderately Important %	Major Importance Freq.	Major Importance %
Fear it is too difficult								
Male	34	14.5	55	23.4	82	34.9	59	25.1
Female	30	11.8	39	15.4	74	29.1	100	39.8
Total	64	13.1	94	19.3	156	31.9	159	32.6
Have had previous problems								
Male	38	16.2	51	21.7	69	29.4	72	30.6
Female	23	9.1	42	16.5	76	29.9	102	40.2
Total	61	12.5	93	19.1	145	29.6	174	35.7
No interest in course content								
Male	19	8.1	38	16.2	74	31.5	98	1.7
Female	16	6.3	31	12.2	84	33.1	113	44.5
Total	35	7.2	69	14.1	158	32.4	211	43.2
No background/preparation								
Male	47	20.0	71	30.2	70	29.8	40	17.0
Female	43	16.9	62	24.4	76	29.9	62	24.4
Total	90	18.4	133	27.3	145	29.9	102	20.9
Poor ability								
Male	55	23.4	67	28.5	74	31.5	34	14.5
Female	34	13.4	53	20.9	84	33.1	72	28.3
Total	89	18.2	120	24.6	158	32.4	106	[illegible]
Not required for program								
Male	30	12.8	26	11.1	70	29.8	103	43.8
Female	18	7.1	32	12.6	69	27.2	125	49.2
Total	48	9.8	58	11.9	139	28.5	228	46.7
Not relevant to career goals								
Male	20	8.5	36	15.3	58	24.6	116	49.4
Female	14	5.5	32	12.6	80	31.5	120	49.2
Total	34	6.9	68	13.9	138	28.3	236	48.4
No time								
Male	74	31.5	54	23.0	54	23.0	48	20.4
Female	59	23.2	64	25.2	63	24.8	58	22.8
Total	133	27.3	118	24.2	117	23.9	106	21.7
Does not enjoy								
Male	24	10.2	58	24.7	67	28.5	81	34.5
Female	22	8.6	48	18.9	77	30.3	94	37.0
Total	46	9.4	106	21.7	144	29.5	175	35.9

TABLE 24

Frequency Distribution of Student's Ratings of importance of the reasons that they do well in math courses

Reason	No Importance		Minor Importance		Moderately Important		Major Importance	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Interest in Course Content								
Males	8	3.4	34	14.5	81	34.5	107	45.5
Females	10	3.9	27	10.6	69	27.2	136	53.5
Total	18	3.7	61	12.5	150	30.7	243	49.8
Good Background								
Males	10	4.3	43	18.3	90	38.3	87	37.0
Females	17	6.7	25	9.8	104	40.9	94	37.0
Total	27	5.5	68	13.9	194	39.8	181	37.1
Good Ability								
Males	-		21	8.9	122	51.9	86	36.6
Females	3	1.2	15	5.9	101	39.8	122	48.0
Total	3	.6	36	7.4	223	45.7	208	42.6
Good Teacher/Instructor Influence								
Males	1	.4	8	3.4	49	20.9	171	72.8
Females	2	.8	8	3.1	45	17.7	186	73.2
Total	3	.6	16	3.3	93	19.3	357	73.1
Encouraged by Others								
Males	56	23.8	74	31.3	76	32.[illegible]	23	9.8
Females	56	14.2	64	25.2	92	36.2	49	19.3
Total	92	18.9	138	28.3	168	34.4	72	14.8
Enjoy the Class								
Males	8	3.4	31	13.2	96	41.3	93	39.6
Females	6	2.4	12	4.7	95	37.4	128	50.4
Total	14	2.9	43	8.8	192	39.3	221	45.3
Hard Work/Effort								
Males	5	2.1	13	5.5	77	32.8	134	57.0
Females	2	.8	7	2.8	66	26.0	163	64.2
Total	7	1.4	20	4.1	143	29.3	297	60.7
Positive Attitude								
Males	5	2.1	12	5.1	90	38.3	122	51.9
Females	1	.4	12	4.7	67	26.4	157	61.8
Total	6	1.2	24	4.9	157	32.2	279	57.2

Good Luck								
Male	129	54.9	65	27.7	21	8.9	14	6.0
Female	117	46.1	83	32.7	30	11.8	9	3.5
Total	246	50.4	148	30.3	51	10.4	23	4.7
Easy Tests/Easy Material								
Male	43	18.3	85	36.2	65	27.7	36	15.3
Female	39	15.4	92	36.2	68	26.8	39	15.4
Total	82	16.8	177	36.2	133	27.3	75	15.3

I never do well		
Male	14	6.0%
Female	32	12.6%
Total	46	9.4%

TABLE 25

Frequency Distribution of Student's Ratings of importance of the reasons that they do poorly in math courses

Reason	No Importance Freq.	No Importance %	Minor Importance Freq.	Minor Importance %	Moderately Important Freq.	Moderately Important %	Major Importance Freq.	Major Importance %
Lack of Interest in Course Content								
Males	14	6.0	24	10.2	69	29.4	108	46.0
Females	9	3.5	23	9.1	82	32.3	114	44.9
Total	23	5.1	47	9.6	151	30.9	222	45.5
Lack of Work/Effort								
Males	4	1.7	23	9.8	57	29.3	131	55.7
Females	6	2.4	24	9.4	42	16.5	158	62.2
Total	10	2.0	47	9.6	99	20.3	289	59.2
Insufficient Background								
Males	23	9.8	57	24.3	76	32.3	60	25.5
Females	18	7.1	56	22.0	79	31.1	74	29.1
Total	41	8.4	113	23.2	155	31.8	134	27.5
Low Ability								
Males	38	16.2	78	33.2	68	28.9	32	13.6
Females	22	8.7	49	19.3	96	37.8	59	23.2
Total	60	12.3	127	26.0	164	33.6	91	18.6
Discouraged by Others								
Males	117	49.8	41	17.4	33	14.0	24	10.2
Females	81	31.9	52	20.5	56	22.0	35	13.8
Total	198	40.6	93	19.1	89	18.2	59	12.1
Do Not Enjoy the Class								
Males	13	5.5	42	17.9	64	27.2	96	40.9
Females	5	2.0	34	13.4	79	31.1	109	42.9
Total	18	3.7	76	15.6	143	29.3	205	42.0
Negative Attitude								
Males	18	7.7	35	14.9	65	27.7	98	41.7
Females	8	3.1	28	11.0	62	24.4	126	49.6
Total	26	5.3	63	12.9	127	26.0	224	45.9
Negative Teacher/Instructor Influence								
Males	16	6.8	22	9.4	60	25.5	118	50.2
Females	7	2.8	17	6.7	60	23.6	140	55.1
Total	23	4.7	39	7.9	120	24.6	258	52.9

