

**THE UNIVERSITY OF CALGARY**

**Parental Influence on Gifted Men's and Women's  
Subjective Task Value of Math and Science**

**by**

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## **ABSTRACT**

The purpose of this study was to examine the link between the individual's subjective task value of math and science in relation to the individual's perception of their parents' influence in these areas. More specifically, subjective task value was examined in relation to particular parental characteristics (i.e., maternal employment, parent's education level) that were hypothesized to predict males' and females' subjective task value of math/science.

Pursued within a larger research framework, the present study's sample consisted of 51 males, and 66 females who had demonstrated high achievement in grades 11 or 12 in the sciences. All subjects had applied to the Shad Valley Program over the time period 1981 to 1995. Subjects in the present study, using the original Shad application information, were traced retrospectively and ranged in age from 19.6 to 33.8 years old.

Statistical procedures involved quantitative analyses. The quantitative results indicated that the child's perception of their relationship with their father was a significant predictor of their subjective task value of math and science, and social tasks. For the subjective task value of math/science, boys scored 12.24% higher than girls while, girls scored 16.77% higher than boys in the subjective task value of social tasks.

The child's perception of their relationship with their mother, however, was not a significant predictor of subjective task value of math and science, but it was a significant predictor for social tasks.

The findings from the current study provided support for the influential role that parents play in influencing their children's subjective task value of math and science. However, the specific parental characteristics examined in the current study: maternal employment, maternal education level, and paternal education level, were not significantly contributing factors in subjects' subjective task value of math and science.

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## **CHAPTER 1**

### **INTRODUCTION**

Women have made significant progress in establishing themselves as a permanent and vital part of today's work force. Historically women's primary role in society entailed being responsible for the family and domestic work while men traditionally were the breadwinners, primarily responsible for earning the family income. Since the mid-60's women have been steadily entering the paid working force. The women who initially sought paid employment were pioneers who helped to establish that females had more to offer than being primary caregivers if provided the opportunity. These early female pioneers entered the work force for various reasons, some sought employment to relieve financial strain while others began careers to fulfill other needs such as to contribute more to society. Whatever their reasons were for seeking employment, females, past and present, have proved themselves to be bright, capable and hard working professionals and employees.

It is an inspiring journey to document the advancements that women have made along the way in establishing themselves in the working world. For instance, in 1991, 58% of Canadian women worked and experts have predicted that by the year 2005, 70% of women will be in the work force (Lero & Johnson, 1994). Despite such promising predictions, the labour force participation rates for women in 1998 reveal a disappointing increase of only one tenth of a percent (i.e., a 58.1% participation rate for women as opposed to a 72.4% participation rate for men) (Statistics Canada, 1999). These statistics indicate that women continue to be unequally represented in the labour force in general,

and perhaps more significant is evidence that demonstrates that women are particularly underrepresented in careers requiring math and science expertise. For example, in 1997 there were 5,057,000 men as opposed to only 1,335,000 women in the natural sciences, engineering and mathematics labour forces (Statistics Canada, 1997). Furthermore the unequal distribution of men and women in the maths and sciences is also apparent in Canadian full-time, undergraduate university programs such as: Engineering (80.6% males, 19.4% females), Computer Science (81.5% males, 18.5% females), Physics (79.5% males, 20.5% females), Geology (62.1% males, 37.9% females), Mathematics (58% males, 42% females) and less so in Chemistry (53% males, 46.2 % females) (Education in Canada, 1998). In full-time, undergraduate Biology programs, however, women outnumber men with 59.6% females and 40.4% males (Education in Canada, 1998). This pattern of underrepresentation continues as the majority of women continue to be over represented in lower paying and lower status areas of employment such as nursing and teaching, while the majority of men continue to dominate higher paying and higher status jobs in areas such as the computer sciences, engineering and physics (Curry, Trew, Turner & Hunter, 1994; Green & Stitt-Gohdes, 1997).

This imbalance in the proportion of males versus females in the maths and sciences emerges as early as high school as males tend to enroll in more physics courses (62.8% males, 37.2% females), while females enroll in more biology courses (61% females, 39% males). In math (49.5% males, 50.5% females), and chemistry (47.9% males, 52.1% females), however, the proportion of males and females is relatively equal (Alberta Education 1997-1998). As a result, females applying to university programs have limited

options as they often lack the required pre-requisites to gain admission into math and science programs. In a sense mathematics acts as a “critical filter” which serves to close off a number of occupations to women (Sells, 1978) and ultimately results in the unequal distribution of men and women. The repercussions of the absence of females in the maths and sciences has an inevitably negative impact on society in that we are not utilizing approximately half of the available resources and talents that women, and more specifically bright women, have to offer. The presence of such glaring gender differences in academic settings as well as in the workplace has lead researchers to examine why these discrepancies continue to exist in the maths and sciences.

## CHAPTER II

### NATURE OF THE PROBLEM

Theorists and researchers have generated numerous hypotheses to explain the gender differences that currently exist in the maths and sciences. Some believe that the gender differences are the result of the effects of socialization, others attribute the differences to the natural aptitude of males and females, and still others believe that the sex differences are due to differences in spatial ability. One theory that attempts to explain male dominance in the maths and sciences hypothesizes that males have more natural ability in math and science than do females (Benbow & Stanley, 1980). There has been some substantiating evidence to support this hypothesis as there is a reliable gender difference on standardized tests of math “aptitude” among the gifted. Benbow and Stanley (1980) for example found that gifted seventh and eighth grade males scored higher on standardized tests in math than gifted seventh and eighth grade females and concluded that males had more natural aptitude in math than the females in their sample did. However, in more normally distributed samples the evidence of such differences is much less reliable and much smaller (Eccles, 1984; Hyde, Fennema, & Lamon, 1990). Eccles, Jacobs, Harold, Suk Yoon, Arbreton and Freedman-Doan (1993) contend that Benbow and Stanley did not measure either effort or prior exposure to mathematics. Therefore they cannot rule out the possibility that the gender differences on these “aptitude” tests are due to gender differences in either experience or test taking strategies (Eccles et al., 1993; Shakeshaft, 1995).

Despite evidence presented to the contrary, it is possible that there are “real” gender differences in aptitude and females compensate by working harder than males in order to do so well. However, findings from Eccles-Parsons, Adler and Kaczala (1982) question the idea that females compensate for lower levels of aptitude with hard work. In a study of fifth through eleventh grade classrooms (53% females, 47% males) they found that there were no gender differences on either standardized tests of math aptitude or on school math grades. Furthermore, Eccles, Adler, Futterman, Goff, Kaczala, Meece and Midgley (1983) report that there is no evidence of a significant gender difference in the amount of time that males and females reported spending on their math homework and schoolwork in general.

Despite the above findings that females and males spend an equal amount of time on their homework, and that males and females perform equally well on standardized math tests, other studies have shown that parents continue to have sex-differentiated perceptions of their child’s math aptitude (Jacobs & Eccles, 1992; Yee & Eccles, 1988). Their findings in this area reveal that parents believe that their daughters have to try harder to do well in math however they do not rate their daughters as having significantly lower math abilities than their sons. This makes it unlikely that parents’ confidence in their children’s competence in this study was primarily due to either a “real” gender difference in math talent or to “real” gender differences in the amount of work the children had invested in mastering mathematics (Eccles, et al., 1993). Rather parents’ sex-differentiated perceptions of their child’s math aptitudes were likely attributed to parents’ traditional

gender-stereotypic beliefs that males have more natural math ability than females and therefore their daughters' success must be due to extra effort and not ability.

Based on the empirical evidence presented above, it appears that males and females have equal or similar mathematical aptitudes. Therefore, the current gender discrepancy with regard to math must be the result of some "other" external factors rather than simply differences in biological abilities. A study conducted by Brandon, Newton and Hammond (1987) in Hawaii supports the hypothesis that gender differences in math are the result of external factors. Their sample consisted of grades 4, 6, 8 and 10 from Hawaii's four major ethnic groups: Caucasians, Filipinos, Hawaiians and Japanese. Brandon et al. found that instead of the males outperforming females in math, the females in their study outperformed the males. This seems to indicate that the gender differences in math favoring females in this case may be the result of a cultural influence or some other external factor(s). Perhaps excelling in math in Hawaii is not particularly valued for males but it is valued for females. In any case this study exemplifies the importance of conducting further research that will shed light on the current gender differences that are typically evident in North American society.

#### Significance of the Problem

Through the examination of numerous studies conducted in the areas of the maths and sciences it has been established that there are virtually no differences between males' and females' level of ability (Eccles, 1984; Hyde, et al., 1990; Heller & Ziegler, 1996), however there continues to be a significant discrepancy in the ratio of males and females entering and completing university programs and careers in the areas of math and science

favoring males. These gender differences may be the result of a number of external and/or environmental factors rather than the result of simply differential ability. Prior research indicates that parents play a significant role in influencing their children in the areas of math and science. It has been established that parents socialize their children to value math differently, depending on whether their child is male or female (Eccles et al., 1993; Farenga & Joyce, 1999). Furthermore, it is believed that children come to value or devalue math and science as a result of their perception of their parents' beliefs, attitudes and expectations. Hence it is necessary to determine the relationship between the individual's perceptions of their parents' beliefs and their subjective task value of math and science. If it can be established that these two factors are related then researchers, teachers and other socializers can target their interventions to encourage and support females, particularly gifted females, to enter the maths and sciences.

The purpose of the current study is to provide additional evidence that supports that gender differences in the maths and sciences are partially the result of an individual's subjective task value of math and science. Secondly, this study will examine the link between the individual's subjective task value of math/science and social tasks, and the individual's perception of their parents' influence in these areas. More specifically, subjective task value will be examined in relation to particular parental characteristics that are hypothesized to predict males' and females' subjective task value of math/science. This research may indicate that the main source of positive or negative influence in achievement-related behaviors begins at home. So, rather than concentrating solely on such factors as the individual's self-concept of ability, expectation for success, affective

memories and goals, researchers, educators and counselors could focus their efforts to concentrate on the parental component and the resulting individual subjective task of math and science.

This does not discount previous models that include these factors such as the model that Eccles et al. have developed. Indeed their comprehensive model serves to explain and connect numerous factors that have been shown to influence achievement-related behaviors in males and females. These factors do, in fact, play a significant role in the development of achievement-related behaviors, however, the current study can contribute to the existing knowledge base on achievement-related behavior in the maths and sciences by examining two fundamental components; namely subjective task value and parental influence. All of the factors in Eccles' model have been shown to contribute in varying degrees to achievement in the maths and sciences, however, if a student does not value a task to begin with, then it is more than likely that the individual will not pursue or excel in that task. Furthermore, Eccles' research has confirmed the significant influence that parents have on their grade-school children's subjective task value of math and science. Previous studies have determined that parents are the most influential socializers in a child's life (McCormick & Wolf, 1993; Birk & Blimline, 1984), however, existing literature has not examined whether the parental component continues to be influential in early adulthood with regards to life-role choices. Consequently, it is essential that researchers determine the connection between an individual's perception of their parents' beliefs, attitudes and expectations and its relationship to the individual's subjective task value of math and science both in childhood, as well as in early adulthood. This study will

specifically focus on the individual's perception of parents' beliefs, attitudes and expectations and its relation to the individual's subjective task value of math and science in an early adult sample, as it is believed to be one of the primary sources that results in gender differences in the maths and sciences.

### CHAPTER III

#### REVIEW OF THE RELEVANT LITERATURE

There is an abundance of research that focuses on the parents' socialization and beliefs and how that affects their child. More specifically, areas include the parent's influence on the child's self-perceptions, actual performance, interests and their expectations for success, as well as the child's self-concept of ability. However, there is a serious gap in the current body of achievement literature in the maths and sciences regarding the effect of parents' beliefs, attitudes and expectations, and their influence on the child's subjective task value of math and science.

It has been well established in the achievement literature that the individual's perception of: their parent's beliefs, expectations and attitudes, gender roles and activity stereotypes (Parsons, Adler, & Kaczala, 1982; Philips, 1987; Jacobs, 1991; Barber & Eccles, 1992) as well as the individual's subjective task value (Hilton & Berglund, 1974; Fennema & Sherman, 1977; Armstrong & Kahl, 1978; Wise, Steel & MacDonald, 1979; Brush, 1980; Sherman, 1980) play a key role in a child's achievement attitudes and academic performance in the maths and sciences. However, subjective task value and the individual's perception of their parent's beliefs, attitudes and expectations have rarely been isolated and compared with each other.

The current study will examine the relationship between these two components to aid in clarifying the current gap in the achievement literature. These two components, subjective task value and the individual's perception of socializer's beliefs, attitudes and expectations, or parents in this case, of Eccles' model will be the focus of the current

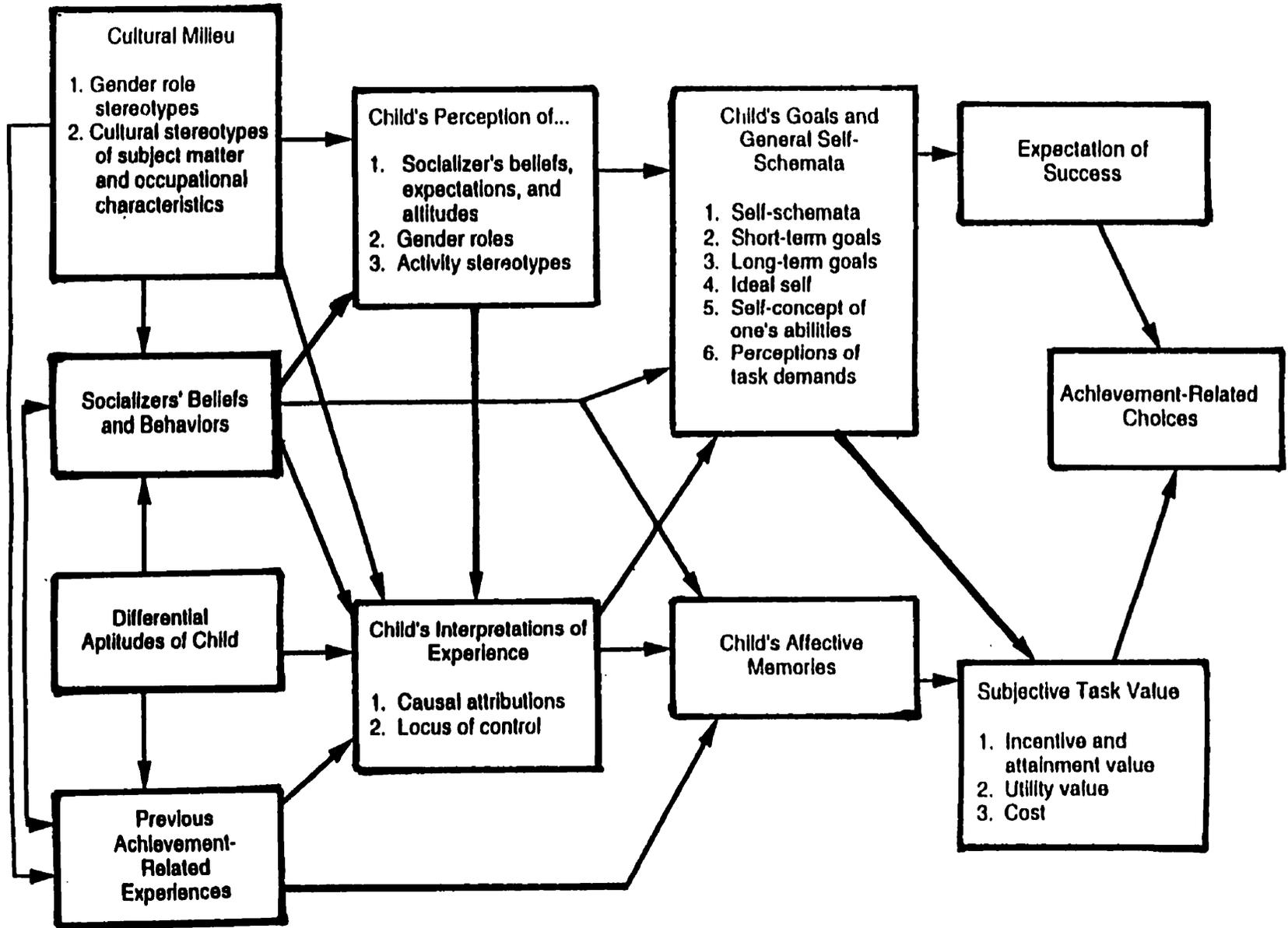
study, as a promising avenue for increasing our current understanding of the gender differences in the maths and sciences.

### Eccles' Model

In the process of determining the factors that influence an individual's motivation and achievement-related choices, Eccles and her colleagues have developed an Expectancy-Value Model to frame the factors that contribute to achievement choices in the maths and sciences (see Figure 1). The model consists of two major components: a psychological component and a developmental component. The psychological component encompasses the interrelations of the various psychological constructs at one point in time and within each individual. The developmental component is where the origins of individual differences are specified (Eccles, 1983). There are ten main components or constructs in Eccles' model that are believed to influence an individual's achievement-related choices. These components are as follows: 1) the cultural milieu, 2) the socializer's beliefs and behaviors, 3) the individual's aptitudes, temperaments and talents, 4) the individual's previous achievement-related experiences, 5) the individual's perception of: the socializer's beliefs, expectations and attitudes, gender roles and activity stereotypes, 6) the individual's interpretations of experience, 7) the individual's goals and general self-schemata, 8) the individual's expectation of success, 9) the individual's affective memories, and 10) the individual's subjective task value.

Despite the abundance of studies that have examined the components stated above, there still remains a serious gap in the literature in relating the individual's perception of their parent's beliefs, expectations and attitudes to the child's subjective task value of

# General Model of Achievement Choices



**FIGURE 1.**

math and science. Establishing this link is essential as the combined factors may contribute significantly to the gender differences typically found in the areas of maths and sciences. Therefore, the current study will focus on the following two components: 1) the individual's perception of: their parent's beliefs, expectations and attitudes, gender roles and activity stereotypes and 2) the individual's subjective task value of math and science.

By examining Eccles' model it is obvious that determining an individual's achievement-related behavior is not a simple task as there is no one causal determinant or pathway that results in success or failure in the maths and sciences. Therefore, researchers have attempted to dissect this complex issue into manageable chunks to produce a more complete picture. In doing so, there has been an abundance of studies that have contributed greatly to our understanding of achievement-related choices and motivation in the math and science domains. For instance Eccles and her colleagues have conducted extensive studies over the last 25 years on the various social and psychological factors that comprise her model. These studies have examined the numerous components of her model and focused on the role of such constructs as self-concept of ability (Eccles, Wigfield, Flanagan, Miller, Reuman & Yee, 1989; Wigfield, Eccles, Mac Iver, Reuman & Midgley, 1991; Jacobs & Eccles, 1992; Lord, Eccles & McCarthy, 1994; and Wigfield & Eccles, 1994), subjective task value (Barber & Eccles, 1992; Eccles, Wigfield, Harold & Blumenfeld, 1993; and Eccles & Wigfield, 1995), individual's perceptions of socializer's beliefs, expectations and attitudes (Parsons, Frieze & Ruble, 1976; Eccles-Parsons, Adler, & Kaczala, 1982; Eccles, 1983; Eccles, 1987; Yee & Eccles, 1988; Jacobs, 1991; Eccles, et al., 1993; Barber & Eccles, 1992) in addition to the overall interrelationship of other

social and psychological factors that impact on achievement-related decisions (Yee & Eccles, 1988; Eccles, Jacobs & Harold, 1990; Meece, Wigfield & Eccles, 1990; Buchanan, Flanagan, Fuligni, Midgley & Yee, 1991; Wigfield, & Eccles, 1992; Eccles & Harold, 1993).

Eccles and her colleagues have conducted comprehensive and ground breaking research providing valuable information regarding students ranging from early elementary to late adolescents. In addition to Eccles at al., there has been another significant researcher, Entwisle, who, along with her colleagues, has contributed greatly to our understanding of math achievement-related behavior in the elementary grade population. Entwisle and her colleagues have conducted a large number of studies on math achievement that have examined the effects of the following on achievement-related behavior in math: family composition (Seaborn Thompson, Alexander, & Entwisle, 1988; Seaborn Thompson, Entwisle, Alexander & Sundias, 1992; Entwisle & Alexander, 1996); socio-economic status and ethnicity (Entwisle & Alexander, 1992; Alexander, Entwisle & Bedinger, 1994); neighborhood resources (Entwisle, Alexander & Steffel Olsen, 1994); and maternal influence on the child's academic expectations (Baker & Entwisle, 1987). The combined research of Eccles and Entwisle and their colleagues, gives current researchers in the area of achievement-related decisions in the maths and sciences access to a substantial knowledge base of students from grade one all the way to late adolescence. Despite the copious amount of literature in this area, there remains a deficiency in the area of early adulthood. More specifically, in relation to the current study, it still isn't clear how the individual's perception of the parental influence may

impact their subjective task value into early adulthood. For instance, does the individual's perception of their parents' beliefs, attitudes and expectations carry over from childhood to adulthood? Do parents still have an impact on their children's achievement-related decisions in math and science in the young adult's life? These questions will be explored in the current study but first it is essential to review the literature regarding the impact or influence that socializers in general may have on achievement and how the individual perceives or interprets their influence.

#### Individual's Perception of Socializer's Beliefs, Expectations, and Attitudes

One of the key components identified by Eccles and her colleagues as influential in achievement-related choices is the individual's perception of socializer's beliefs, expectations and attitudes. It has been determined that teachers, counselors and parents have a significant impact on a student's actual performance (Rosenthal & Rosnow, 1969). For example, the achievement literature has documented the importance of teachers' expectations and attitudes in shaping students' self-concepts and general expectancies of success (Brookover & Erickson, 1975; Parsons, Frieze, & Ruble, 1976; Rosenthal & Rosnow, 1969; Webster & Sobicozek, 1974; Tomini & Page, 1994). During elementary school years teachers generally expect females to do better than males (Maccoby & Jacklin, 1974) however, as students progress to junior high and high school, teachers tend to have higher educational expectancies for males rather than females (Good, Sikes & Brophy, 1973; Hilton & Berglund, 1974; Sears, Maccoby & Levin, 1957). Teachers' differential treatment of male and female students in academic settings, ultimately results in gender differences in their achievement and academic performance, notably in the areas

of math and science. Research on gender differences in this area produce consistent results. Students for whom teachers have high expectations also have high expectations for themselves and in fact do better in their course work. It seems only reasonable that this effect is mediated, in part, by students' perceptions of teachers' expectations (Eccles, 1983). Eccles (1983) found that teachers' beliefs are related to students' expectancies and plans and that the students' expectancies and plans were related most directly to their self-concepts of math abilities and to their perceptions of teachers' beliefs about their math aptitudes and potentials.

As is the case with teachers, counselors have also been shown to be influential in students' achievement-related decisions. Research has indicated that counselors are a significant source of information that the majority of students turn to for academic and career advice. For example, Johnson, Stewart and Eberly (1991) conducted a study examining the impact of the school counselor on students' college choices. Results from this study indicated that counsellors do have a significant impact on students' choices. In the top nine information sources that students reported as influential in their decision to attend a particular college, counsellors ranked in the top three, along with friends and other college students. Unfortunately, research conducted with counselors has also indicated that counselors often show biases against students' nontraditional occupational choices (Haring, Beyard-Tyler & Gray, 1983; Hopkins-Best, 1987). For instance, in a study conducted by Sauter, Seidl, and Karbon (1984), they found that counsellors discouraged high school students, both males and females, from entering nontraditional careers and encouraged students to pursue gender-appropriate, traditional careers.

Furthermore, in a study by Tomini and Page (1992) results indicated that of the two hundred, first-year undergraduate students in their sample, only 4% of males and 21% of females reported that a nontraditional choice had been encouraged. Haring, Beyard-Tyler and Gray (1983) had similar findings that indicated that counselor bias is still prevalent, especially in male counsellors, towards individuals choosing nontraditional careers.

Furthermore, counsellors in their sample were not only biased in their attitudes towards women pursuing nontraditional careers but they were particularly biased in their attitudes towards men pursuing nontraditional careers.

Despite the evidence presented above, overall research results in this area are equivocal and it appears that counsellors may not have as much influence as teachers and parents do regarding students' achievement and career-related decisions. For example, in the Tomini and Page (1992) study students reported that, generally speaking, counsellors had little or no influence on their career decisions. Alden and Seiferth (1979) found similar results in their sample of 1,470 students, as when students were asked to rank order the people who had the most influence on their career choice, parents were ranked as the most influential, followed by friends, teachers, counsellors and siblings. On the other hand, in a study of female graduate students, Reis (1995) found that the influence of elementary and high school teachers, and school counsellors, played a pivotal, positive role in students' decisions to pursue advanced education.

In sum, research has shown that the beliefs, expectations and attitudes of such significant socializers as teachers, counselors and parents, all appear to influence students' achievement-related behaviors (Leung, 1990). However, the literature does appear to

indicate that parents are the most influential socializer in a child's life (Curry, et al., 1994), therefore research on the influence of parents will be discussed in the following section.

### Individual's Perception of Parents' Beliefs, Attitudes and Expectations

The achievement literature has established the importance of parents' expectations, attitudes and beliefs in shaping their children's self-concepts, expectancies for success, academic performance and achievement attitudes (Brookover & Erickson, 1975; Parsons, et al., 1976; Rosenthal, & Rosnow, 1969; Webster & Sobicozek, 1974; Birk & Blimline, 1984). In fact, parents' beliefs about their children's abilities has been found to have an even greater influence on children's achievement attitudes than does the child's previous performance (Eccles-Parsons, Adler, & Kaczala, 1982; Philips, 1987), or the beliefs of teachers, peers and counselors regarding the child's abilities. The powerful effect that parents have on their children's achievement-related behaviors is reasonable as parents are the dominant and primary attachment figures in a child's life, subsequently, parents seem to have the most control and effect on their child's behavior (Curry et al., 1994). Hence, parents who have high expectations for their children, in turn have children with high expectations of themselves. The flip side of this coin is that parents who have lower expectations for their children, generally have children who have lower expectations for themselves.

Eccles' model is based on the assumption that parents' views of their children's competencies in various activities are influenced by several social factors in addition to the child's actual performance level in each activity domain (Eccles et al., 1993). For example, parents are inevitably influenced by cultural norms, gender-role beliefs, and gender-role

stereotypes. However, exactly how parents influence their children is not as easily determined as parents affect their children in many subtle, as well as, direct ways. Parents convey their expectations, attitudes and beliefs to their children through nonverbal messages, through their beliefs of appropriate male and female roles, by encouraging their children to excel in specific subject areas and by promoting their child's participation in particular sports or activities. For example, Hill and Lynch (1983) found that parents of daughters were more likely than parents of sons to expect that their daughter become involved in social activities when she reached junior high school. In general, it appears that parents influence their children's achievement-related behaviors in two ways: 1) through their roles as models, and 2) as value and expectancy socializers (Eccles, 1983). These two areas will be discussed below.

#### Parents as Role Models

The importance of adult behavior as a standard or model for children's behavior has been established by experimental research. The effects of role models in math achievement has received some attention in the literature. For example, Greene and Stitt-Gohdes (1997) found that positive role models working in non-traditional careers were important to woman's career choices both in demonstrating acceptable patterns of behaviour, and in providing support for their individualistic choices. Furthermore, Sandberg et al. (1987) found that women who seek employment in male-dominated careers were more likely to have had mothers who had worked throughout their daughters' schooling versus mothers who had never worked. The absence of appropriate

female role models in math has been suggested as one potential reason for the underrepresentation of females in math courses (Eccles, 1983).

Indeed one of the general ways in which parents influence their child's achievement behaviors is through their roles as models (Green & Stitt-Gohdes, 1997). Parents are important models who exhibit behaviors that children come to imitate and later adopt as part of their own behavioral repertoires. If mothers exhibit different behavior patterns than do fathers, then, it has been argued, females and males will acquire sex-differentiated behavioral patterns (Eccles, 1983). For instance, Dickens and Cornell (1993) hypothesized that females exhibit more math avoidance and have lower math expectancies than do males because mothers are more likely than fathers to exhibit math-avoidance behaviors. Fathers, on the other hand, have been shown to have a more positive attitude toward math and a more positive self-concept regarding their math abilities than do mothers.

In support, a study conducted by Wallace, Haines and Cannon (1999) of engineering students and the factors that influence their decision to major in engineering, indicates that not only parents, but other relatives (in the engineering profession) also play a significant role in influencing students' academic and career decisions in the maths and sciences. In fact, 51% of the students in the Wallace et al. study had either a parent or other relative in the engineering profession. This study indicates that family members in general play a very important part in influencing students' achievement-related decisions in relation to the pursuit of engineering. Furthermore, this study provides evidence that

supports the critical influence that significant others in an individual's surroundings have on their life-role choices in general.

Despite the influence that parents may have as role models on their child's achievement-related behavior, parents seem to have an even greater impact on their children through their role as value and expectancy socializers which will be discussed in the following section.

### Parents as Value and Expectancy Socializers

The second general way that parents influence their children's achievement behaviors is through their transmission of values and expectancies. Parental expectancies have been linked to both high achievement motivation and high achievement behavior (Crandall, 1969; Winterbottom, 1958). Moreover parents' expressed beliefs about either the math abilities or the value of math for their children has also been shown to be an important factor in children's achievement-related behaviors (Eccles-Parsons, Adler, & Kaczala, 1982). Research revealed that children's course plans, future expectancies, current performance, and perceptions of the importance and value of math were highly correlated to their parents' beliefs and expectancies, and to the parents' actual estimates of the children's abilities. It is less clear, however, as to how parents convey their values and expectancies to their children.

Eccles and her colleagues (1983) report that parents convey their expectations of their child in a number of ways. They found that parents convey their expectations for their child by giving messages concerning their beliefs about the child's abilities and that the messages differ depending on the sex of the child. Although parents did not rate their

daughters' math abilities significantly lower than their sons', they did think that math was more difficult for their daughters and that their daughters had to work harder to do well in math. Parents thought advanced math was more important for males than females and had sex-differentiated perceptions of their children's math abilities, despite the similarity of actual performance of their sons and daughters (Eccles, 1983). In this study, the beliefs that parents held regarding the amount of effort their children had to exert to do well and their beliefs about the importance of the activity for their children were the critical mediators of sex-differentiated self-concepts of math abilities and math expectancies (Eccles, 1983).

Contrary to the earlier findings of Eccles (1983), Yee and Eccles (1988) have shown that parents did believe that gender differences in math talent exist. Specifically, parents in Yee and Eccles' study believed that males had more math ability than females. More recently, Eccles et al. (1993) conducted a study where mothers were asked to imagine a time when their child did very well in mathematics, sports and reading and then rate on a 7-point Likert scale, the importance of the following six possible causes in determining this successful experience: natural talent, effort, task ease, teacher help, parent help and current skill level. The results of this study indicated that parents were more likely to attribute their child's success to natural talent in math and sports if their child was a male and that they were more likely to attribute their child's success to natural talent in English if their child was a female.

Up to this point the literature reveals that parents, as a whole, are the most influential socializers in relation to their child's achievement-related behavior and career

decisions. Nevertheless, it appears that mothers have an even greater influence on their child's beliefs and attitudes than do fathers, teachers, peers or counselors (Eccles, 1983). Therefore, research on maternal influence and maternal employment, are presented in the following sections.

### Maternal Influence

It has been established that the mother's perception of the child's abilities affects the child's interest in specific subjects as well as their estimate of their ability in these subjects (Eccles et al., 1993). Furthermore, Meisel (1983) found that the best predictors of science persistence, in a sample of women, were scores on the Scholastic Aptitude Test-Mathematics (SAT-M), mothers' involvement in students' science interests, and students' confidence in their technical abilities. Buchanan, Eccles, Flanagan, Midgley, Feldlaufer and Harold (1990) report that mothers have a more enhanced influence on their children in that they play a more central socialization role with their children than do fathers. For example, fathers tend to play a more instrumental function, focusing on issues of performance and being enlisted into communication over personal matters only when special advice is needed. Mothers, on the other hand, tend to fulfill both instrumental and expressive functions in the family system as they are more aware of and responsible for the everyday details of adolescent life. For example, mothers are more likely to monitor their adolescent's behavior, acting both as confidants and disciplinarians. Thus, mothers may be more aware than fathers of the "troubles" their adolescent children are having.