Bad Luck								
Males	145	61.7	51	21.7	16	6.8	4	1.7
Females	132	52.0	74	29.1	13	5.1	6	2.4
Total	277	56.8	125	25.6	29	5.9	10	2.0
Difficult Tests/Difficult Material								
Males	27	11.5	63	26.8	77	32.8	49	20.9
Females	13	5.1	49	19.3	93	36 6	67	26.4
Total	40	8.2	112	22.9	170	34.8	116	23.8

I never do poorly

Male	33	14.0%
Female	35	13.8%
Total	68	13.9%

TABLE 26

Multivariate Analysis of Variance for Gender Differences in Importance of Various Reasons for Why Students Do Not Do Well in Mathematics Courses

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Lack of interest in course content	2.970	2.992	.04	1/486
Lack of Work/effort	3.157	3.210	.21	1/486
Insufficient background	2.562	2.621	.28	1/486
Low ability	2.226	2.546	8.81**	1/486
Discouraged by others	1.672	1.949	6.49**	1/486
Do not enjoy the class	2.851	2.949	.73	1/486
Negative attitude	2.855	2.980	1.12	1/486
Negative teacher/ instructor influence	3.013	3.087	.39	1/486
Bad Luck	1.315	1.356	.31	1/486
Difficult Tests/ Difficult Material	2.455	2.601	1.70	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p < .05; **p < .01; ***p < .001

TABLE 27

Frequency Distribution of Student's Ratings of importance of training to career goals

Training	Very Important		Somewhat Important		Somewhat Unimportant		Very Unimportant	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Mathematics and/or Statistics								
Males	34	14.5	80	34.0	68	28.9	53	22.6
Females	18	7.1	89	35.0	88	34.6	59	23.2
Total	52	10.7	169	34.6	156	31.9	112	22.9
Use of Computers								
Males	21	8.9	99	42.1	80	34.0	34	14.5
Females	10	3.9	98	38.6	96	37.8	50	19.7
Total	31	6.4	197	40.4	176	36.1	84	17.2
Writing Skills								
Males	99	42.1	96	40.9	33	14.0	7	3.0
Females	110	43.3	107	42.1	32	12.6	4	1.6
Total	209	42.8	203	41.6	65	13.3	11	2.3
Science								
Males	62	26.4	60	25.5	73	31.1	40	17.0
Females	89	35.0	62	24.4	67	26.4	36	14.2
Total	151	30.9	122	25.0	140	28.7	76	15.6

TABLE 28

Multivariate Analysis of Variance for Gender Differences in Importance of Training in Various Areas to Students' Career Goals

Dependent Variable	Male Group Mean (N=235)	Female Group Mean (N=253)	Univariate F	df
Mathematics/Statistics	2.396	2.261	2.50	1/486
Use of Computers	2.464	2.269	6.55**	1/486
Writing Skills	3.217	3.289	1.04	1/486
Science	2.261	2.798	3.38	1/486

Significance Level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p <.05; **p <.01; ***p <.001

TABLE 29

Frequency Distribution of the Most Important Factor
in Selection of a Job or Career
broken down by sex of subject

Factor	Male		Female		Total	
	Freq.	%	Freq.	%	Freq.	%
Amount of education needed	14	6.0	7	2.8	21	4.7
Cost of education needed	-		1	.4	1	2.2
Amount of mathematics needed	-		2	.8	2	4.5
Amount of writing involved in the job	-		-		-	
Belief that I will be able to do the job well	16	6.8	26	10.2	42	9.4
Belief that I will enjoy the job	84	35.7	86	33.9	190	42.4
Belief that the job will be interesting to me	24	10.2	23	9.1	47	10.5
Opportunity to use my special abilities to the fullest	14	6.0	23	9.1	37	8.3
Opportunity to earn a high salary	28	11.9	8	3.1	36	8.0
Having a position that is looked up to by others	1	.4	-		1	2.2
Possibility of a flexible time schedule	1	.4	-		1	2.2
Challenge of difficult work	-		2	.8	2	4.5
Many job openings in the field	5	2.1	4	1.6	9	2.0
Opportunities to be helpful to others or useful to society	22	9.4	35	13.8	57	12.7
Chance to work with people rather than things	5	2.1	15	5.9	20	4.5
The ability to combine career and family	18	7.7	21	8.3	39	8.7

TABLE 30

Multivariate Analysis of Variance for Gender Differences in Importance of Various Factors in Selection of a Job or Career

Dependent Variable	Male Group Means (N=235)	Female Group Means (N=253)	Univariate F	df
Amount of education needed	3.323	3.308	0.03	1/486
Cost of education needed	2.349	2.605	8.57**	1/486
Amount of mathematics needed	2.145	2.249	1.16	1/486
Belief that I will be able to do the job well	3.711	3.881	11.93***	1/486
Belief that I will enjoy the job	3.779	3.905	8.14**	1/486
Belief that the job will be interesting to me	3.762	3.913	14.02***	1/486
Opportunity to use my special abilities to the fullest	3.549	3.696	7.09**	1/486
Opportunity to earn a high salary	3.098	2.941	4.42*	1/486
Having a position that is looked up to by others	2.438	2.439	0.00	1/486
Possibility of a flexible time schedule	2.553	2.510	0.29	1/486
Challenge of difficult work	2.877	2.968	1.52	1/486

. . . . 2

TABLE 30 (continued)

Dependent Variable	Male Group Means	Female Group Means	Univariate F	df
Many job openings in the field	2.868	3.233	19.34***	1/486
Opportunities to be helpful to others or useful to society	3.187	3.601	38.01***	1/486
Chance to work with people rather than things	3.106	3.585	40.39***	1/486
The ability to combine career and family	3.102	3.336	7.33*	1/486
Amount of writing involved in the job	2.298	2.150	2.28	1/486

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p < .05; **p < .01; ***p < .001