### Maternal Employment

Studies in the achievement literature that focus on the role that mothers play in influencing their children suggest that there may not only be differences between mothers and fathers but also differences between various “types” of mothers. For instance, there is evidence that suggests that employed mothers may affect their children differently than stay-at-home mothers or “unemployed” mothers through the different expectations, beliefs and attitudes that they convey to their children. Sandberg, Ehrhardt, Mellins, Ince and Meyer-Bahlburg (1987) conducted a study that explored whether maternal employment versus maternal unemployment had an affect on career choices that middle-class daughters made. More specifically Sandberg et al. were interested in comparing daughters who entered male-dominated careers versus daughters who entered more traditionally female-dominated careers. The study indicated that females aspiring to male-dominated careers had mothers who worked throughout their daughters’ schooling versus mothers who had never worked. On the basis of this study it appears that employed mothers held different beliefs or expectations, perhaps more egalitarian values, while unemployed mothers seem to hold more traditional values. Along these lines, Shapiro and Crowley (1982) found that daughters with mothers working in nontraditional jobs are significantly more likely to aspire to similar jobs.

However, Barber and Eccles (1992) found that it was not only important that females had close female role models who worked, but also that these female role models were satisfied with their jobs. Brooks (1984) has suggested that females need the following two kinds of role models when considering different career options: women in

nontraditional occupations, and women successfully integrating family and work. Moreover, females whose mothers do not express expectations that daughters marry, or who expect their daughters to delay marriage, may be more likely to consider nontraditional careers because they would not anticipate having to allocate as much time to domestic roles. Because male-dominated occupations frequently demand greater time commitment, females who do not anticipate integrating family and work roles may be more likely to aspire to nontraditional careers (Eccles, 1987). However Sandberg et al. (1987), also found that females/women aspiring to male-dominated careers were more often persistent tomboys, had higher IQs, and had parents with higher educational attainment. Adolescent females who aspired to male-dominated careers also had higher educational aspirations and were less likely to anticipate being married within ten years than females who aspired to female-dominated careers (i.e., teacher, secretary, nurse). In adolescence, paternal education was the only variable that showed the same relation to career choice.

Despite the overwhelming evidence that points to the significant role that parents play in their children's achievement-related behaviors, few studies have tested for sex differences in perceived parental expectations in relation to the subjective task value of math and science. Therefore the present study will examine this area to augment the current literature base.

In addition to the influence that parents have as role models, and value and expectancy socializers, Eccles' model points to activity stereotypes as another significant

factor influencing children's achievement-related behavior in the maths and sciences and therefore will be discussed below.

### Activity Stereotypes

It is commonly accepted that socializers and parents in particular, encourage children, based on the sex of the child, to engage in sex-stereotyped activities. As a result of such differential encouragement males and females play with very different toys from a young age. It is believed that activity stereotypes may play a role in creating the gender differences in the maths and sciences that currently exist.

For example, research has shown that males may have more opportunities to develop spatial abilities and receive more exposure to math concepts than females due to their experience with such "masculine" toys as large blocks, big wheels and other math-related activities (Connor, Schackman & Serbin, 1978). Exposure to such activities may potentially teach males important math concepts and spatial relations which females are more likely not to be exposed to. Females, on the other hand, are more likely to play with "feminine" toys like dolls, for instance, which do not provide the same experience or stimulation which math games or blocks provide males. In support, Astin (1974) found that parents of females were less likely to buy mathematics-related toys and games compared with parents of males.

In addition, Lupart (1999) reported that males had more access to, more use of, and more experience with computers in comparison to female peers in grades 11 and 12. One reason that Silverman and Pritchard (1993) propose for the low participation rates of females in the computer field is that females are discouraged from taking computer

courses by their peers, and peers' beliefs regarding gender-appropriate careers.

Furthermore, computers seem to have become stereotyped as a masculine activity, and therefore, results in the perception that employment and careers in the computer field industry are traditionally male occupations.

Due to their low participation rates in the computer field, females are at a disadvantage as they are missing out on the necessary skills and knowledge to succeed in academic settings as well as in future job opportunities. As a result of such skill deficits, the disproportionate ratio of females to males becomes even more apparent in computer education at the university level, just as is evidenced in the areas of maths and sciences.

The research described in this section confirms that it is not accurate to say that males and females with the same formal mathematical training have had equivalent math education. Because the promotion of such gender stereotypic activities begins at such an early age, it is difficult to factor out these experiences in order to compare their effects on the sex differences that have emerged in the maths and sciences.

### Subjective Task Value

Despite the large body of gender and achievement literature in the maths and sciences, gaps still remain. The subjective task value of math/science, for example, has been for the most part neglected as a significant predictor of achievement in the maths and sciences in the literature even though there is sufficient evidence to warrant further exploration of this area. Values are key components to understanding achievement-related behavior and yet they are often overlooked in studies of gender differences while

efficacy/ability self-concepts are overemphasized. It is not a question of whether females can do math but rather it may matter significantly how much they value math.

Theorists with a broader, more individualistic concept of task value (Crandall, Katkovsky, & Preston, 1962; Parsons & Goff, 1978, 1980; Raynor, 1974; Spenner & Featherman, 1978), than for example Atkinson (1964) who defines task value based on such objective task characteristics as the value an individual attaches to success or failure on a task, believe that the value of the task is determined both by the characteristics of the task and by the needs, goals and values of the person. The degree to which the task is able to fulfill needs, facilitate reaching goals, or affirm personal values determines the value a person attaches to engaging in that task. The question becomes, what makes children believe that they are good at a particular activity? For example, how does a male or female decide that they are proficient in math? Does a child who is mathematically adept automatically value math, or are there other social factors that contribute and/or determine an individual's high, or low, subjective task value of math? As evidenced in the above questions, it is extremely difficult to dissect and compartmentalize this complicated issue into a neat formula or equation that states that if a child has high math ability plus a supportive parent then this will equal a child with high subjective task value of math.

In the current study subjective task value, a core construct of the Eccles model, will be examined. However, as with any construct it is necessary to first describe what Eccles et al. have determined constitutes subjective task value as a whole. Therefore, elaborating on previous work, Eccles et al. (1983) suggest that the overall value of any specific task is a function of three major components: 1) incentive and attainment value, 2)

utility value, and 3) cost. These three elements will be examined collectively in the present study, however, they will be briefly discussed below to give the reader a sense of what constitutes subjective task value.

### Incentive and Attainment Value

The incentive and attainment value can be described as the importance an individual places on high performance on a particular task. For instance, Eccles (1983) provides the following example to illustrate this concept: a student who sees herself as smart and regards a particular course (e.g., advanced math) as both intellectually challenging and “the” course for smart students to take. Therefore, the attainment value of the advanced math course in this case should be high as elevated performance in it would confirm a crucial element of her self-concept.

Eccles hypothesized that females, in general, would perceive math as less important to their future plans than males and as being a “masculine” activity and therefore incongruent with feminine roles. In support of this hypothesis, Eccles (1983) found that decisions regarding course enrollment in high school are influenced by adolescents’ confidence in their math ability and by the value they attach to math.

### Utility Value

Eccles (1983) states that utility value, the second major component comprising subjective task value, “is determined by the importance of the task for some future goal that might be somewhat unrelated to the process nature of the task at hand” (p.89). For example, in order to gain admittance to a particular program an individual may be required to take specific math or science requirements. Thus, the individual may be required to take

these courses as part of a program or course of study even though she may have little or no interest in the courses themselves.

In the literature specifically relevant to mathematics participation, there is evidence to support the influence of utility value on course selection. Several researchers, for example, have reported that students' perceptions of the usefulness of mathematics are strongly related to their intentions to continue or discontinue their mathematical studies (e.g., Armstrong & Kahl, 1978; Brush, 1980; Fennema & Sherman, 1977; Sherman, 1980). Males, as early as seventh and eighth grade, are more likely than females to perceive math as important to future career goals (Dornbusch, 1974; Fennema & Sherman, 1977, 1978; Fox, 1975; Hilton & Berglund, 1974; Wise et al., 1979). And in fact, these differences are actualized as is evidenced in the disproportionate number of males, compared to females, in math and science related post-secondary programs and occupations, reinforcing the belief that math is more important for males' future career goals than females'.

This prior research emphasizes the importance of the current research in determining influential factors that young adults, particularly those gifted in the maths and sciences, perceived, in retrospective, as crucial to their decisions to pursue math and science oriented academic goals. Such research would provide parents, educators and counselors with information to create early intervention programs and strategies that may counter females' apparent negative value of math and science and enable them to see the utility of math and science in their post-secondary studies and consequently their career choices.

## Cost

The third major component that comprises subjective task value, according to Eccles et al., is called the cost of engaging in a particular task. Eccles and her colleagues see the cost of a task in a cost/benefit ratio. Basically, the individual subconsciously or consciously weighs the positives and negatives of an activity prior to actively engaging in it. There are three variables that influence the cost of an activity, 1) the amount of effort needed to succeed, 2) the time lost that could have been spent engaging in other valued activities, and 3) the psychological meaning of failure (Eccles, 1983). Simply put, children spend more time engaged in activities that they think they are good at, and that they enjoy and value. Since there is a limited amount of time and energy to be expended, individuals will likely pursue the tasks they value most. Even though this makes intuitive sense, little research currently exists in this area.

In conclusion, the current study hopes to provide some clarity to this area regarding the individual's perception of their parents' beliefs, attitudes and expectations and particular parental characteristics, and their relationship with the child's subjective task value of math/science using Eccles' model as the theoretical framework guiding this investigation.

Eccles et al.'s (1983) model incorporates gender differences in the value that males and females place on mathematics. With regards to the current study, it is hypothesized that the individual's general subjective task value of math/science will be related to specific parental characteristics. For instance, a child whose mother is employed and has some

formal educational background may be more likely to value math/science than a child whose mother is a homemaker and who has no formal educational background.

### Summary

As the previous literature review suggests, there are currently some significant gaps in the math and science achievement literature that the present study intends to address. The three major gaps in the literature that will be the focus of this study are as follows: 1) subjective task value for math and science, 2) effect of parents' beliefs, attitudes and expectations and their influence on the child's subjective task value of math and science, and 3) the lack of research focusing on the early adult population. These three areas will be briefly elaborated on below.

Subjective task value in general has been overlooked as a significant predictor of achievement behavior in the maths and sciences despite the empirical evidence that has indicated that it plays a key role in the manifestation of gender differences in the maths and sciences. Secondly, few studies have tested for sex differences in perceived parental expectations for achievement in mathematics and science and the effect on their child's subjective task value. Thirdly, there is a glaring paucity of studies that have been conducted with early adults in the areas of math and science while there continues to be an abundance of research conducted with elementary and early to late adolescent samples. Of particular relevance to the current study, is the belief that there is a gap in the literature as to how the individual's perception of the parental influence may impact their subjective task value in early adulthood. One of the general purposes of the current study is to determine whether parents still have the same significant impact on their child's

achievement-related decisions in the areas of math and science in early adulthood as they do in childhood. It is possible that parents are not as influential in early adulthood as they are in childhood. Early adults may tend to be significantly more influenced by other socializers such as spouses or partners, peers or post-secondary educators (i.e., professors). It may be that as children enter early adulthood they spend less and less time with their parents and more time with other socializers who have a greater impact on them at this stage of life.

To close these gaps, the current study will focus on the following two components of Eccles' model: 1) the individual's perception of: their parents' beliefs, expectations and attitudes, gender roles and activity stereotypes and 2) the individual's subjective task value of math and science. More specifically, this study will examine particular parental characteristics such as mother/father occupational status, mother/father educational attainment and perceived mother/father affective relationship, in relation to the child's subjective task value to determine the impact that the individual's perception of their parents' beliefs, attitudes and expectations have on the early adult's subjective task value of math and science.

## CHAPTER IV

### METHOD

#### Background

The sample in the present study consisted of one hundred and seventeen Shad Valley program participants and applicants. The Shad Valley program, established in 1981, is a university-based summer program designed for students in grades 11 and 12 to promote excellence in science, technology and entrepreneurship. Each summer, eight Canadian universities host a total of approximately 400 of the top male and female students in Canada due to their demonstrated talents in Science (i.e., Chemistry, Math, Biology, and Physics). Despite the seemingly large number of students admitted into the Shad program, not every student who applies to the Shad Valley program is accepted due to the limited amount of placements. All applicant files, however, have been retained since the program's inception in 1981 and stored at the Shad International headquarters in Waterloo, Ontario. Therefore, the subjects in the current study consisted of an approximately equal number of applicants and participants. Applicants were defined as students who had applied to the Shad Valley program but whose applications were unsuccessful. Participants were defined as students who had applied to the Shad Valley program and were accepted. Since this factor was not relevant to the present study it was not included in the data analysis, however, an attempt was made to locate equal numbers of male and female subjects for the present study.

The current study is based upon data from stage two of a much larger three-part Social Sciences and Humanities Research Council of Canada (SSHRC) funded study of

female and male achievement in the math/science domains. The three stages of the SSHRC study were as follows: 1) a content analysis of 600 randomly selected Shad Valley application forms, 2) in-depth questionnaires completed by former Shad Valley participants and their cohorts, and 3) in-depth telephone interviews of former Shad participants and their cohorts (Lupart & Barva, 1998). These three stages will be briefly described below.

Data obtained as part of the application process has been gathered on Shad Valley participants and applicants since the program's inception in 1981 through to 1995. Therefore, in stage one, the primary activity entailed an in-depth analysis of the application forms for both males and females since the origin of the Shad Valley program in 1981. The sample for this component of the study consisted of 600 randomly selected male and female student application forms from a pool of approximately 7000. However, rather than analyzing the archived data year by year, the years from 1981 to 1995 were collapsed into three blocks of time to aid in the statistical analysis of the data. The three time blocks were based on the point when subjects initially submitted their application forms to Shad Valley and then, the researchers subsequently tracked stage two research participants back to these original applications. Hence, all 600 students were categorized into these three time blocks, resulting in 100 male and 100 female students in each time block.

The three time blocks were as follows: 1) 1981-1985, 2) 1986-1990, and 3) 1991-1995. This data was analyzed to determine personal and educational factors pertaining to high achievement, and to analyze differences between males and females on selected

variables. The analysis of the year one data was carried out on the basis of two comparative groups: 1) Male and Female, and 2) Shad Participants and Applicants.

In both stages two and three the research focus was on the investigation of specific factors (i.e., aptitudes, abilities, perception of needs, role identity, and the input of significant others) that influence achievement-related decisions using Eccles' achievement motivation model (1985, 1987). In this phase of the study, an adapted questionnaire was developed based on the previous work of Eccles and her colleagues, and grounded in the stage one analysis (described above) of the data collected from the application forms of male and female students. Age-related adjustments were also made to the adapted questionnaire. The questionnaire, The University of Michigan Study of Adolescent Life Transitions [adapted] (See Appendix A), was included as part of a survey package sent to approximately 180 of the subjects selected from stage one, who could be tracked to their current address. The survey package also included two other instruments, The Values Scale (See Appendix B) and The Salience Inventory (See Appendix C) which were not analyzed in the current study. An invitational letter describing the study (See Appendix D), consent forms (See Appendix E), an endorsement letter from the vice-president of Shad Valley (See Appendix F), deadline dates to return the questionnaire and self-addressed, stamped envelopes were included in the package. The data collection from the questionnaires took place between July and December of 1997.

In stage three, sixty in-depth interviews, based on Eccles' model, along with relevant factors that emerged from the year one data analysis as well as on the stage 2 questionnaire data, were conducted over the telephone. The data gathered from the

telephone interviews was tape recorded and transcribed. Data analysis is currently being carried out for stages two and three.

### Overview of Current Study

Applicants were encouraged by teachers and school counselors to apply to the Shad Valley program due to their demonstrated talents and achievements in the sciences and maths which is directly relevant to the current study. Male and females who are obviously gifted in the maths and sciences provide researchers with the opportunity to understand and examine the factors that have been key to their success. More specifically, individuals with high ability in the sciences can shed light on the relationship between the parental influence and their current subjective task value of math and science which is the focus of the current study.

### Participants

Subjects were traced retrospectively from the following three time blocks: 1) 1981-1985, 2) 1986-1990, and 3) 1991-1995. Once subjects were successfully traced, they were invited to participate in the second stage of the study by completing the adapted questionnaire and/or the in-depth telephone interview.