TABLE 31

Frequency Distribution of Attitudes
Toward Women in Science Careers

Item	Strongly Agree Freq.	Strongly Agree %	Slightly Agree Freq.	Slightly Agree %	Neither Agree or Diagree Freq.	Neither Agree or Diagree %	Slightly Disagree Freq.	Slightly Disagree %	Strongly Disagree Freq.	Strongly Disagree %
It is very difficult for a woman to combine a career as a scientist with a family life.										
Male	24	10.2	37	15.7	63	26.8	56	23.8	55	23.4
Female	14	5.5	32	12.6	62	24.5	68	26.9	77	30.4
If a woman chemist or physicist takes time away from her career to have children, she will never catch up again.										
Male	3	1.3	9	3.8	58	24.7	73	31.1	92	39.1
Female	-	-	11	4.3	44	17.4	67	26.5	131	51.8
A woman who is considering a career as a mathematician or scientist should probably plan not to have children.										
Male	5	2.1	7	3.0	36	15.3	57	24.3	130	55.3
Female	-	-	6	2.4	21	8.3	25	9.9	201	79.4
For women, there is nothing incompatible about planning both a family and a top-level scientific career.										
Male	9	3.8	29	12.3	51	21.7	58	24.7	88	37.4
Female	12	4.8	24	9.5	37	14.7	63	25.0	116	46.0

TABLE 31 (continued)

Item	Strongly Agree Freq.	Strongly Agree %	Slightly Agree Freq.	Slightly Agree %	Neither Agree or Diagree Freq.	Neither Agree or Diagree %	Slightly Disagree Freq.	Slightly Disagree %	Strongly Disagree Freq.	Strongly Disagree %
Most women who are scientists find that, with a little ingenuity and support, they can happily combine their career with having a family.										
Male	2	0.9	9	3.8	51	21.8	68	29.1	104	44.4
Female	8	3.2	6	2.4	34	13.4	72	28.5	133	52.6
For women, combining scientific career with motherhood is no more difficult than combining any other career with motherhood.										
Male	23	9.8	40	17.0	47	20.0	47	20.0	78	33.2
Female	31	12.3	36	14.2	37	14.6	49	19.4	100	39.5
A woman who is really dedicated to a career in science or mathematics would not be able to devote much time or energy to her family.										
Male	17	7.2	45	19.1	53	22.6	67	28.5	53	22.6
Female	13	5.2	33	13.1	38	15.1	75	29.8	93	36.9
Both women and men can find the time they need for the concentrated work that a career in mathematics and science requires, even if they are involved in an intimate relationship (with a non-scientist).										
Male	5	2.1	14	6.0	58	24.7	72	30.6	86	36.6
Female	5	2.0	22	8.7	57	22.5	66	26.1	103	40.7

TABLE 32

Multivariate Analysis of Variance for Gender Differences in Attitudes Toward Women in Science Careers

Item	Male Group Means (N=234)	Female Group Means (N=251)	Univariate F	df
It is very difficult for a woman to combine a career as a scientist with a family life	3.342	3.641	7.13**	1/483
If a woman chemist or physicist takes time away from her career to have children, she will never catch up again	4.026	4.267	8.29**	1/483
A woman who is considering a career as a mathematician or scientist should probably plan not to have children	4.278	4.670	25.30***	1/483
For women, there is nothing incompatible about planning both a family and a top-level scientific career	2.201	2.012	3.36	1/483
Most women who are scientists find that, with a little ingenuity and support, they can happily combine their career with having a family	1.876	1.745	2.23	1/483
For women, combining scientific career with motherhood is no more difficult than combining any other career with motherhood	2.504	2.387	.86	1/483

. . . . 2

TABLE 32 (continued)

Item	Male Group Means	Female Group Means	Univariate F	df
A woman who is really dedicated to a career in science or mathematics would not be able to devote much time or energy to her family	3.402	3.805	13.13***	1/483
Both women and men can find the time they need for the concentrated work that a career in mathematics and science requires, even if they are involved in an intimate relationship (with a non-scientist)	2.068	2.044	.07	1/483

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 33

Multivariate Analysis of Variance for Gender Differences in Male Peer Attitudes Toward Women in Math and Science

Item	Male Group Mean (N=234)	Female Group Mean (N=248)	Univariate F	df
Most of my male peers think that females are as good as males in Geometry	2.397	2.637	5.08*	1/480
Most of my male peers think that mathematics is for men; arithmetic is for females	4.150	4.016	1.82	1/480
Most of my male peers think girls who enjoy studying math are a bit peculiar	3.803	4.234	17.46***	1/480
Most of my male peers think males are not naturally better than females in mathematics	2.752	2.730	.03	1/480
Most of my male peers think that when a woman has to solve a math problem, it is feminine to ask a man for help	4.150	4.323	3.34	1/480
Most of my male peers trust a woman just as much as they would trust a man to figure out important calculations	1.950	2.061	1.04	1/480

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*$p < .05$; **$p < .01$; ***$p < .001$

TABLE 34

Multivariate Analysis of Variance for Gender Differences in Female Peer Attitudes Toward Women in Math and Science

Item	Male Group Means (N=232)	Female Group Means (N=250)	Univariate F	df
Most of my female peers think it's hard to believe a female could be a genuis in mathematics	4.043	4.212	2.68	1/480
Most of my female peers think that girls can do just as well as boys in mathematics	1.539	1.516	.08	1/480
Most of my female peers would expect a woman mathematician to be a masculine type of person	4.315	4.620	13.04***	1/480
Most cf my female peers think that women certainly are logical enough to do well in mathematics	1.582	1.432	3.65	1/480
Most of my female peers think that studying mathematics is just as appropriate for women as for men	1.522	1.444	1.05	1/480

Significance level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p <.05; **p <.01; ***p <.001

TABLE 35

Results of Factor Analysis on Mathematics, Science, Arts and Language Items*

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability/Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
In general, how hard is math for you (R)	.895	-.284	.314	.374	-.029	.803
Compared to others, how hard is math for you (R)	.880	-.265	.321	.387	-.030	.777
How good at math are you.	.900	-.292	.336	.439	-.061	.818
Parents think math is hard for you (R)	.840	-.157	.238	.387	.002	.716
Boyfriend/girlfriend/spouse think math is hard for you (R)	.813	-.185	.216	.323	-.047	.667
Rate how good at math your parents think you are.	.836	-.188	.248	.388	.001	.705
Rate how good at math your 'significant other' thinks you are.	.835	-.194	.286	.406	-.046	.705
Where would you rank order yourself in your math/stats class.	.794	-.187	.227	.327	-.058	.635
Rate how good at math teachers/professors think you are	.813	-.176	.284	.364	-.017	.665