This process resulted in the following: forty-six subjects (21 males, 25 females) were traced from the 1981-1985 pool. Subjects in this pool ranged in age from 29.1 to 33.8 years old as of July 1998. Thirty-three subjects (17 males, 16 females) were traced from the 1986-1990 pool. Subjects ranged from 24.4 to 29.0 years of age as of July 1998. In the last time block, thirty-eight subjects (13 males, 25 females) were traced from the

1991-1995 pool. The subjects in this pool ranged from 19.6 to 24.3 years of age as of July 1998.

#### Research Instrument - Eccles et al.'s Scales

Eccles and her colleagues have designed a questionnaire called the University of Michigan Study of Life Transitions, for the purposes of their Michigan Study of Adolescent Life Transition (MSLT). This study is a 15 year longitudinal study of approximately 1,000 adolescents from southeast Michigan (Eccles, 1994). The main focus of this project is to study adolescent psychosocial development across three stages of life: 1) transition from middle school to junior high, 2) transition from junior high through to high school, and 3) transition from high school to post-secondary/college. Eccles and her colleagues are currently involved with stage three of the work. These three stages of life have been examined by Eccles and her colleagues in relation to the impact on the following domains: adolescent's academic achievement, motivation, expectancy-value cognition, self-concept, activity preferences and participation, identity formation, gender roles, mental health, occupational, family planning and parenting. The results of this study, so far, have indicated further support for the predicted relation between personal values, subjective task values, and occupational choices (Eccles, 1994), as well as demonstrated strong support of the validity of the Eccles MSLT questionnaire.

Guided by the results available and the phases presented above, the instrument administered in this study was an adapted questionnaire of Eccles' University of Michigan Study of Life Transitions (MSLT) as Eccles' MSLT questionnaire. The most recent questionnaire available from the Eccles research project, at that time, was designed to be

administered to younger populations and the present study targets an older sample of 19 to 34 year olds. The adapted instrument, Study of Life Transitions (Lupart, Boberg, Smyth, 1997) (See Appendix A), takes approximately 45 minutes for subjects to complete and taps very similar areas that Eccles and her colleagues have examined. The primary change in the adapted version was to eliminate questions irrelevant to the subject age group and/or the specific research interests of Lupart, Boberg and Smyth, and to focus more extensively on the adult life-role achievement motivation factors.

Information has been gathered in the present study through the analysis of the subjects' responses to the adapted questionnaire regarding such constructs as subjective task value, self-concept of ability, the influence of socializers, expectation of success, gender roles, activity stereotypes, individual's goals, in addition to obtaining demographic information about the subjects. Described below are the constructs specifically relevant to the present study, they include: mother's and father's employment, mother's and father's educational level, gender of the subject, the individual's subjective task value of math/science and social tasks, and the individual's perception of their relationship with their mother and their father.

Categorical data regarding the subject's mother's and father's employment, mother's and father's educational level, and the gender of the subject, were obtained through the demographic section of the adapted questionnaire. The complete list of demographic items that were examined and analyzed in the present study can be found in Appendix G.

In the current study the individual's subjective task value of math/science and social tasks, and the individual's perception of their relationship with their mother and their father, were of particular interest. Therefore, more detail of the process in defining and operationalizing these constructs is provided below.

To examine the constructs of the individual's subjective task value of math/science and social tasks, specific items from the MSLT questionnaire that Eccles has determined to comprise the subjective task value of math/science as well as social tasks were utilized. The break-down of these constructs and the specific items that were included in the present study's analysis are provided in Appendix G.

The construct, individual's perception of their relationship with their mother and their father, however, was not specifically defined by Eccles and her colleagues, therefore it was constructed by collapsing three separate MSLT constructs related to the parental relationship. The new construct was then labeled, "relationship with mother/father", and consisted of a total of 8 individual items. These 8 items are listed in Appendix G. Table 1 presents the Cronbach Alpha reliabilities for these 2 new constructs. As Table 1 suggests, the "relationship with father" construct has very high internal consistency (.91) and the "relationship with mother" construct has high internal consistency (.84).

In addition, Table 1 displays the Cronbach's Alpha reliability analysis that was completed on all of the Eccles' (1983) scales that were used in the present study. As Table 1 suggests, all eight of the alpha values in the current study have moderate to very high internal consistencies (i.e., .72 to .91), and are comparable to those reported by Eccles.

Table 1  
**Cronbach Alpha Reliabilities: Eccles et al.'s (1983) Scales**

Scale	Cronbach's Alpha (Current Study)	Cronbach's Alpha (Eccles Study)
STV: Math/Science	.86	.78
STV: Social Tasks	.81	.81
*Discuss Future With Mother	.77	.88
*Affective Relationship With Mother	.72	.82
*Desire to be Like Mother	.84	.91
**Discuss Future With Father	.78	.92
**Affective Relationship With Father	.75	.86
**Desire to be Like Father	.91	.93
Relationship with Father	.91	—
Relationship with Mother	.84	—

STV: Subjective Task Value

\* Collapsed three MSLT constructs that comprise the "relationship with mother" variable

\*\* Collapsed three MSLT constructs that comprise the "relationship with father" variable

## Data Analyses

### Research Questions and Analyses

**1a. Do females have a different subjective task value of math/science than males?**

**1b. Do females have a different subjective task value of social tasks than males?**

In the analysis of the current study, the mean subjective task value of math/science scores for males and the mean of the subjective task value of math/science scores for females were calculated. In addition, the mean subjective task value of social tasks for males' and females' scores were calculated. The means were examined to determine if a gender difference existed. An independent 2 sample t-test was conducted to explore gender differences among the two sets of constructs. Whether there was a gender difference present or not, the means were compared with the corresponding parental characteristics to examine the correlation between these two variables.

**2. Does the mother's employment effect the subjective task value of math/science and/or social tasks of females and males? If so, are there differences between the effect that mother's employment has on males versus females?**

Two 2-way analyses of variance (ANOVA) with 2 independent variables, 1) maternal employment (employed, unemployed) and 2) sex (male, female), and 1 dependent variable (subjective task value of math/science or subjective task value of social tasks) were used to determine whether there were differences between groups. Mother's employment was divided into two categories: 1) unemployed, defined as mothers who were homemakers, and 2) employed, mothers who worked outside the home. (For fathers, there was only one category, employed, as all fathers in the sample worked therefore, an

analysis was not conducted regarding fathers and employment). The two-way ANOVAs were followed by testing for interactions between employment and gender to determine if there were significant gender differences between the effect that the mother's employment had on males versus females.

**3a. Does the mother's level of education effect the individual's subjective task value of math/science and/or social tasks? If so, are there differences between the effect that the mother's level of education has on males versus females?**

**3b. Does the father's level of education affect the individual's subjective task value of math/science and/or social tasks? If so, are there differences between the effect that the father's level of education has on males versus females?**

Four 2-way ANOVAs with 2 independent variables, 1) parental education level (education of mother, or education of father) and 2) sex (male, female), and 1 dependent variable (subjective task value of math/science or subjective task value of social tasks) were used to determine whether there were differences between groups. Mothers' and fathers' educational level was divided into two categories: 1) those who had attained high school or less, and 2) those who had attained some post secondary schooling. Following the two-way ANOVAs, testing for interactions between education and gender were conducted to determine whether there were significant gender differences.

**4a. Does the individual's perception of their relationship with their mother affect their subjective task value of math/science and social tasks? If so, are there differences between the effect that the relationship with their mother has on males versus females?**

**4b. Does the individual's perception of their relationship with their father effect their subjective task value of math/science and social tasks? If so, are there differences between the effect that the relationship with their father has on males versus females?**

First, a multiple linear regression was conducted to explore the relationship between subjective task value of math/science and social tasks, and the child's perception of their overall affective relationship with their mother and with their father. The backwards, multiple regression was calculated with 2 independent variables, 1) relationship with parent (mother or father) and 2) sex (male, female), and one dependent variable (subjective task value of math/science or subjective task value of social tasks). Secondly, Beta values were calculated to determine if there were differences between the effect that their relationship with their mother and father has on males versus females for both math/science and social task.

## CHAPTER V

### RESULTS

Analysis of the adapted questionnaire provided general information regarding gender differences and the individual's subjective task value of math/science and social tasks. The questionnaire analysis also yielded information on the effect of the following on the individual's subjective task value of math/science and social tasks: mother's employment, education level of both mothers and fathers, and the individual's perception of their relationship with their mother and father. The analysis and interpretation of these factors is reported in detail below.

#### Research Questions and Analyses

**1a. Do females have a different subjective task value of math/science than males?**

**1b. Do females have a different subjective task value of social tasks than males?**

The means for the individual's subjective task value of math/science and social tasks for males, and for females were calculated and examined to determine if a gender difference existed. The mean subjective task value of math/science was 10.24 (SD = 2.7) for males and 9.47 (SD = 3.1) for females. The mean subjective task value of social tasks was 15.22 (SD = 3.5) for males and 16.47 (SD = 3.1) for females.

An independent sample t-test was conducted to explore gender differences among the subjective task value of math/science and social tasks. An independent sample t-test revealed that males and females did not significantly differ in their subjective task value of math/science ( $t(115) = -1.397, p = 0.165$ ) however, there was a significant difference

favoring females over males and their subjective task value of social tasks ( $t(115) = 2.046, p < 0.05$ ).

As indicated in the results, males and females did not significantly differ in their subjective task value of math/science. This outcome was initially somewhat surprising as it is contrary to the research findings in this area and it was hypothesized that there would be a gender difference with regards to the value of math/science. In that, it was predicted that males in the sample would have a higher subjective task value of math/science than females. However, the sample in the current study consisted of a select group of all high achieving males and females in the maths/sciences who are more likely to have a high task value of math and science than non-gifted samples.

With regards to the subjective task value of social tasks, females had a significantly higher subjective task value of social tasks than did the males in the current sample. These results were consistent with the predicted outcome.

**2. Does the mother's employment affect the subjective task value of math/science and/or social tasks of females and males? If so, are there differences between the effect that mother's employment has on males versus females?**

As described, a two-way ANOVA was performed on the individual's subjective task value of math/science using the two levels of gender and the two levels of mother's employment. There was no significant mother's employment by gender effect ( $F(1, 112) = 1.958, p = 0.165$ ), mother effect ( $F(1, 112) = 0.095, p = 0.758$ ), or gender effect ( $F(1, 112) = 3.616, p = 0.060$ ).

A two-way ANOVA was also performed on the individual's subjective task value of social tasks. No significant differences were found on the mother's employment by gender effect ( $F(1, 112) = 0.299, p = 0.585$ ), the employment of mother effect ( $F(1, 112) = 0.364, p = 0.548$ ), or the gender effect ( $F(1, 112) = 0.987, p = 0.323$ ). Table 2 presents the means and standard deviations of maternal employment with subjective task value of math/science and social tasks as the dependent variables.

It was hypothesized that maternal employment would result in females in particular, having a higher subjective task value of math/science, and females with unemployed mothers would be more likely to have daughters with a higher subjective task value of social tasks. Despite this hypothesis that maternal employment (or unemployment) would have an effect on females' subjective task value of math/science and social tasks, this was not the case. The results of the present study indicated that mother's employment (employed or unemployed) did not effect the subjective task value of math/science or social tasks.

Table 2

**Means and Standard Deviations of Maternal Employment with Subjective Task Value of Math/Science and Social Tasks as Dependent Variables**

Variable	<u>Employed</u>		<u>Unemployed</u>	
	Male	Female	Male	Female
*STV_M/S	9.9(SD=2.9)	9.5(SD=3.2)	11.3(SD=1.7)	8.7(SD=2.1)
**STV_S	15.2(SD=3.6)	16.6(SD=3.1)	15.2(SD=3.4)	15.6(SD=3.4)

\*STV\_M/S = subjective task value of math/science

\*\*STV\_S = subjective task value of social tasks

**3a. Does the mother's level of education affect the individual's subjective task value of math/science and/or social tasks? If so, are there differences between the affect that the mother's level of education has on males versus females?**

A two-way ANOVA was performed on the individual's subjective task value of math/science using the two levels of gender and the two levels of mother's education. There was no significant mother's education by gender effect ( $F(1, 111) = 0.082, p = 0.775$ ), mother education effect ( $F(1, 111) = 0.262, p = 0.610$ ) or gender effect ( $F(1, 111) = 1.590, p = 0.210$ ).

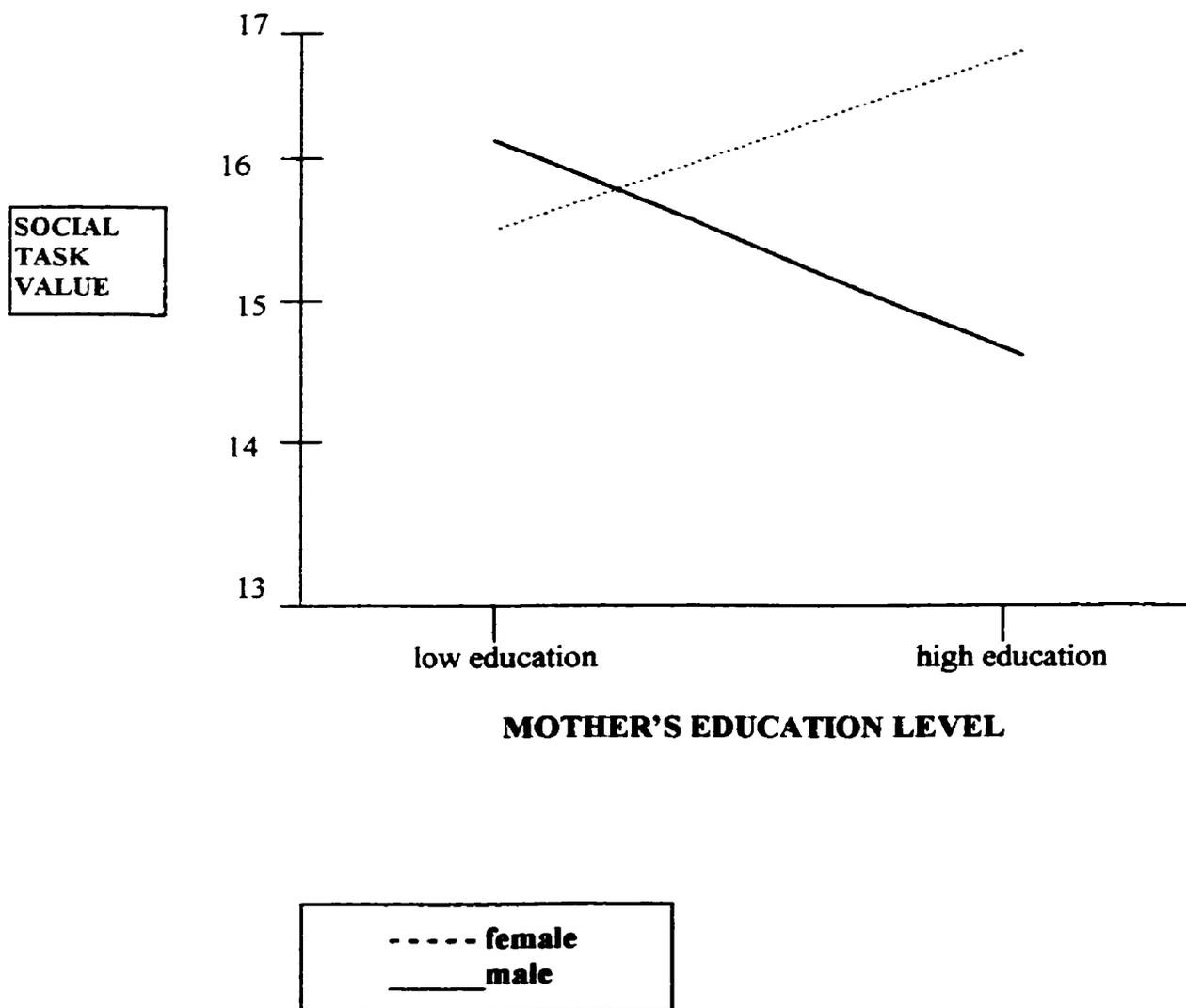
A two-way ANOVA was also conducted, as above, on the individual's subjective task value of social tasks. For mothers, there was a significant mother's education by gender effect ( $F(1, 111) = 4.089, p < .05$ ). Specifically, as indicated in Figure 2 females with mothers of higher educational attainment had higher subjective task value of social tasks, in comparison to females with mothers of lower educational attainment. Males, on the other hand, showed the opposite trend as males with highly educated mothers had a lower subjective task value of social tasks, whereas males with mothers of lower educational attainment had a higher subjective task value. However, there was no significant main effect for mother's education ( $F(1, 111) = 0.003, p = 0.957$ ) or gender ( $F(1, 111) = 0.977, p = 0.325$ ). Table 3 presents the means and standard deviations of mother's education level with subjective task value of math/science and social tasks as the dependent variables.