TABLE 35 (continued)

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
Compared to most other academic subjects, how hard is math for you (R)	.854	-.398	.249	.435	-.019	.767
How hard does your best friend think math is for you (R)	.809	-.220	.280	.349	-.022	.654
Compared to average male undergraduate, how well do you or would you do in math courses.	.835	-.221	.318	.411	-.004	.703
Compared to other subjects, how hard do you have to work in math/stats courses	.787	-.313	.245	.306	.011	.634
I feel I don't know what I am doing when in courses requiring a lot of math.	.796	-.244	.286	.414	.005	.643
How hard would it be for you if you majored in mathematics, either pure or applied (R).	.754	-.158	.361	.263	-.041	.590
Effort required to get good grades in math/stats (R)	.705	-.247	.228	.192	-.045	.517
Compared to average under-graduate, how well do you or would you do in math courses	.779	-.168	.335	.382	-.029	.621

TABLE 35 (continued)

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
How hard do you think the next level of mathematics would be for you (R)	.745	-.203	.341	.302	.080	.574
Compared to average female undergraduate, how well do you or would you do in math courses.	.796	-.307	.307	.448	-.093	.660
Compared to other students, time spent on math/stats assignments (R).	.633	-.196	.171	.092	-.093	.447
Compared to other academic subjects, how good are you at math	.822	-.463	.238	.539	-.057	.772
When in a course that requires a lot of math, I worry that I might look foolish.	.700	-.173	.306	.319	.068	.503
Courses requiring a lot of math overwhelm me.	.589	-.224	.244	.246	.123	.374
Working on math problems is interesting.	.681	.210	.321	.609	.010	.599
I find arts interesting (eg. history, english).	.310	.823	-.304	-.261	.069	.704

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
Compared to other students, how hard is english for you (R).	-.188	.768	.011	-.337	.071	.638
Working on Arts assignments (e.g., history, english) is interesting.	-.281	.784	-.219	-.288	.095	.622
Enjoy writing essays and term papers (R)	-.178	.728	-.142	-.294	.102	.537
Compared to other academic subjects, how hard is english for you (R)	-.314	.740	-.091	-.341	.113	.578
Outside school, how useful are university english courses to your daily life.	-.112	.617	-.204	.062	.101	.474
How useful are good basic writing skills for what you want to do after you graduate.	-.123	.623	-.234	-.017	.122	.449
How hard do you think an honours degree in Arts (eg.english/history) would be for you (R).	-.181	.663	-.005	-.300	.026	.474
Confident I have done a good job when I write an essay (R).	-.141	.603	.059	-.293	.136	.424

TABLE 35 (continued)

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
Good basic writing skills useful for university courses outside english department	-.149	.532	-.308	-.102	.151	.345
I find reading history books interesting	-.248	.501	-.205	-.145	-.003	.279
How good at science are you.	.443	-.182	.830	.241	-.017	.720
Compared to other academic subjects, how good are you at science.	.368	-.365	.836	.342	-.069	.747
Compared to other students, how hard is science for you (R).	.445	-.184	.796	.163	-.006	.683
How hard would advanced courses in biology be for you (R).	.184	.027	.686	.052	.021	.505
I am sure I could do advanced work in science (R)	.393	-.192	.762	.320	-.026	.609
How useful are university science courses (eg.physics, chemistry) for what you want to do after you graduate.	.150	-.329	.676	.424	-.041	.587
For my future career, studying science is a waste of time.	.146	-.299	.677	.467	-.024	.610

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
I find reading about science interesting.	.142	-.120	.619	.293	-.041	.423
How hard do you think an honours degree in physical science (eg. physics, chemistry) would be for you (R)	.440	-.118	.637	.135	-.034	.479
Rate how good at science your parents think you are.	.469	-.098	.635	.193	.014	.488
Outside school, how useful are university math coruses (eg. statistics, calculus, algebra) to your daily life	.379	-.226	.177	.793	.017	.634
Is amount of effort required to do well in advanced math courses worthwhile.	.424	-.324	.281	.773	.007	.618
How useful are university math courses (eg. statistics, calculus, algebra) for what you want to do after graduation.	.318	-.196	.151	.723	.013	.526
How useful are good basic math skills for university courses, outside math department.	.261	-.203	.291	.672	-.062	.474

TABLE 35 (continued)

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
Importance of being good at solving math problems or reasoning mathematically.	.447	-.191	.258	.710	-.045	.539
Amount of effort required to do well in a math course worthwhile.	.429	-.347	.384	.744	.022	.610
A general understanding of basic math is important.	.357	-.056	.133	.599	.095	.407
Most of my female peers would expect a woman mathematician to be a masculine type of person.	-.009	.078	-.037	-.009	.675	.457
Most of my female peers think studying mathematics is just as appropriate for women as for men (R).	.001	.074	-.074	.056	.665	.451
Most of my female peers think women certainly are logical enough to do well in mathematics (R).	-.035	.083	-.002	-.051	.650	.426
Most of my female peers think it's hard to believe a female could be a genuis in mathematics.	-.057	.046	-.110	-.049	.637	.420
Most of my male peers think mathematics is for men; arithmetic is for females.	.065	.049	.071	.077	.640	.422

TABLE 35 (continued)

Items	Factor 1 Mathematics Ability	Factor 2 Arts Ability/Value	Factor 3 Science Ability Value	Factor 4 Value of Mathematics	Factor 4 Perception of Peers Acceptance of Females in Mathematics & Science	Communality
Most of my male peers think girls who enjoy studying math are a bit peculiar.	-.065	-.004	-.017	.036	.616	.394
Most cf my male peers think that when a woman has to solve a math problem, it is feminine to ask a man for help.	-.024	.152	.040	-.001	.624	.400
Most of my female peers think girls can do just as well as boys in math (R)	-.001	.095	-.043	-.050	.603	.368
Most of my male peers would trust a woman as much as a man to figure out important calculations (R).	-.005	.106	.009	-.096	.592	.364
Most of my female peers would have more faith in the answer for a math problem solved by a man than a woman.	.024	.116	-.144	-.014	.485	.261
Scientists lead a lonely life.	-.031	.098	.185	.095	.436	.253

* Items marked with (R) have been reverse-scored.