The total number of high achieving females in the current sample was 66. Of these 66 females, 18 females had mothers with an education level of high school or less, and 48 females had mothers with an education level of some college background.

The total number of high achieving males in the current sample was 51. Of these 51 males, 15 males had mothers with an education level of high school or less, 34 males had mothers with an education level of some college background, and two males did not specify their mother's educational level and therefore were not included in this analysis.

The results of the present study indicate that the mother's level of education (high school or less, or some college) did not effect either males' or females' subjective task value of math/science. It was predicted that mothers with some college education would have a positive impact on their daughter's subjective task value of math/science, while mothers with a high school education or less would have daughters with a less positive task value of math/science. However, it appears that in the current study, it was irrelevant whether mother's educational level consisted of high school or less, or some college education. Further interpretation of these findings is provided in the Maternal and Paternal Education Level section in the General Discussion.

Figure 2  
Effect of Mother's Education Level on the Subjective Task Value of Social Tasks for Males and Females



**3b. Does the father's level of education affect the individual's subjective task value of math/science and/or social tasks? If so, are there differences between the affect that the father's level of education has on males versus females?**

A two-way ANOVA was performed on the individual's subjective task value of math/science and the two levels of father's education. There was no significant father's education by gender effect ( $F(1, 111) = 0.007, p = 0.935$ ), father education effect ( $F(1, 111) = 2.983, p = 0.087$ ) or gender effect ( $F(1, 111) = 1.510, p = 0.222$ ).

A two-way ANOVA was also conducted, as above, on the individual's subjective task value of social tasks. For fathers, there was no significant father's education by gender effect ( $F(1, 111) = 0.746, p = 0.390$ ), father education effect ( $F(1, 111) = 0.403, p = 0.527$ ), or gender effect ( $F(1, 111) = 2.047, p = 0.155$ ). Table 4 presents the means and standard deviations of father's education level with subjective task value of math/science and social tasks as the dependent variables.

The total number of high achieving females in the current sample was 66. Of these 66 males, 18 females had fathers with an education level of high school or less, and 48 females had fathers with an education level of some college background.

The total number of high achieving males in the current sample was 51. Of these 51 males, 15 males had fathers with an education level of high school or less, 34 males had fathers with an education level of some college background, and two males did not specify their father's educational level and therefore were not included in this analysis.

Results indicated that father's level of education also did not have a significant effect on males' or females' subjective task value of math/science or social tasks. This

analysis was exploratory in nature as there is presently a lack of research focusing on fathers in general. Therefore, father's education was examined to compare this variable to mother's education and to accumulate a data base for future research directions.

Table 3

**Means and Standard Deviations of Mother's Education Level with Subjective Task Value of Math/Science and Social Tasks as Dependent Variables**

Variable	<u>High School and Less</u>		<u>Some college</u>	
	Male	Female	Male	Female
*STV_M/S	10.1(SD=3.0)	9.1(SD=3.0)	10.2(SD=2.7)	9.6(SD=3.2)
**STV_S	16.2(SD=3.5)	15.5(SD=3.5)	14.8(SD=3.5)	16.8(SD=2.9)

\*STV\_M/S = subjective task value of math/science

\*\*STV\_S = subjective task value of social tasks

Table 4

**Means and Standard Deviations of Father's Education Level with Subjective Task Value of Math/Science and Social Tasks as Dependent Variables**

Variable	<u>High School and Less</u>		<u>Some college</u>	
	Male	Female	Male	Female
*STV_M/S	9.5(SD=2.9)	8.7(SD=3.0)	10.5(SD=2.7)	9.8(SD=3.1)
**STV_S	15.3(SD=4.0)	15.7(SD=3.5)	15.2(SD=3.3)	16.8(SD=3.0)

\*STV\_M/S = subjective task value of math/science

\*\*STV\_S = subjective task value of social tasks

**4a. Does the individual's perception of their relationship with their mother effect their subjective task value of math/science and social tasks? If so, are there differences between the effect that the relationship with their mother has on males versus females?**

As described, a multiple linear regression was conducted to explore the relationship between subjective task value of math/science and social tasks, and the child's perception of their overall affective relationship with their mother.

Controlling for gender effects, the individual's relationship with their mother was not a significant predictor of the individual's subjective task value of math/science ( $B = 1.946$ ,  $SE(B) = 0.035$ ,  $t = 0.554$ ,  $p = 0.581$ ), however, the relationship with their mother was a significant predictor of the individual's subjective task value of social tasks ( $B = 8.180$ ,  $SE(B) = 0.039$ ,  $t = 2.118$ ,  $p < 0.05$ ). Therefore, the better the relationship with their mother, the higher the individual's subjective task value of social tasks.

Once the regression analysis was conducted, Beta values were calculated to determine differences between the effect that the relationship with their mother had on males versus females. For the subjective task value of math/science, Beta values indicated that males scored 11.51% higher than females.

Beta values were also calculated to determine differences between the effect that the relationship with their mother had on males versus females. For the subjective task value of social tasks, Beta values indicated that females scored 14.4% higher than males.

Results indicated that the individual's perception of their relationship with their mother was not a significant predictor of their subjective task value of math/science,

however, the perceived relationship with their mother was a significant predictor of the subjective task value of social tasks. Therefore, the closer the individual's perceived relationship with their mother, the higher the individual's subjective task value of social tasks but not of math/science tasks.

Furthermore, there were differences between the effect that the relationship with their mothers had on males versus females, as males scored 11.51% higher than females on their subjective task value of math /science, and females scored 14.4% higher than males on social tasks. These trends are consistent with the previous literature showing greater subjective task value for males in the maths/sciences, and for females in social tasks.

**4b. Does the individual's perception of their relationship with their father effect their subjective task value of math/science and social tasks? If so, are there differences between the effect that the relationship with their father has on males versus females?**

A multiple linear regression was also conducted to explore the relationship between subjective task value of math/science and social tasks, and the child's perception of their overall affective relationship with their father.

Controlling for gender effects, the individual's relationship with their father was a significant predictor of both the individual's subjective task value of math/science ( $B = 0.05616$ ,  $SE (B) = 0.025$ ,  $t = 2.251$ ,  $p < 0.05$ ) and the individual's subjective task value of social tasks ( $B = 8.691$ ,  $SE (B) = 0.027$ ,  $t = 3.175$ ,  $p < 0.05$ ).

Again, once the regression analysis was conducted, Beta values were calculated to determine differences between the effect that the relationship with their father had on

males versus females. For the subjective task value of math/science, Beta values indicated that males scored 12.24% higher than females.

Beta values were also calculated to determine differences between the effect that the relationship with their father had on males versus females for the subjective task value of social tasks. Beta values indicated that females scored 16.77% higher than males on their subjective task value of social tasks.

Results indicated that the individual's perception of their relationship with their father was a significant predictor of both the individual's subjective task value of math/science, as well as the individual's subjective task value of social tasks. This indicates that the closer the child (male or female) perceives their relationship with their father to be, the higher their subjective task value of math/science and social tasks will be.

Furthermore, there were differences between the effect that the relationship with their father had on males versus females similar to those described above regarding the effect that the perceived relationship with their mother had. In the subjective task value of math/science, males scored 12.24% higher than females, while females scored 16.77% higher than males in their subjective task value of social tasks.

These results differ from the proposed influence that fathers were suspected to have, as fathers have tended to play a more instrumental function in their child's life while mothers, on the other hand, tended to play a more central role in the child's life. Thus, in the current study, the individual's perception of their relationship with their mothers, rather than fathers, was expected to have a greater impact on the individual's subjective task value of math/science.

Table 5

**Multiple Regression of the Independent Variables with Subjective Task Value of Social Tasks as the Dependent Variable**

Model	Multiple R	R Square	Adjusted R Square
1	.270	.073	.057
2	.358	.128	.112

Model 1 = independent variables, relationship with mother, sex

Model 2 = independent variables, relationship with father, sex

Table 6

**Multiple Regression of the Independent Variables with Subjective Task Value of Math/Science as the Dependent Variable**

Model	Multiple R	R Square	Adjusted R Square
1	.135	.018	.001
2	.238	.057	.040

Model 1 = independent variables, relationship with mother, sex

Model 2 = independent variables, relationship with father, sex

## CHAPTER VII

### DISCUSSION AND IMPLICATIONS

This research study investigated the contribution of five variables: mother's employment, mother's education level, father's education level, relationship with mother and relationship with father, to female and male subjective task value of math/science and social tasks. This section is a general discussion of the study's findings. The subsequent sections in this chapter discuss the educational implications of the current study, followed by a discussion of the study's limitations and future research directions.

#### General Discussion

The current study explored the parental influence on gifted men's and women's subjective task value of math and science. Due to the nature of the study, only subjective task value of math and science, and not subjective task value of social tasks, will be addressed in the general discussion section of this thesis. This section is organized so that each of the major variables examined in this research are discussed separately. The sections will be as follows: gender differences in the subjective task value of maths and sciences, influence of specific parental characteristics and the individual's perception of their relationship with their mother and father. Following this, educational implications, study limitations, and future research directions will be discussed.

#### Gender Differences in the Subjective Task Value of Math/Science

The conceptual definition of subjective task value is defined as the value of the task determined both by the characteristics of the task and by the needs, goals and values of the person. The degree to which the task is able to fulfill needs, facilitate reaching

goals, or affirm personal values determines the value a person attaches to engaging in that task (Eccles, 1983). In light of this definition, perhaps it is not at all surprising that there were no gender differences in the subjective task value of math/science. In that it would seem likely that both males and females who have demonstrated giftedness in the maths and sciences would have a very high subjective task value of math and science, and therefore seek opportunities to validate this belief about themselves.

Another possible explanation for the absence of a gender difference in math/science value in the current study may be attributed to the fact that applicants applying to the Shad Valley program were actively seeking out extra-curricular activities in the areas of math and science, thereby demonstrating their high subjective task value of math and science. It is feasible that the males and females with relatively equal, high ability in math and science would be the individuals who seek opportunities to use and improve their current knowledge and talent in math and science. Therefore, these differences would not be apparent in studies such as this one where subjects are intending on participating in programs specifically designed for gifted math and science students.

There is evidence that may explain why the males and females in the current sample did not have significantly different subjective task values of math/science. For instance, Alfeld-Liro and Eccles (1997) found no gender differences among gifted females and males in terms of self-perceptions of math ability, expectations for success, and value of math. Although typical gender differences were found in their nongifted population, these findings do suggest the possibility that circumstances for gifted females may have changed. Furthermore, it seems that gifted females who pursue academics and careers in

math and science had inordinately high math and science values. For example, in Wallace et al.'s (1999) study, findings indicated that although male and female students reported that their favorite subjects in high school were: mathematics, physics and chemistry, female students reported that mathematics was by far their favorite subject compared to other subjects, while for many male students mathematics or physics was their favorite subject. So it seems that gifted females in these areas have an extremely high task value of math and science, perhaps this is due to the fact that in order to succeed in the maths and sciences, females have to compete with the predominantly male population who may not be particularly welcoming to members of the opposite sex.

In addition to examining the overall gender differences in the maths and sciences, the influence of specific parental characteristics thought to be relevant to individuals' subjective task value of math and science were also analyzed. The discussion and interpretation of these results is presented in the next section.

#### Influence of Specific Parental Characteristics

It was hypothesized that in addition to the influence of the parental relationship, there would be specific parental characteristics that would significantly contribute to the individual's math and science task value. The parental characteristics examined in the current study were maternal employment and parental education level, these factors will be discussed below.

#### **Maternal Employment**

The findings in the current study regarding maternal employment are not consistent with the current achievement literature as mothers have been consistently cited as the most

influential socializer in their children's life over fathers, teachers, peers and counsellors. Furthermore, specifically related to maternal employment, studies that focus on the role that mothers play in influencing their children's task values suggest that employed mothers may affect their children differently than stay-at-home mothers or "unemployed" mothers through the different expectations, beliefs and attitudes that they convey to their children. Sandberg et al. (1987) found that females aspiring to male-dominated careers had mothers who worked throughout their daughters' schooling, in contrast to mothers who had never worked. In the Sandberg study it appears that employed mothers held different beliefs or expectations, perhaps more egalitarian values, while unemployed mothers seem to hold more traditional values. In similar findings, Schwartz (1980) found that women in non-traditional careers had been influenced by mothers who had been employed outside the home and/or had had non-traditional careers.

The outcome in this study that maternal employment did not affect daughter's task value of math and science may be due to the possibility that the employed mothers in the sample were not satisfied with their occupations. This explanation is consistent with recent research in this area, for instance, Barber and Eccles (1992) found that it was not only important that females had close female role models who worked, but also that these female role models were satisfied with their jobs. Nevertheless, it not likely that all mothers, or even the majority of mothers in the current sample, were dissatisfied with their employment status, however, this is one possibility. Unfortunately, data is not available to examine this possibility in the present study to determine the link between mother's occupational satisfaction with their daughter's subjective task value of math and science.

In addition to maternal employment, maternal and paternal educational level was examined due to its potentiality in significantly impacting gifted females' task value of math and science. The impact that parental education level had on the current sample is elaborated on below.

### **Maternal and Paternal Education Level**

An analysis of the parental education levels of mothers and fathers was conducted more as an exploratory search to determine the impact it may have had on the individual's subjective task value in the areas of math and science. Despite its exploratory nature, this analysis was grounded in prior research findings that found that education level did seem to impact individual's task value of math and science. For example, in the Wallace et al. (1998) study, the majority of engineering students in their sample had parents with a university background. Furthermore, Sandberg et al. (1987), found that females/women aspiring to male-dominated careers had parents with higher educational attainment. Therefore, it would seem that fathers and mothers with higher educational levels (i.e., university or college) would be more likely to have daughters who pursued academics and careers in the maths and sciences.

Contrary to such previous research findings as described above, neither maternal nor paternal educational level had a significant impact on their individual's subjective task value of math and science. These results may be indicative of the diminishing influence that parents have on their children as they enter early adulthood. Perhaps, the educational level of parents is primarily influential in elementary or secondary school but as adolescents approach post-secondary schooling and early adulthood, the impact of the parent influence

decreases. Furthermore, the case may be that other significant socializers in the early adult's life become more crucial at this stage. Examples of significant socializers are peers, particularly those who are pursuing studies in math and science programs and eventually careers, and teachers, especially those who provide support and positive encouragement to early adults. Despite such possibilities, findings in the present study provide evidence suggesting that fathers have a significant influence on their individual's value of math and science, however, there were interesting findings regarding mothers that will be discussed in the following section.

#### Individual's Perception of Their Relationship with Their Mother and with Their Father

Previous research indicates that parents, as a whole, are the most influential socializers in relation to their child's achievement-related behavior and career decisions. Moreover, it appears that mothers have an even greater influence on their child's beliefs and attitudes than do fathers, teachers, peers or counselors (Eccles, 1983). It has been established that the mother's perception of their child's abilities affects the child's interest in specific subjects as well as their estimate of their ability in these subjects (Eccles et al., 1993). It has been shown that mothers have a more enhanced influence on their children because they play a more central socialization role with their children than do fathers (Buchanan et al., 1990).

In contrast to the research presented above indicating the strong influence that mothers have on their child's achievement-related behaviors in the maths and sciences, this trend was not apparent in the present study. The individual's perceived relationship with their mothers in this study was not a significant predictor of either males' or females'

subjective task value of math and science. However, the most striking and surprising result of the current study was the strong impact that fathers had on their children's achievement-related behavior in the maths and sciences. The present results suggest that the role that fathers play has been generally underestimated. In support of this notion, Schwartz (1980) found evidence that gifted women frequently had fathers who were supportive of their efforts to fulfill their potential. This is particularly relevant to math and science, as fathers' perceptions and expectations have been found to be quite influential in determining their daughters' self-perceptions of math ability (Philips, 1987; Dickens, 1990). In a more recent study conducted by Wallace et al. (1999) results indicated that, in comparison to mothers and other relatives, more students reported that their fathers had a positive influence on their decision to major in engineering.

Perhaps the results of more recent studies are indicative of the changing role that fathers play in their influence on their children, particularly with regards to gifted females. As in the findings presented here, the closer the perception of the relationship with their fathers, the more influential fathers were in predicting males' and females' subjective task value of math and science. Furthermore, the results of this study indicate that fathers influenced their daughters more than they influenced their sons. In short, fathers appear to be increasingly more influential in their children's achievement-related behaviors in general, and their children's subjective task value of math and science. The current research indicates that if fathers are supportive and encouraging of their daughters than the result tended to be that their daughters had a higher subjective task value of math and science.

In light of the results and discussion presented above, there are a number of educational implications that warrant discussion below.

### Educational Implications

There are two main educational implications that are relevant to the current study's findings. First and foremost, the acknowledgment of the influential impact that fathers have on their children's task value of math and science is required. The findings of the current study, along with some limited past research, indicate that fathers are an important resource that could be accessed in encouraging and supporting gifted females to enter academic programs, as well as careers, in the maths and sciences. Therefore, creating awareness amongst fathers regarding their vital impact on their daughter's achievement-related behaviors in the maths and sciences is essential. If fathers are aware of their influence on their daughters they be more inclined to play an active role in ensuring that young females receive the benefit of their encouragement and support that is necessary to succeed in these areas. In sum, fathers can be instrumental in ensuring that their daughters keep their academic and career options open, in addition to countering the current gender-stereotypes that exist in the maths and sciences by helping their daughters make the connections between the skills acquired in school, and future careers and adult life-role fulfillment.

The second educational implication of this study is the necessity to foster career awareness programs that use parents, in general, as explicit occupational models. In doing so, this would encourage children to find out what their parents do. Particularly beneficial aspects of such programs involve children bringing their parents into their schools to

report on their occupations as well as, encouraging parents to bring their own and others' children with them to work. These programs allow gifted students, and females in particular, to see firsthand the number of potential future occupations that are available to them. Gifted females need to see multiple role models who are successful in their careers, particularly those in math and science careers, rather than only seeing a limited picture of their opportunities.

### Study Limitations

In the current study there were a number of limitations that were difficult to avoid and that require discussion. The following section discusses the implications of these limitations in regards to the present research.

One limitation of the current study was that it was not possible to consider socioeconomic status (SES) in the data analysis. Originally, the SES of the individuals in this research was intended to be included in the statistical analysis however, as a result of ambiguity in subject reporting of personal income versus parental income, it was decided to exclude this as a predictor variable. In future research it would be interesting to explore this variable, specifically whether individuals from lower SES backgrounds differ from those from higher or middle-class backgrounds in their value of math and science. Furthermore, are individuals from particular SES backgrounds more likely than others to enter careers in science and math? Do parents at these various SES levels exhibit differential influences in the individual's ultimate task value of math and science? Examining questions such as those mentioned above, may provide additional information regarding the current gender differences that exist in the maths and sciences.

Another limitation of this study was that ethnicity was not examined due to similar problems with question ambiguity described above. Detailed information regarding ethnicity was obtained through the questionnaire however, many subjects considered themselves to be belonging to two or more ethnic groups such as German and Scottish, or Chinese, English and Canadian. Therefore, subjects could not be easily categorized as belonging to one particular ethnic group or another. Consequently, the result of eliminating ethnicity as a predictor variable leaves the question as to whether there may be differences between various ethnic groups with regards to achievement and individual's value of math and science remains unanswered.

Despite the number of subjects that specified that they considered themselves to belong to various ethnic groups, the sample in the current study was comprised primarily of White middle-class individuals. Thus this made the current study much like the majority of other studies conducted in this area, which lack the investigation of diversity in achievement-related behaviors in the maths and sciences.

#### Future Research Directions

One particularly interesting finding in the current study suggests that the role that fathers play in influencing their child's achievement-related decisions, particularly in the areas of math and science, requires further investigation. The results of this research indicate that perhaps the significance of the role that fathers play in influencing both their sons and daughters in the areas of math and science has been overlooked while the role of mothers has been overemphasized. However, this is not to suggest that mothers are not influential in their child's academic and career decisions as there is an abundance of

research that indicates that this is not the case. Furthermore, research presented in the literature review of this investigation reveals that parents as a whole are the most influential socializers in their child's life. It is possible, nonetheless, that a shift has emerged where fathers have become more influential than previously believed in their child's academic and career decisions, therefore further research is required to confirm whether the father's influence continues to impact their children in the areas of math and science.

Another area requiring further investigation is the influence that parents have on the achievement-related behaviors of their children as they enter early adulthood. The population in the current study consisted of subjects in early adulthood and, as evidenced in the results, parents did not appear to be influential in the predicted direction. That is, it appeared that parents did not have as much influence on their children as predicted by the present body of achievement literature. It is possible that some of the surprising results in the current study were due to the subjects entering a different phase in their lives where parents have less influence, while spouses, partners, peers and/or other important socializers have a more significant impact on the individual's achievement behaviors. The literature investigating early adults and their achievement patterns is relatively small in comparison to the literature focusing on elementary and secondary student populations. Therefore, future research is necessary to understand the decisions and choices that early adults make in the areas of math and science.

### Conclusions and Summary

In conclusion, the purpose of the present research was to examine key parental factors that contribute to high achievement in the maths and sciences by gifted males and females. The results of the current research confirm the notion that parents continue to be a particularly influential socializing agent regarding their child's achievement-related behaviors in the maths and sciences. Therefore, parents need to understand the key position they are in to effect the changes needed regarding gifted females and their presence in the maths and sciences. Parents influence their children through a number of avenues such as, modeling and basic proximity to child, by providing math-related activities at home for both males and females, and by discussing career opportunities with their children that do not imply gender-typed stereotypes (i.e., gender role conditioning). Hence, parents, and perhaps mothers especially, need to be aware of their own biases and open the lines of communication to their daughters by discussing with them the family-career conflicts that may arise in their future as well as the many opportunities and challenging careers that are available to them. Only through the active support and encouragement of parents can gifted females fully realize their vast potential.

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**APPENDIX A*****Study of Life  
Transitions******(Lupart, Boberg, Smyth)******Book 1******(Adapted from the  
University of Michigan  
Study of Life Transitions)******1997***

What is your date of birth? Month \_\_\_\_ Day \_\_\_\_ Year \_\_\_\_

Are you a \_\_\_\_ Male \_\_\_\_ Female

Some people consider themselves members of an ethnic group. To which ethnic or cultural group(s) do you belong? (Mark or specify as many as applicable.)

- |                                    |                                                            |
|------------------------------------|------------------------------------------------------------|
| <input type="checkbox"/> French    | <input type="checkbox"/> Dutch (Netherlands)               |
| <input type="checkbox"/> English   | <input type="checkbox"/> Jewish                            |
| <input type="checkbox"/> German    | <input type="checkbox"/> Polish                            |
| <input type="checkbox"/> Scottish  | <input type="checkbox"/> Black                             |
| <input type="checkbox"/> Italian   | <input type="checkbox"/> North American Indian             |
| <input type="checkbox"/> Irish     | <input type="checkbox"/> Métis                             |
| <input type="checkbox"/> Ukrainian | <input type="checkbox"/> Inuit / Eskimo                    |
| <input type="checkbox"/> Chinese   | <input type="checkbox"/> Other ethnic or cultural group(s) |
- (Please specify) \_\_\_\_\_

What is your current marital status?

- |                                                |                                    |
|------------------------------------------------|------------------------------------|
| <input type="checkbox"/> Married               | <input type="checkbox"/> Divorced  |
| <input type="checkbox"/> Engaged to be married | <input type="checkbox"/> Separated |
| <input type="checkbox"/> Living with partner   | <input type="checkbox"/> Other     |
| <input type="checkbox"/> Single                | (Please specify) _____             |

How long has this been your living arrangement?

- |                                             |                                          |                                           |
|---------------------------------------------|------------------------------------------|-------------------------------------------|
| <input type="checkbox"/> Less than 6 months | <input type="checkbox"/> 2.1 to 3 years  | <input type="checkbox"/> 10.1 to 15 years |
| <input type="checkbox"/> 6 months to 1 year | <input type="checkbox"/> 3.1 to 5 years  | <input type="checkbox"/> Over 15 years    |
| <input type="checkbox"/> 1.1 to 2 years     | <input type="checkbox"/> 5.1 to 10 years |                                           |

Do you have any children? \_\_\_\_ yes \_\_\_\_ no

IF YES, how many biological/adopted children do you have?

\_\_\_\_ # girls (Age of girl(s): \_\_\_\_, \_\_\_\_)

\_\_\_\_ # boys (Age of boy(s): \_\_\_\_, \_\_\_\_)

IF YES, how many step children do you have?

\_\_\_\_ # girls (Age of girl(s): \_\_\_\_, \_\_\_\_)

\_\_\_\_ # boys (Age of boy(s): \_\_\_\_, \_\_\_\_)

**What was your total family income before taxes in calendar year 1996?**

- |                                              |                                                |
|----------------------------------------------|------------------------------------------------|
| <input type="checkbox"/> below \$10,000      | <input type="checkbox"/> \$75,000 - \$99,999   |
| <input type="checkbox"/> \$10,000 - \$24,999 | <input type="checkbox"/> \$100,000 - \$149,999 |
| <input type="checkbox"/> \$25,000 - \$49,999 | <input type="checkbox"/> \$150,000 - \$199,999 |
| <input type="checkbox"/> \$50,000 - \$74,999 | <input type="checkbox"/> \$200,000 and over    |

**During most of LAST YEAR (1996/1997), where did you live?**

(Check one)

- |                                                            |                                                 |
|------------------------------------------------------------|-------------------------------------------------|
| <input type="checkbox"/> parents' home or apartment        | <input type="checkbox"/> other relative's home  |
| <input type="checkbox"/> your own house                    | <input type="checkbox"/> an apartment           |
| <input type="checkbox"/> university fraternity or sorority | <input type="checkbox"/> rented room            |
| <input type="checkbox"/> university dorm/residence hall    | <input type="checkbox"/> other (please specify) |
|                                                            | _____                                           |

**IF YOU ARE LIVING WITH YOUR PARENT(S), in how many months OR years do you expect to move out of your parent's house?**

\_\_\_\_\_ Months (if more than 12 months----> \_\_\_\_\_ Years)

**(NOW, SKIP TO QUESTION A)**

=====

**IF YOU HAVE ALREADY MOVED OUT OF YOUR PARENT(S) HOME, PLEASE ANSWER THE FOLLOWING SET OF QUESTIONS.**

(Circle one number for each question)

**1. How likely is it that you could return to live with your parent(s)?**

Very unlikely							Very likely
1	2	3	4	5	6	7	

**2. How comfortable would you be moving back in with your parent(s)?**

Very uncomfortable							Very comfortable
1	2	3	4	5	6	7	

Approximately how many days did you spend time with your FATHER during the past 12 months?

\_\_\_\_\_ days

Would you like to see your father

A lot  
less

the same

A lot  
more

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

In a typical month, how many times do you talk to your FATHER on the phone?

\_\_\_\_\_ # of times

---

---

C. Are your mother and father: (Check one)

\_\_\_\_\_ Married and living together

\_\_\_\_\_ Never married and living together

\_\_\_\_\_ Divorced

\_\_\_\_\_ Never married and not living together

\_\_\_\_\_ Separated

\_\_\_\_\_ Widowed

How long has this been their living arrangement?

\_\_\_\_\_ Less than 6 months

\_\_\_\_\_ 2.1 to 3 years

\_\_\_\_\_ 10.1 to 15 years

\_\_\_\_\_ 6 months to 1 year

\_\_\_\_\_ 3.1 to 5 years

\_\_\_\_\_ Over 15 years

\_\_\_\_\_ 1.1 to 2 years

\_\_\_\_\_ 5.1 to 10 years

---

---

**How much have you thought about this choice?**

A little A lot  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

**How successful do you think you could be in this kind of job?**

Not Very Very  
successful successful  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

**How likely do you think it is that you will actually end up in the job you most want to have 10 years from now?**

Very Very  
unlikely likely  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

**If you think you may not get the job you want most, what type of job do you think you will actually have 10 years from now?**

\_\_\_\_\_

**E. JOBS**

**NOW WE WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT DIFFERENT KINDS OF JOBS.**

**How well do you think you would do in each of the following types of jobs: (Please write a number on the line next to each item).**

I would not do I would do I would do  
well at all average very well  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

- \_\_\_\_\_ Full-time homemaker
- \_\_\_\_\_ Child care/day care worker
- \_\_\_\_\_ Personal service (like cosmetologist, masseuse, tailor, or chef)
- \_\_\_\_\_ Transportation (like taxi-cab, bus, or truck driver)
- \_\_\_\_\_ Factory (like assembly line worker, welder)

	Not at all good			About average			Very good
help other people a lot.....	1	2	3	4	5	6	7
be creative.....	1	2	3	4	5	6	7
take care of young children .....	1	2	3	4	5	6	7
teach older children .....	1	2	3	4	5	6	7
be a leader.....	1	2	3	4	5	6	7

**THE FOLLOWING IS A LIST OF THINGS THAT SOME PEOPLE DO ON THEIR JOBS. USING THE SCALE BELOW, PLEASE WRITE A NUMBER ON THE LINE NEXT TO EACH ITEM.**

Very uncomfortable							Very comfortable
	1	2	3	4	5	6	7

**How comfortable or uncomfortable do you think you would be...**

- \_\_\_\_\_ Telling people what to do or giving people orders
- \_\_\_\_\_ Firing someone
- \_\_\_\_\_ Having responsibility for others
- \_\_\_\_\_ Reprimanding an employee for poor performance
- \_\_\_\_\_ Asking for a raise or promotion
- \_\_\_\_\_ Working with children
- \_\_\_\_\_ Taking care of people who need your help
- \_\_\_\_\_ Helping people solve their problems
- \_\_\_\_\_ Being responsible for the well-being of others

**DIFFERENT PEOPLE MAY LOOK FOR DIFFERENT THINGS IN THEIR WORK. USING THE SCALE BELOW, PLEASE WRITE A NUMBER ON THE LINE NEXT TO EACH ITEM.**

Not at all important							Very important
	1	2	3	4	5	6	7

F. SELF

Now we would like to ask you some questions about you.  
 Compared to other people, how good are you at each of the following skills and abilities. (Circle a number)

	A lot worse than other people					A lot better than other people	
Supervising others.....	1	2	3	4	5	6	7
Repairing mechanical equipment..	1	2	3	4	5	6	7
Taking care of children.....	1	2	3	4	5	6	7
Being a leader .....	1	2	3	4	5	6	7
Logical, analytic thinking.....	1	2	3	4	5	6	7
Intelligence.....	1	2	3	4	5	6	7
Listening to and understanding others .....	1	2	3	4	5	6	7
Teaching and explaining to others.....	1	2	3	4	5	6	7
Helping others solve their problems .....	1	2	3	4	5	6	7
Artistic creativity .....	1	2	3	4	5	6	7
Musical ability.....	1	2	3	4	5	6	7
Independence.....	1	2	3	4	5	6	7
Self-confidence.....	1	2	3	4	5	6	7
Decisiveness.....	1	2	3	4	5	6	7
Doing advanced math.....	1	2	3	4	5	6	7
Doing physical science .....	1	2	3	4	5	6	7
Doing things that require a lot of writing.....	1	2	3	4	5	6	7
Interacting with other people .....	1	2	3	4	5	6	7

**USING THE FOLLOWING SCALE, WRITE A NUMBER ON EACH LINE.**

Strongly  
disagree

Strongly  
agree

1                      2                      3                      4                      5                      6                      7

**What is your opinion about the roles of men and women in this society?**

- \_\_\_ In general, men are more reliable on the job than women.
- \_\_\_ A man's relationship with his wife suffers when he puts a great deal of energy into his career.
- \_\_\_ In general, men are naturally more competitive than women.
- \_\_\_ It is usually better for everyone involved if the man is the achiever outside the home and the woman takes care of the home and family.
- \_\_\_ It bothers me to see a man being told what to do by a woman.
- \_\_\_ When a woman gets married, she should make sacrifices in her career for her husband's career.
- \_\_\_ Men are naturally better than women at mechanical things.
- \_\_\_ Women give up more than men when they get married.
- \_\_\_ A wife's relationship with her husband is better if she doesn't place too much importance on her job.
- \_\_\_ It bothers me when a woman acts like a man.
- \_\_\_ A man is less likely to marry a woman who plans to devote a good deal of energy to her career.
- \_\_\_ Men are naturally better at advanced math than women.
- \_\_\_ A guy will lose respect if he talks about his problems.
- \_\_\_ If someone's career needs to suffer for the good of the family, it should be the wife's and not the husband's.
- \_\_\_ The best that a man can do for his family is to be successful in his career.
- \_\_\_ A husband should be willing to relocate if his wife gets a better job offer in another city.
- \_\_\_ Having a demanding career takes away from a woman's relationship with her husband.
- \_\_\_ Women get more out of being married than men do.
- \_\_\_ Men would be better off if they focused less on their work and more on their family.
- \_\_\_ If a husband and wife both work full-time, the husband should do half of the housework and child care.
- \_\_\_ A mother has to make more sacrifices in her career than a father does.