TABLE 36

Inter-Factor Correlation Matrix of Factor Analysis of Attitudes Toward Mathematics, Science, Arts and Languages

	Factor 1 Mathematics Ability	Factor 2 Arts Ability/ Value	Factor 3 Science Ability/Value	Factor 4 Value of Mathematics	Factor 5 Perception of Peers Acceptance of Females in Mathematics & Science
Factor 1 Mathematics Ability	1.000	-.274	.337	.417	-.020
Factor 2 Arts Ability/Value	-.274	1.000	-.19[illegible]	-.314	.129
Factor 3 Science Ability/Value	.337	-.199	1.000	.252	-.025
Factor 4 Value of Mathematics	.417	-.314	.252	1.000	-.003
Factor 5 Perception of Peers Acceptance of Females in Mathematics & Science	-.020	.129	-.025	-.003	1.000

TABLE 37

Multivariate Analysis of Variance for Gender Differences of Factor Scores

Dependent Variable	Male Group Mean (N=214)	Female Group Mean (N=234)	Univariate F	df
Factor One - (Mathematics Ability)	.1392	-.1273	8.06**	1/446
Factor Two - (Arts Ability/Value)	-.1232	.1127	6.29*	1/446
Factor Three - (Science Ability/Value)	.0565	-.0517	1.31	1/446
Factor Four - (Value of Mathematics)	.0398	-.0364	.65	1/446
Factor Five - (Perception of Peers' Acceptance of Females in Mathematics and Science)	-.1434	.1314	8.60**	1/446

Significance Level cannot be evaluated. However, in a univariate context, F values would reach the following significance levels as indicated:

*p <.05; **p <.01; ***p <.001

TABLE 38

Canonical Discriminant Analysis to Predict Female Students' Choice of Major Subject in University (Variables = High School Background)

Canonical Structure

Canonical Variables	Canonical Correlation	Adjusted Canonical Correlation	Squared Canonical Correlation	Proportion	Likelihood Ratio	Approx. F	df	Probability
1	.479	.453	.230	.675	.671	5.140	20,803	.0001
2	.299	.265	.089	.222	.871	2.873	12,643	.0007
3	.207	.197	.043	.100	.957	1.828	6,488	N.S.
4	.029	-.035	.001	.002	.999	0.104	2,245	N.S.

Standardized Canonical Coefficients

Variable	Can 1	Can 2
High School Chemistry	.757	.145
High School Biology	.305	.865
High School Physics	.547	-.524
High School English	-.288	-.178

Class Means on Canonical Variables

Class (Major Categories)	Can 1	Can 2
1. Math, Physics, Chemistry Computer Science & Statistics	1.482	-.628
2. Biology, MicroBiology & Zoology	.844	.502

TABLE 38 (continued)

Class (Major Categories)	Class Means on Canonical Variables: Can 1	Can 2
3. Geography/Economics	-.175	-.359
4. Psychology, Sociology	-.565	.282
5. English, History, French and German	-.320	-.286
6. Other	.049	-.107

TABLE 39

Canonical Discriminant Analysis to Predict Male Students' Choice of Major Subject in University (Variables = High School Background)

Canonical Structure

Canonical Variables	Canonical Correlation	Adjusted Canonical Correlation	Squared Canonical Correlation	Proportion	Likelihood Ratio	Approx. F	df	Probability
1	.579	.558	.336	.678	.529	6.215	25,830	.0001
2	.343	.297	.118	.179	.796	3.323	16,685	.0001
3	.259	.236	.067	.097	.902	2.648	9,548	.0053
4	.180	-	.033	.045	.967	1.934	4,452	N.S.
5	.029	-	.001	.001	.999	0.192	1,227	N.S.

Standardized Canonical Coefficients

Variable	Can 1	Can 2	Can 3
High School Chemistry	.806	.134	-.082
High School English	-.585	-.177	.956
High School Biology	.263	.973	.134
High School Physics	.554	-.379	.215
Father's Education	-.025	.361	-.114

Class Means on Canonical Variables

Class (Major Categories)	Can 1	Can 2	Can 3
1. Math, Physics, Chemistry Computer Science & Statistics	1.522	-.372	.146
2. Biology, MicroBiology & Zoology	.833	.672	.123

TABLE 39 (continued)

Class (Major Categories)	Class Means on Canonical Variables		
	Can 1	Can 2	Can 2
3. Geography/Economics	-.147	-.358	-.485
4. Psychology, Sociology	-.688	.205	.278
5. English, History, French and German	-.647	-.510	.367
6. Other	-.192	.196	-.117

TABLE 40

Canonical Discriminant Analysis to Predict Female Students' Choice of Major Subject in University (Variables = Factor Scores)

Canonical Structure

Canonical Variables	Canonical Correlation	Adjusted Canonical Correlation	Squared Canonical Correlation	Proportion	Likelihood Ratio	Approx. F	df	Probability
1	.614	.601	.377	.878	.574	9.273	15,624	.0001
2	.248	.211	.061	.095	.921	2.368	8,454	.0166
3	.135	.117	.018	.027	.982	1.406	3,228	N.S.

Standardized Canonical Coefficients

Variable	Can 1	Can 2
Factor 1 Mathematics Ability	-.042	-.811
Factor 2 Arts Ability/Value	-.594	.509
Factor 3 Science Ability/Value	1.017	.704

Class Means on Canonical Variables

Class (Major Categories)	Can 1	Can 2
1. Math, Physics, Chemistry Computer Science & Statistics	1.790	-.600
2. Biology, MicroBiology & Zoology	1.198	.399

TABLE 40 (continued)

Class (Major Categories)	Class Means on Canonical Variables	
	Can 1	Can 2
3. Geography/Economics	-.286	-.659
4. Psychology, Sociology	-.608	.070
5. English, History, French and German	-.868	.081
6. Other	.141	-.091

TABLE 41

Canonical Discriminant Analysis to Predict Male Students' Choice of Major Subject in University (Variables = Factor Scores)

Canonical Structure

Canonical Variables	Canonical Correlation	Adjusted Canonical Correlation	Squared Canonical Correlation	Proportion	Likelihood Ratio	Approx. F	df	Probability
1	.698	.688	.487	.895	.461	12.288	15,569	.0001
2	.298	.270	.089	.092	.899	2.838	8,414	.0045
3	.116	.083	.013	.013	.987	0.940	3,208	N.S.