- Children from divorced families can be just as well adjusted and successful as children from two parent families.
- Having a close intimate relationship with only one partner is too restrictive for the average person.
- A woman's career suffers more than a man's when a couple has children.
- Being married is the most important part of a person's life.
- Children raised by single-parent families can do just as well as children raised by two parent families.
- Preschool children are likely to suffer if their mothers work outside of the home.
- A working mother can establish just as warm and secure in a relationship with her children as a mother who does not work.
- Single women should not have and should not raise children.
- It would be better for everyone if fathers could take time off work when their children are young.
- Even when they have troubles, couples with children should stay together for the sake of the children.
- Children are better off if their mothers don't have demanding jobs.
- Children from divorced families have lots more problems than children from two parent families.
- It is perfectly OK for a single woman to have and raise children.
- Children always do better if they live with two parents.

## G. TIME USE

**Think about the kinds of things you usually do each week. If you are a university student, think about a typical week while you are in school.**  
 (Check one line for each question):

**About how many hours do you usually spend each week...**

**doing school/class assignments?**

- |                                         |                                           |
|-----------------------------------------|-------------------------------------------|
| <input type="checkbox"/> none           | <input type="checkbox"/> 7-10 hours       |
| <input type="checkbox"/> 1 hour or less | <input type="checkbox"/> 11-15 hours      |
| <input type="checkbox"/> 2-3 hours      | <input type="checkbox"/> 16-20 hours      |
| <input type="checkbox"/> 4-6 hours      | <input type="checkbox"/> 21 or more hours |

**hanging out with close friends other than your spouse/romantic partner?**

- |                                         |                                           |
|-----------------------------------------|-------------------------------------------|
| <input type="checkbox"/> none           | <input type="checkbox"/> 7-10 hours       |
| <input type="checkbox"/> 1 hour or less | <input type="checkbox"/> 11-15 hours      |
| <input type="checkbox"/> 2-3 hours      | <input type="checkbox"/> 16-20 hours      |
| <input type="checkbox"/> 4-6 hours      | <input type="checkbox"/> 21 or more hours |

**fixing meals?**

- none  7-10 hours
- 1 hour or less  11-15 hours
- 2-3 hours  16-20 hours
- 4-6 hours  21 or more hours

**other indoor housework/chores at home?**

- none  7-10 hours
- 1 hour or less  11-15 hours
- 2-3 hours  16-20 hours
- 4-6 hours  21 or more hours

**yard work and other outdoor chores at home?**

- none  7-10 hours
- 1 hour or less  11-15 hours
- 2-3 hours  16-20 hours
- 4-6 hours  21 or more hours

**providing volunteer or community service?**

- none  7-10 hours
- 1 hour or less  11-15 hours
- 2-3 hours  16-20 hours
- 4-6 hours  21 or more hours

**participating in clubs or organizations?**

- none  7-10 hours
- 1 hour or less  11-15 hours
- 2-3 hours  16-20 hours
- 4-6 hours  21 or more hours

**working on a hobby?**

- none  7-10 hours
- 1 hour or less  11-15 hours
- 2-3 hours  16-20 hours
- 4-6 hours  21 or more hours

**H. RESPONSIBILITIES**

**As people get older they begin to take more responsibility for themselves. USING THE FOLLOWING SCALE, WRITE A NUMBER ON THE LINE NEXT TO EACH ITEM.**

Somebody else does this for me all of the time	Somebody else does this most of the time	I do this half of the time	I do this most of the time	I am completely responsible for this all of the time
1	2	3	4	5

**How much responsibility do you currently take for each of the following:**

- earning your own living
- paying rent
- paying your other bills

**If you were to rank all the people you know from the worst to the best in sports, where would you put yourself?**

The worst

The best

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

**USING THE FOLLOWING SCALE, WRITE A NUMBER ON THE LINE NEXT TO EACH ITEM.**

Strongly  
disagree

Strongly  
agree

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

- \_\_\_ I consider myself an athlete.
- \_\_\_ I have many goals related to sports.
- \_\_\_ Sports is a very important part of my life.
- \_\_\_ I spend more time thinking about sports than anything else.
- \_\_\_ I need to participate in sports to feel good about myself.
- \_\_\_ Other people see me mainly as an athlete.
- \_\_\_ I feel badly about myself when I do poorly in sports.
- \_\_\_ I would be very depressed if I were injured and could not compete in sports.

**Do you play any team/competitive sports?** \_\_\_ Yes \_\_\_ No

**If yes, what team/competitive sports do you compete in?** \_\_\_\_\_

**Do you play any individual/competitive sports?** \_\_\_ Yes \_\_\_ No

**If yes, what individual/competitive sports do you compete in?** \_\_\_\_\_

**ANSWER THE NEXT QUESTIONS WITH YOUR CLOSEST FRIENDS IN MIND: (Circle one number for each question)**

**My friends make too many demands on me.**

Never

Daily

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7

**J. INFORMATION ABOUT FATHER**

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**IF YOUR FATHER IS STILL LIVING, COMPLETE THIS SECTION.  
IF NOT, SKIP TO QUESTION L.**

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**To which ethnic or cultural group(s) did your father belong? (Mark or specify as many as applicable.)**

- |                                    |                                                            |
|------------------------------------|------------------------------------------------------------|
| <input type="checkbox"/> French    | <input type="checkbox"/> Dutch (Netherlands)               |
| <input type="checkbox"/> English   | <input type="checkbox"/> Jewish                            |
| <input type="checkbox"/> German    | <input type="checkbox"/> Polish                            |
| <input type="checkbox"/> Scottish  | <input type="checkbox"/> Black                             |
| <input type="checkbox"/> Italian   | <input type="checkbox"/> North American Indian             |
| <input type="checkbox"/> Irish     | <input type="checkbox"/> Métis                             |
| <input type="checkbox"/> Ukrainian | <input type="checkbox"/> Inuit / Eskimo                    |
| <input type="checkbox"/> Chinese   | <input type="checkbox"/> Other ethnic or cultural group(s) |

(Please specify) \_\_\_\_\_

**Is your father employed now?  yes  no**

**IF YES,**

**What is your father's occupation? \_\_\_\_\_**

**How many years has he been working in that occupation?**

\_\_\_\_\_ years

**How satisfied is your father with his job?**

Not at all  
satisfied

Very  
satisfied

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**How satisfied would you be with a job like your father's?**

Not at all  
satisfied

Very  
satisfied

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**IF NO,**

**What was his occupation the last time he worked? \_\_\_\_\_**

**Has your father retired?  yes  no**

**When was the last time he worked? month: \_\_\_\_\_ year: \_\_\_\_\_**

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**How much would you say your father has influenced you?**

Not at all

A great deal

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**Right now, how close do you feel to your father?**

Not at all  
close

Very  
close

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**Right now, how much do you admire your father?**

Not at all

A great deal

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**How much do you want to be like the kind of person your father is when you are his age?**

Not at all

A great deal

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**In what ways do you want to be like your father when you are his age?**

(Please list)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

How satisfied would you be with a job like your mother's?

Not at all  
satisfied

Very  
satisfied

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**IF NO,**

Has your mother ever worked? \_\_\_\_ yes \_\_\_\_ no

**(IF NO, SKIP TO QUESTION M)**

**IF YES,** What was her occupation the last time she worked? \_\_\_\_\_

Has your mother retired? \_\_\_\_ yes \_\_\_\_ no

When was the last time she worked? month: \_\_\_\_\_ Year: \_\_\_\_\_

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M. USING THE FOLLOWING SCALE, WRITE A NUMBER ON THE LINE NEXT TO EACH ITEM.

Never

Daily

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

- \_\_\_\_\_ My mother and I talk about my future job plans.
- \_\_\_\_\_ My mother and I talk about my future education plans.
- \_\_\_\_\_ My mother and I talk about my future family plans.
- \_\_\_\_\_ My mother and I talk about my personal problems.
- \_\_\_\_\_ My mother and I talk about conflicts that might arise in the future between family and work responsibilities.

**CIRCLE ONE NUMBER FOR EACH QUESTION:**

If you needed someone to talk to about a personal problem, how willing would your mother be to talk with you?

Not at all  
willing

Very  
willing

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

My mother makes too many demands on me.

Never

Daily

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**In what ways do you want to be like your mother when you are her age?**  
(Please list)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**N. FAMILY**

**CIRCLE ONE NUMBER FOR EACH ITEM**

**My parent(s) encourage me to go into a challenging and demanding career.**  
Not at all A lot  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**My parent(s) would be upset if I did not live up to my full potential in my work.**  
Not at all A lot  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**My parent(s) would be upset if I went after a challenging career.**  
Not at all A lot  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**My parent(s) encourage me to slow down and be more laid back.**  
Not at all A lot  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

**My parent(s) encourage me to put more time into my personal life.**  
Not at all A lot  
1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_

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# The Values Scale

## APPENDIX B

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85

# Canadian Work Importance Study

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This inventory is a measure of how you feel about things you are doing in your life. It asks you about the meaning and importance of various kinds of values and activities. There are no right or wrong answers. Your answers will help you identify what is important to you as you plan your life and your career.

### Directions:

1. Please make no marks on this booklet; it will be used again by other people.
2. Please mark your responses on the answer sheet provided.
3. Use a soft, black, lead pencil to make your marks the answer sheet.
4. Fill in your name and other information on the answer sheet.
5. Make a heavy dark mark for each answer - not a cross or a check mark.
6. If you make a mistake or change your mind, erase carefully and thoroughly.
7. Your answer sheet will be processed by computer. Please keep it neat and free from stray marks.
8. Please answer each question. Work quickly; first impressions usually give the best results with this inventory.

**Turn the page and begin.**

For each of the following statements, indicate how important it is to you.

Use the following scale:

1 means **of little or no importance**

2 means **of some importance**

3 means **important**

4 means **very important**

Use a pencil to indicate on the answer sheet how important each statement is to you.

Please respond to all questions, **using the answer sheet.**

**It is now or will be important for me to . . .**

- |                                                           |                                                                |
|-----------------------------------------------------------|----------------------------------------------------------------|
| 1 use all my skills and knowledge                         | 26 be a leader on the job                                      |
| 2 obtain results that show I have done well               | 27 make my own decisions at work                               |
| 3 get ahead                                               | 28 create something new in my work                             |
| 4 make life more beautiful                                | 29 have a good income                                          |
| 5 help people with problems                               | 30 live my life my way                                         |
| 6 be able to take charge at work when necessary           | 31 have ideas about what to do with my life                    |
| 7 act on my own                                           | 32 take part in physical activities                            |
| 8 discover, develop, or design new things                 | 33 receive recognition for my accomplishments                  |
| 9 be able to afford the things I want                     | 34 feel that there is some risk or danger in my work           |
| 10 live according to my own ideas                         | 35 work in a group rather than by myself                       |
| 11 develop as a person                                    | 36 do things with people I like                                |
| 12 exercise                                               | 37 do a number of different things each day                    |
| 13 be admired for my knowledge and skills                 | 38 have good facilities at work                                |
| 14 do things that involve some risk                       | 39 work where people of my ethnic origin can have good careers |
| 15 take part in activities with other people              | 40 be able to carry heavy things easily                        |
| 16 spend time with people who are special to me           | 41 do work in which I can develop my abilities                 |
| 17 have each day be different in some way                 | 42 reach a high standard in my work                            |
| 18 have good space and light in which to work             | 43 be able to get promotions                                   |
| 19 live where people of my religion and race are accepted | 44 be concerned with beauty in my work                         |
| 20 work hard physically                                   | 45 help others                                                 |
| 21 do work in which I have abilities                      | 46 manage things at work                                       |
| 22 know that my efforts in life will show                 | 47 be free to get on with a job in my own way                  |
| 23 advance quickly in my career                           | 48 have the opportunity to try out new ideas at work           |
| 24 find pleasure in the beauty of my work                 | 49 work where employment is regular and secure                 |
| 25 be involved in work which helps people                 | 50 work at what I want to when I want to                       |
-

---

For each of the following statements, indicate how important it is to you.

Use the following scale:

1 means **of little or no importance**

2 means **of some importance**

3 means **important**

4 means **very important**

**It is now or will be important for me to . . .**

- |    |                                              |     |                                                    |
|----|----------------------------------------------|-----|----------------------------------------------------|
| 51 | find personal satisfaction in my work        | 76  | have good friends                                  |
| 52 | be physically active in my work              | 77  | have variety in my life                            |
| 53 | be respected for the quality of my work      | 78  | work in a place that is free of hazards            |
| 54 | take on dangerous tasks, if they interest me | 79  | use the language of my choice whenever I want      |
| 55 | be with other people while I work            | 80  | be able to move heavy objects                      |
| 56 | work with people I like                      | 81  | work at what I am good at                          |
| 57 | change work activities frequently            | 82  | complete what I start                              |
| 58 | be protected from the weather while I work   | 83  | be successful                                      |
| 59 | work in a language in which I am comfortable | 84  | be able to appreciate beauty                       |
| 60 | use my physical strength at work             | 85  | be considerate of others                           |
| 61 | use my talents in my work                    | 86  | have the authority at work to get things done      |
| 62 | achieve the goals I have set for myself      | 87  | choose how I am going to do my work                |
| 63 | work where people have a chance to get ahead | 88  | use my imagination whenever I can                  |
| 64 | add to the beauty of my environment          | 89  | earn a steady income                               |
| 65 | give help to those who need it               | 90  | work where there are few rules or regulations      |
| 66 | have others follow my instructions           | 91  | be responsible for doing my work well              |
| 67 | be independent                               | 92  | keep my body fit                                   |
| 68 | invent new ways to solve problems            | 93  | be known for doing good work                       |
| 69 | be financially secure                        | 94  | gamble when there is something to gain             |
| 70 | choose my own style of life                  | 95  | spend time with friends                            |
| 71 | take my responsibilities seriously           | 96  | have friends who will help me when I have problems |
| 72 | be physically fit enough to do my job        | 97  | have variety in my work                            |
| 73 | have others think well of the work I do      | 98  | have a comfortable workplace                       |
| 74 | take chances in my life                      | 99  | feel proud of my cultural heritage                 |
| 75 | be involved with others                      | 100 | be physically strong                               |
-



# S a l i e n c e

## I n v e n t o r y APPENDIX C

### Directions

1. Please make no marks on this booklet; it will be used again by other people.
2. Please mark your responses on the answer sheet provided.
3. Use a soft, black, lead pencil to make your marks the answer sheet.
4. Fill in your name and other information on the answer sheet.
5. Make a heavy, dark mark for each answer - not a cross or a check mark.
6. If you make a mistake or change your mind, erase carefully and thoroughly.
7. Your answer sheet will be processed by computer. Please keep it neat and free from stray marks.
8. Please answer each question. Work quickly; first impressions usually give the best results with this inventory.
9. Before you answer any of the questions please read the following descriptions of the five key activities used in this inventory, so that you understand what they involve.

### Activity descriptions

- Studying:** What you do to learn new things. It includes taking courses and going to school either during the day or in the evening. It covers all the work you do to prepare for class such as homework, assignments, and studying. It can also include the studying that you do on your own in order to learn how to do a hobby or to gain a new skill.
- Working:** What you do to make money or profits, either on a job or by yourself.
- Community Service:** What you do as a volunteer to help your community. It can include what you do in recreational groups like sports leagues, on the student union, in self help groups, in neighbourhood associations, political parties, in trade unions, or in any other group or club where you are doing something to make life better or more interesting for those around you.
- Home and Family:** What you do to take care of your home, your family, and your responsibilities. It includes housework, repairs, washing, cooking, cleaning up after meals, shopping and looking after your dependents such as your children, relatives, or pets.
- Leisure Activities:** What you do for fun and relaxation. It can include things like taking part in sports or exercise, watching television, doing a hobby, going to the movies or spending time with your family and your friends.