Standardized Canonical Coefficients

Variable	Can 1	Can 2
Factor 2 Arts Ability/Value	-.418	.106
Factor 3 Science Ability/Value	1.064	.624
Factor 4 Value of Mathematics	.373	-.908

Class Means on Canonical Variables

Class (Major Categories)	Can 1	Can 2
1. Math, Physics, Chemistry Computer Science & Statistics	1.838	-.328
2. Biology, MicroBiology & Zoology	1.760	.418

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TABLE 41 (continued)

(Major Categories)	Class Means on Canonical Variables	
	Can 1	Can 2
3. Geography/Economics	-.486	-.651
4. Psychology, Sociology	-.452	.126
5. English, History, French and German	-1.059	.121
6. Other	-.295	.131

TABLE 42 - A

Correlation Matrix of Input Variables for Causal Modeling - Females

	CNFDNCT	QA151RT	QA213RT	QA225	QA201	USEFULT	EFCTNCT	QA135	QA240	QA228RT	QA92RT
CNFDNCT	1.000										
QA151RT	.8382	1.000									
QA213RT	.8114	.7119	1.000								
QA225	.8930	.7767	.8258	1.000							
QA201	.4940	.4014	.3948	.4560	1.000						
USEFULT	.5067	.4139	.4296	.4428	.6342	1.000					
EFCTNCT	.7780	.6923	.6396	.6939	.5799	.6203	1.000				
QA135	.6428	.5744	.5260	.5484	.4238	.4855	.7830	1.000			
QA240	.7563	.6752	.5915	.6958	.5560	.5906	.8444	.6626	1.000		
QA228RT	.6009	.5391	.5165	.5443	.5952	.6458	.6017	.4714	.5562	1.000	
QA92RT	.6558	.6373	.5362	.5787	.5291	.5958	.7034	.5804	.6473	.6745	1.000
Standard deviations:	1.3297	.3727	.1975	1.1963	1.4526	.9844	1.1676	1.2621	1.2525	.2452	.2540

Note:

CNFDNCT = CLM score, with log 10 transformation
QA151RT = Item: "Compared to most other academic subjects, how hard is math for you?", with square root transformation
QA213RT = Item: "Compared to most other students you know, how hard is math for you?", with log 10 transformation.
QA225 = Item: "How good at math are you?"
QA201 = Item: "Is the amount of effort it would take to do well in a math course this year worthwhile to you?"

TABLE 42 - A (continued)

USEFULT = Fennema-Sherman Usefulness of Math matics score, with log 10 transformation.
EFCTNCT = Fennema-Sherman Effectance in Mathematics score, with log 10 transformation.
QA135 = Item: "In general, I find working on math games or puzzles: Very boring... very interesting
QA240 = Item: "In general, I find working on math problems: very boring...very interesting"
QA228RT = Item: "In future years, I intend to take more courses in mathematics", with log 10 transformation
QA92RT = Item: "Would you take more math or statistics courses if you didn't have to?", with log 10 transformation.

TABLE 42 - B

Correlation Matrix of Input Variables for Causal Modeling - Males

	CNFDNCT	QA151RT	QA213RT	QA225	QA201	USEFULT	EFCINCT	QA135	QA240	QA228RT	QA92RT
CNFDNCT	1.000										
QA151RT	.8079	1.000									
QA213RT	.7710	.7120	1.000								
QA225	.8394	.7325	.7620	1.000							
QA201	.4824	.4322	.3646	.4064	1.000						
USEFULT	.5674	.4882	.3797	.4642	.6550	1.000					
EFCINCT	.7741	.6585	.6169	.6845	.4861	.5622	1.000				
QA135	.5270	.4215	.4509	.5057	.3421	.4258	.6850	1.000			
QA240	.6752	.5347	.5528	.5740	.4433	.4913	.8401	.6430	1.000		
QA228RT	.5872	.5088	.4165	.4873	.5655	.7248	.5789	.4078	.4972	1.000	
QA92RT	.6130	.5786	.4846	.5265	.6486	.6204	.6559	.4755	.5760	.6703	1.000
Standard deviations:	1.2382	.3755	.1860	1.1163	1.4358	1.1083	1.0903	1.2603	1.1972	.2578	.2735

TABLE 43

Standardized Measurement Model Coefficients and Indicator Variable Reliabilities for Models 1, 1A and 1B

	Model 1		Model 1A		Model 1B	
I. Measurement Model Coefficients:						
	Females	Males	Females	Males	Females	Males
Y1, 1	1.309	1.186	1.295	1.158	1.309	1.178
Y2, 1	0.328	0.323	0.331	0.329	0.328	0.325
Y3, 1	0.170	0.152	0.980	0.933	0.972	0.917
Y4, 2	1.126	1.113	1.106	1.122	1.051	1.077
Y5, 2	0.819	0.933	0.834	0.926	0.751	0.897
Y6, 3	.209	.208	0.177	0.176	0.210	0.208
Y7, 3	.217	.220	0.185	0.188	0.216	0.220
II. Indicator Variable Reliabilities (Squared Multiple Correlations)						
Y1	0.936	0.902	0.916	0.360	0.936	0.890
Y2	0.767	0.738	0.782	0.764	0.769	0.750
Y3	0.710	0.665	0.786	0.718	0.774	0.694
Y4	0.582	0.590	0.562	0.600	0.507	0.553
Y5	0.688	0.718	0.714	0.706	0.580	0.662
Y6	0.716	0.662	0.712	0.656	0.725	0.665
Y7	0.719	0.649	0.723	0.655	0.709	0.647
TCD*=	0.992	0.985	0.992	0.983	0.988	0.980

Note: Y1 = CNFDNCT
Y2 = QA151RT
Y3 = QA213RT
Y4 = QA201
Y5 = USEFULT
Y6 = QA228RT
Y7 = QA92RT

*Total Coefficient of determination for the Y variables

TABLE 44

Standardized Structural (Beta) Coefficients
for Models 1, 1A and 1B

	Model 1		Model 1A		Model 1B	
	Females	Males	Females	Males	Females	Males
BE2,1	0.417	0.410	-	-	0.547	0.474
BE3,1	0.347	0.224	0.572	0.460	-	-
BE1,2	0.308	0.361	-	-	0.352	0.397
BE3,2	0.682	0.821	0.718	0.865	0.999	1.021