The following questions ask you about some of the things you do in each of these activities and how you feel about doing them. You may need to consider time in some questions and amount or quantity in others. Please read each statement carefully, then use the answer sheet to record your responses. Turn the page and begin.

## Section I: Participation (what you actually do or have done recently).

On the answer sheet please find the section called Participation  
Please do each item under letters A to J using the following scales.

- 1 means Never or rarely
- 2 means Sometimes
- 3 means Often
- 4 means Always or almost always

- A. I have spent time in or do spend time in
- 1 studying
  - 2 working
  - 3 community service
  - 4 home and family
  - 5 leisure activities
- B. I have talked or do talk to people about
- 6 studying
  - 7 working
  - 8 community service
  - 9 home and family
  - 10 leisure activities
- C. I have spend or do spend time reading about
- 11 studying
  - 12 working
  - 13 community service
  - 14 home and family
  - 15 leisure activities
- D. I have taken or do take advantage of opportunities in
- 16 studying
  - 17 working
  - 18 community service
  - 19 home and family
  - 20 leisure activities
- E. I have read some books and magazines on
- 21 studying
  - 22 working
  - 23 community service
  - 24 home and family
  - 25 leisure activities
- F. I have been or am active in an organization that has to do with
- 26 studying
  - 27 working
  - 28 community service
  - 29 home and family
  - 30 leisure activities
- G. As often as I can I take part in
- 31 studying
  - 32 working
  - 33 community service
  - 34 home and family
  - 35 leisure activities
- H. I have improved my performance in
- 36 studying
  - 37 working
  - 38 community service
  - 39 home and family
  - 40 leisure activities
- I. I am active in
- 41 studying
  - 42 working
  - 43 community service
  - 44 home and family
  - 45 leisure activities
- J. I encourage others to spend time in
- 46 studying
  - 47 working
  - 48 community service
  - 49 home and family
  - 50 leisure activities

## Section II: Commitment (how I feel about it).

On the answer sheet please find the section called Commitment.  
Please do each item under letters A to J using the following scales.

- 1 means Little or none
- 2 means Some
- 3 means Quite a lot
- 4 means A great deal

A. It is or will be important to me to be good in

- 1 studying
- 2 working
- 3 community service
- 4 home and family
- 5 leisure activities

B. I am or expect to be very much involved in

- 6 studying
- 7 working
- 8 community service
- 9 home and family
- 10 leisure activities

C. I would like to be remembered for what I did in

- 11 studying
- 12 working
- 13 community service
- 14 home and family
- 15 leisure activities

D. I would like to be active for many years in

- 16 studying
- 17 working
- 18 community service
- 19 home and family
- 20 leisure activities

E. I am committed to being active in

- 21 studying
- 22 working
- 23 community service
- 24 home and family
- 25 leisure activities

F. I am or will be proud to do well in

- 26 studying
- 27 working
- 28 community service
- 29 home and family
- 30 leisure activities

G. I feel personally involved in

- 31 studying
- 32 working
- 33 community service
- 34 home and family
- 35 leisure activities

H. I admire people who are good at

- 36 studying
- 37 working
- 38 community service
- 39 home and family
- 40 leisure activities

I. I find it fulfilling to take part in

- 41 studying
- 42 working
- 43 community service
- 44 home and family
- 45 leisure activities

J. I would like to have plenty of time for

- 46 studying
- 47 working
- 48 community service
- 49 home and family
- 50 leisure activities

### Section III: Role Values

In this section, you will be asked questions which may sound like those you have already answered. However, here your answers will show what values you seek in each of the five major life roles: studying, working, community service, home and family, and leisure activities. What you value may often differ in each activity. Please read each of the following statements carefully.

On the answer sheet please find the section called Role Values. Please do each item in letters A to N using the following scale:

1 means Little or none  
2 means Some  
3 means Quite a lot  
4 means A great deal

What opportunity do you see now or in the future to . . .

A. use all your skills and knowledge in

- 1 studying
- 2 working
- 3 community service
- 4 home and family
- 5 leisure activities

B. be good at

- 6 studying
- 7 working
- 8 community service
- 9 home and family
- 10 leisure activities

C. be able to appreciate beauty through your

- 11 studying
- 12 working
- 13 community service
- 14 home and family
- 15 leisure activities

D. help others through your

- 16 studying
- 17 working
- 18 community service
- 19 home and family
- 20 leisure activities

E. act on your own in

- 21 studying
- 22 working
- 23 community service
- 24 home and family
- 25 leisure activities

F. use your imagination in

- 26 studying
- 27 working
- 28 community service
- 29 home and family
- 30 leisure activities

G. be able to afford to

- 31 study
- 32 work
- 33 do community service
- 34 do home and family care
- 35 have leisure activities

H. have the following be part of your life

- 36 studying
- 37 working
- 38 community service
- 39 home and family
- 40 leisure activities

I. be physically active as part of your

- 41 studying
- 42 working
- 43 community service
- 44 home and family
- 45 leisure activities

J. be recognized for your accomplishments in

- 46 studying
- 47 working
- 48 community service
- 49 home and family
- 50 leisure activities

K. gamble where there is something to gain by

- 51 studying
- 52 working
- 53 community service
- 54 home and family
- 55 leisure activities

L. do things with other people in

- 56 studying
- 57 working
- 58 community service
- 59 home and family
- 60 leisure activities

M. have variety in

- 61 studying
- 62 working
- 63 community service
- 64 home and family
- 65 leisure activities

N. have good conditions for

- 66 studying
- 67 working
- 68 community service
- 69 home and family
- 70 leisure activities



August 1, 1997

## APPENDIX D Invitational Letter

Dear Participant:

Our research team, Dr. Judy Lupart, Dr. Alice Boberg, Michael Enman, Charlene Barva (The University of Calgary) and Dr. Elizabeth Smyth (OISE) would like to request your participation in a research study involving Shad Valley Program applicants and participants. This study is part of a 3 year research program funded jointly by the Social Sciences and Humanities Research Council of Canada and Northern Telecom, under the auspices of a Science and Culture Canada joint initiative. The purpose of the present study is to gain insights into factors influencing both interest in and involvement in science-related courses, programmes and careers.

There are two parts to this study and participation in either or both parts is voluntary. In Part 1, we are asking all study participants to complete a set of questionnaires. We will mail out to all participants the appropriate questionnaires with a target return date mutually agreed upon by the participant and researcher. We anticipate mailings to occur in the summer of 1997.

The first questionnaire in the set will take approximately 45 minutes to complete and it explores a variety of personal beliefs and attitudes known to influence achievement-related decisions. The second questionnaire will take approximately 20 minutes to complete and it surveys workplace values and life roles. The final questionnaire will take approximately 10 minutes to complete and it examines personal epistemology (i.e., beliefs about knowledge and learning) and the values a respondent assigns to his/her selected major or career.

In Part 2 of this study, respondents will be asked to participate in a 45 minute follow up telephone interview exploring personal, social, and achievement-related influences on participation in the sciences. All interview times and locations will be mutually agreed upon by the volunteer and the researcher.

Confidentiality and anonymity will be safe-guarded at all times. The researchers will not share individual information results with any other individuals prior to or following data collection. Once collected, responses will be kept in strictest confidence in a locked file cabinet in our research office at the University of Calgary. Only group results will be reported in any published studies.

The participant is encouraged to discuss and question all aspects of the research and will be free to withdraw at any time. If you have any questions or require any additional information, please call the principal investigator, Dr. Judy Lupart at the University of Calgary (403) 220-6280 or (403) 282-9244 (fax), Michael Enman (403) 220-5696 or Charlene Barva at (403) 556-7211.

Please complete the attached form to indicate your permission to participate in this research. A stamped addressed return envelope has been provided for your convenience.

Thank you for cooperation

Sincerely,



Judy Lupart, Ph.D.  
Professor



**THE UNIVERSITY OF  
CALGARY**

Department of Educational Psychology

**APPENDIX E  
Consent Form**

**PARTICIPANT CONSENT FORM**

I, the undersigned, hereby give my consent to participate in a research study exploring personal, social, and achievement-related influences on Shad Valley participants and applicants' involvement in the sciences. This study is part of a 3 year research program funded jointly by the Social Sciences and Humanities Research Council of Canada and Northern Telecom, under the auspices of a Science and Culture Canada joint initiative.

I understand that such consent (indicated by marking the blanks below) means participating in either one or both parts of the study.

Part 1

\_\_\_\_\_ Three questionnaires. The first questionnaire, completed in approximately 45 minutes, explores a variety of personal beliefs and attitudes known to influence achievement-related decisions. The second questionnaire, completed in approximately 20 minutes, surveys workplace values and life roles. The third questionnaire, completed in approximately 10 minutes, examines personal epistemology (i.e., beliefs about knowledge and learning) and the values a respondent has assigned to his/her selected major or career.

Part 2

\_\_\_\_\_ A 45 minute follow up telephone interview exploring personal, social, and achievement-related influences on participation in the sciences. All interview times and locations will be mutually agreed upon by the volunteer and the researcher.

I understand that participation in this study may be terminated at any time by my request or at the request of the investigator. Participation in this study and/or withdrawal from this study will not adversely affect me in any way.

I understand that my responses will be kept confidential and only group data will be reported in any published reports. Once collected, responses will be kept in strictest confidence in a locked file cabinet in our research office at the University of Calgary.

I have received a copy of this consent form for my records. I understand that if I have any questions I can contact the principal investigator, Dr. Judy Lupart at (403) 220-6280 or (403) 282-9244 (fax), the Office of the Chair, Faculty of Education Joint Ethics Review Committee at (403) 220-5626, or the Office of the Vice-President (Research) at (403) 220-3381.

\_\_\_\_\_ Date

\_\_\_\_\_ Signature

\_\_\_\_\_ Telephone number

\_\_\_\_\_ Participant's Printed Name

\_\_\_\_\_ E-mail address (Optional)

July 16, 1997

**APPENDIX F**  
**Endorsement Letter from the Vice-president of Shad Valley**

**Re: Lupart, Boberg, Smyth Research Study**

This letter is to inform you of Shad International's complete endorsement of this research project. It is the first large-scale retrospective study of the Shad Valley Program, and we are confident that the results will help us to understand the full range of positive effects of participation in programs like Shad Valley and their long-term impact on decisions for pursuit of university programs and careers in the sciences. Moreover, the results will be most informative in forging other future collaborative school/university/business initiatives to increase science literacy and development in Canada.

It may seem to be an inconvenience to allocate a couple of hours of your free time in this way; however, your time will help the researchers to target key information to assist others in developing their talents and expertise in the sciences. Therefore, we urge you to give your permission for participation in the research project.

If you have any questions or concerns about the research project, we invite you to contact the researchers directly or to contact us at Shad International.

Thank you for your co-operation.

Sincerely,

A handwritten signature in black ink that reads "Ron Champion".

Ron Champion  
Vice-President, Shad Valley

[ron@shad.ca](mailto:ron@shad.ca)

Direct telephone: (519) 884-8847, ext. 229

## APPENDIX G

### Operationalizing the Variables

#### Operationalizing the Dependent Variable

In operational terms the dependent variable was measured as follows:

Using the Likert 7-point scale (1=Not at all, 7=A lot) on the following items:

How much do you like doing things that involve each of the following?

#### **Measure of Subjective Task value of Math/Science (Alpha 0.78)**

using advanced math

using physical science

#### **Measure of Subjective Task Value of Social Tasks (Alpha 0.81)**

interacting with other people a lot

helping other people solve their problems

teaching people

#### Predictor/Independent Variables

The independent variables in the study were: 1) gender, 2) mother's employment, 3) father's employment, 4) mother's level of education, 5) father's level of education. In addition to the above, an independent variable named "relationship with father" was created by collapsing the following items: a) discuss future plans with father, b) affective relationship with father, and c) the child's desire to be like their father. The same was done for the variable labeled "relationship with mother" by collapsing the following items: d) discuss future plans with mother, e) affective relation with mother, and f) child's desire to be like their mother.

### Operationalizing the Independent Variables

In operational terms the above predictor variables were measured as follows:

#### **Gender**

Subjects were divided by gender into 2 categories: males and females. This information was obtained through the data collected in the Study of Life Transitions (SLT) Book One (1997) questionnaire when applicants and participants answered the item:

**Are you a \_\_\_ Male \_\_\_ Female?**

#### **Mother's and Father's Occupations**

##### Operationalization

To determine if the parents' employment had an affect on the student's subjective task value of math/science and social tasks, mothers were divided into two categories: 1) mothers who were employed in the paid work, and 2) mothers who were unemployed or considered as homemakers. For the fathers there was only one category as all of the fathers in the sample were employed. The following questions were used to gather information regarding mothers' and fathers' occupational status:

**What are (were) your father's and mother's principal occupations?**

College or university teaching, research, or administration

Elementary or secondary school teaching or administration

Business Owner

Other managerial or administrative

Technical and semi-professional

Other white collar, clerical, retail sales

Skilled wage worker

Semi- and unskilled wage worker, farm laborer

Armed forces

Homemaker

Other (Please specify)\_\_\_\_\_

### **Mother's and Father's Level of Education**

#### Operationalization

To determine whether mothers' and fathers' level of education affected the students' subjective task value of math/science as well as their subjective task value of social tasks, the mother's level of education was divided into two categories: 1) mothers who had high school or less, and 2) mothers who had some college education. As with mothers, fathers were also divided into the same two categories: 1) fathers who had high school or less, and 2) fathers who had some college education. This information was gathered by the following items:

**What is the highest level of formal education completed by your mother?**

**Your father?**

Some high school

Completed high school

Some college/CEGEP/Institute of Tech

Completed University degree in General Arts or Science

Don't know

### **Child's Perception of their Relationship with their Mother and Father**

To determine whether the child's perception of their relationship with their mother and father was related to the child's subjective task value of math/science and social tasks the following categories were selected to assess the child's perception of that relationship and collapsed into a variable labeled, "relationship with mother" and "relationship with father". The child's perception of their relationship with their mother was determined by collapsing these three variables: 1) Discuss Future Plans with Mother, 2) Affective Relationship With Mother, 3) Child's Desire to be Like Their Mother. As with the mother, the child's perception of their relationship with their father was determined by collapsing the following three variables: 4) Discuss Future Plans with Father, 5) Affective Relationship With Father, and 6) Child's Desire to be Like Their Father. These variables and their items are presented below.

#### Operationalization

##### **Discuss Future Plans with Mother (Alpha 0.88)**

Using the Likert 7-point scale (1=Never, 7=Daily) rate the following:

My mother and I talk about my future job plans.

My mother and I talk about my future education plans.

##### **Discuss Future Plans with Father (Alpha 0.92)**

Using the Likert 7-point scale (1=Never, 7=Daily) rate the following:

My father and I talk about my future job plans.

My father and I talk about my future education plans.

##### **Affective Relationship With Mother (Alpha 0.82)**

Using the Likert 7-point scale (1=Not at all Willing, 7=Very Willing) rate the following:

If you needed someone to talk to about a personal problem, how willing would your mother be to talk with you?

(1=Not at all, 7=A Great Deal)

How much does your mother take an interest in your activities?

How satisfied are you with how supportive your mother is?

#### **Affective Relationship With Father (Alpha 0.86)**

Using the Likert 7-point scale (1=Not at all Willing, 7=Very Willing) rate the following:

If you needed someone to talk to about a personal problem, how willing would your father be to talk with you?

(1=Not at all, 7=A Great Deal)

How much does your father take an interest in your activities?

How satisfied are you with how supportive your father is?

#### **Child's Desire to be Like Their Mother (0.91)**

Using the Likert 7-point scale(1=Not at all, 7=A Great Deal) rate the following:

How much would you say your mother has influenced you?

Right now, how close do you feel to your mother?

Right now, how much do you admire your mother?

How much do you want to be like the kind of person your mother is when you are her age?

**Child's Desire to be Like Their Father (0.93)**

Using the Likert 7-point scale(1=Not at all, 7=A Great Deal) rate the following:

How much would you say your father has influenced you?

Right now, how close do you feel to your father?

Right now, how much do you admire your father?

How much do you want to be like the kind of person your father is when you are her age?