TABLE 45

Standardized Latent Variable Residuals and Latent Variable Reliabilities for Models 1, 1A and 1B

	Model 1		Model 1A		Model 1B	
	Females	Males	Females	Males	Females	Males
I. Residuals:						
PSI 1,1	0.699	0.646	1.000	1.000	0.593	0.576
PSI 2,2	0.638	0.618	1.000	1.000	0.474	0.530
PSI 3,3	0.111	0.029	0.158	0.041	0.001	-0.042
II. Reliabilities (squared Multiple Correlations):						
ETA 1	0.301	0.354	-	-	0.407	0.424
ETA 2	0.362	0.382	-	-	0.526	0.470
ETA 3	0.889	0.971	0.842	0.959	0.999	1.042

*The PSI matrix is not positive definite for this model with this group.

TABLE 46

Goodness of Fit Statistics for Models 1, 1A and 1B

	Model 1		Model 1A		Model 1B	
	Females	Males	Females	Males	Females	Males
X^2	16.93	32.53	96.69	125.09	33.91	43.43
df	11	11	12	12	12	12
p	0.110	0.001	0.000	0.000	0.001	0.000
AGFI	0.946	0.899	0.778	0.726	0.896	0.880
RMSR	0.012	0.010	0.282	0.275	0.041	0.038
TDSE	0.541	0.274	-	-	0.348	-

AGFI = Adjusted Goodness of Fit Index

RMSR = Root Mean Square Residual

TDSE = Total Coefficient of Determination for the Structural Equations

TABLE 47

The t-Values for Beta paths in Models 1, 1A and 1B

	Model 1		Model 1A		Model 1B	
	Females	Males	Females	Males	Females	Males
BE2,1	9.493	10.199	-	-	12.911	12.865
BE3,1	4.787	2.861	9.816	7.941	-	-
BE1,2	9.493	10.199	-	-	12.911	12.865
BE3,2	7.544	8.230	8.998	10.109	11.093	11.808

TABLE 48

Standardized Measurement Model Coefficients and Indicator Variable Reliabilities for Models 2F, 2M and 2A

	Model 2F (Females)	Model 2M (Males)	Model 2A Females	Model 2A Males
I. Measurement Model Coefficients:				
Y1,1	1.306	1.197	1.307	1.197
Y2,1	0.321	0.318	0.320	0.318
Y3,1	0.168	0.153	0.168	0.153
Y4,1	1.114	0.984	1.115	0.984
Y5,2	1.113	1.111	1.065	1.074
Y6,2	0.833	0.924	0.779	0.892
Y7,3	1.143	1.054	1.142	1.054
Y8,3	1.022	0.891	1.022	0.891
Y9,3	1.114	1.024	1.114	1.024
Y10,4	0.203	0.205	0.203	0.206
Y11,4	0.215	0.223	0.214	0.222
II. Indicator Variables Reliabilities (Squared Multiple Correlations):				
Y1	0.945	0.918	0.946	0.918
Y2	0.739	0.714	0.736	0.714
Y3	0.717	0.676	0.717	0.676
Y4	0.855	0.780	0.855	0.780
Y5	0.573	0.588	0.525	0.549
Y6	0.698	0.703	0.610	0.655
Y7	0.933	0.941	0.932	0.941
Y8	0.642	0.497	0.642	0.497
Y9	0.775	0.745	0.775	0.745
Y10	0.677	0.647	0.679	0.654

TABLE 48 (continued)

	Model 2F	Model 2M	Model 2A	
	(Females)	(Males)	Females	Males
Y11	0.711	0.664	0.708	0.657
TCD	0.999	0.998	0.998	0.998

Note:

Y1 = CNFDNCT
Y2 = QA151RT
Y3 = QA213RT
Y4 = QA225
Y5 = QA201
Y6 = USEFULT
Y7 = EFCTNCT
Y8 = QA135
Y9 = QA240
Y10 = QA228RT
Y11 = QA92RT
TCD = Total Coefficient of Determination for Y variables

TABLE 49

Standardized Structural (Beta) Coefficients for Models 2F, 2M and 2A

	Model 2F	Model 2M	Model 2A	
	(Females)	(Males)	Females	Males
BE2,1	-	0.402	0.160	0.380
BE3,1	0.603	0.576	0.605	0.575
BE4,1	0.351	-	-	-
BE4,2	0.671	0.836	0.969	1.025
BE1,3	0.462	0.447	0.462	0.446
BE2,3	0.778	0.344	0.704	0.423
BE4,3	-	0.215	-	-

TABLE 50

Standardized Latent Variable Residuals and Latent Variable Reliabilities for Models 2F, 2M and 2A.

	Model 2F	Model 2M	Model 2A	
	(Females)	(Males)	Females	Males*
I. Residuals:				
PS1,1	0.444	0.472	0.443	0.473
PS2,2	0.395	0.495	0.290	0.416
PS3,3	0.359	0.394	0.357	0.396
PS4,4	0.122	0.013	0.061	-0.051
II. Reliabilities:				
ETA 1	0.556	0.528	0.557	0.527
ETA 2	0.605	0.505	0.710	0.584
ETA 3	0.641	0.606	0.643	0.604
ETA 4	0.878	0.984	0.939	1.051

*PSI matrix is not positive definite.

TABLE 51

Goodness of Fit Statistics for Models 2F, 2M and 2A

	Model 2F	Model 2M	Model 2A	
	(Females)	(Males)	Females	Males
X^2	87.37	70.40	107.31	76.19
df	40	39	40	40
p	0.000	0.002	0.000	0.000
AGFI	0.894	0.911	0.873	0.909
RMSR	0.028	0.018	0.036	0.026
TCDSE	0.479	0.449	0.481	-

Note: AGFI = Adjusted Goodness of Fit Index
RMSR = Root Mean Square Residual
TCDSE = Total Coefficient of Determination for Structural Equations

TABLE 52

The t-values for Beta Paths in Models 2F, 2M and 2A

	Model 2F	Model 2M	Model 2A	
	(Females)	(Males)	Females	Males
BE 2,1	--	3.671	1.709 (n.s.)	3.801
BE 3,1	19.966	17.682	19.910	17.626
BE 4,1	5.167	-	-	-
BE 4,2	7.879	8.306	11.408	11.835
BE 1,3	19.966	17.682	19.910	17.626
BE 2,3	11.211	3.088	6.717	4.175
BE 4,3	-	2.770	-	-

TABLE 53

Frequency Distribution of Math Course participation by males and females

	Males	Females
Math Credits in first year*	25	8
Math withdrawal in first year	13	5
Math failures in first year	20	9
Math registered for in Fall 1987	26	19
Total attempts at Math to date	61	36

*Of the credits in first year, only 2 females had received 2 course credits, while 8 males received 2 or more course credits.

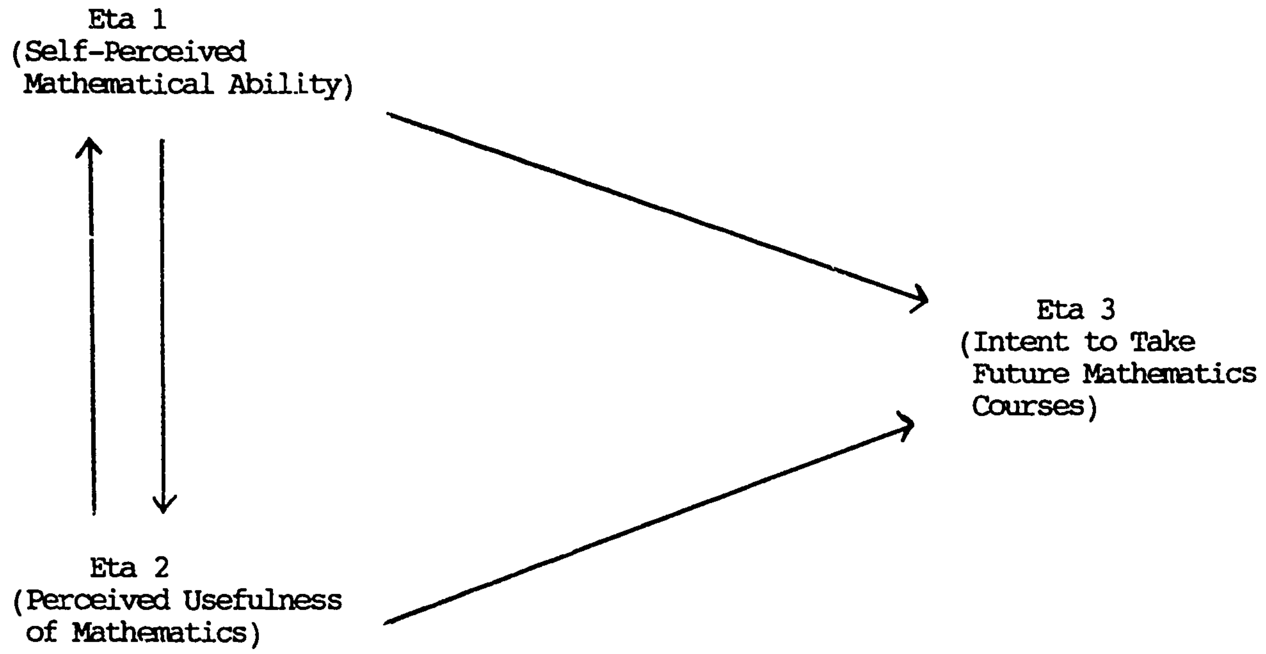
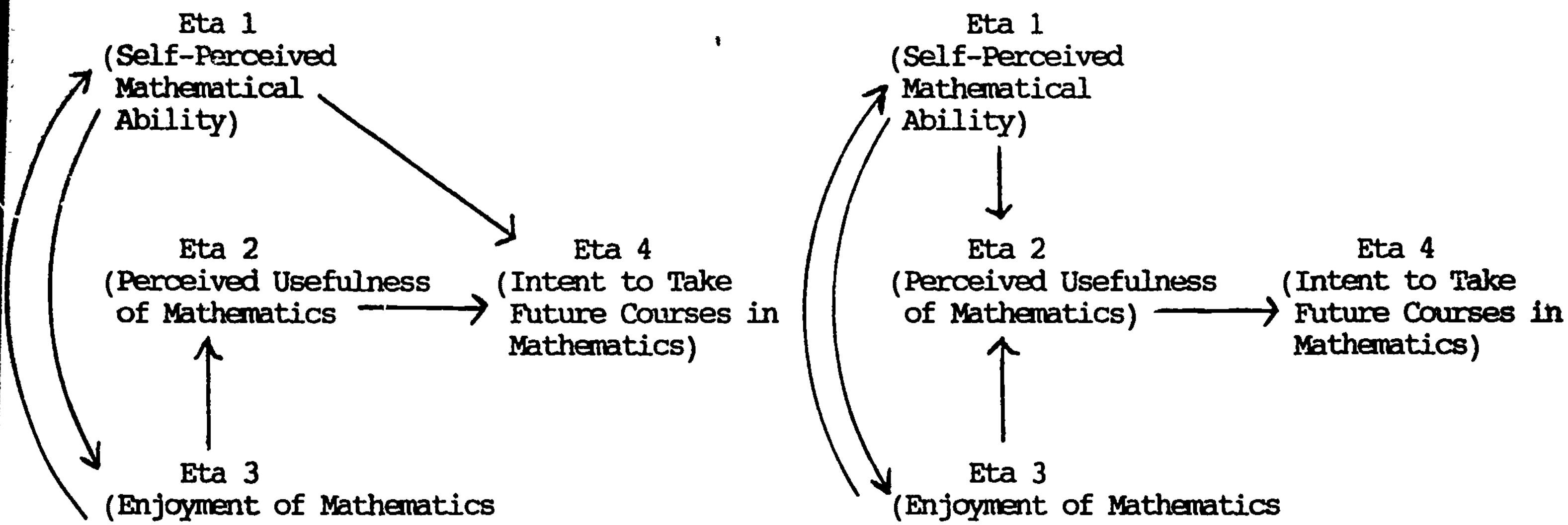


FIGURE 1 - MODEL 1



<u>Model 2F</u>
(Best-fitting model for Females)

<u>Model 2M</u>
(Best-fitting model for Males)

FIGURE 2