

1994

UNDERSTANDING WOMEN'S EDUCATIONAL AND OCCUPATIONAL CHOICES

Applying the Eccles et al. Model of Achievement-Related Choices

Jacquelynne S. Eccles
University of Michigan

Despite recent efforts to increase the participation of women in advanced educational training and high-status professional fields, women and men are still concentrated in different occupations and educational programs, and women are still underrepresented in many high-status occupational fields—particularly those associated with physical science, engineering, and applied mathematics. Many factors, ranging from outright discrimination to the processes associated with gender role socialization, contribute to these gendered patterns of educational and occupational choices. This paper summarizes a set of social and psychological factors that Eccles and her colleagues have been studying for the past 15 years in an effort to understand the occupational and educational choices of women and men. The paper summarizes the key features of the theoretical model they developed and provides an overview of the empirical support now available for key aspects of this model. The implications of this model for understanding the link between gender roles and gendered educational and occupational decisions are discussed.

Expanded version of an address given at 1992 APA Convention, Washington, DC, August.

The author wishes to thank all of her colleagues and former students who have worked with her in developing the studies summarized in this paper. These include Judith Meece, Carol Kaczala, Allan Wigfield, Janis Jacobs, Constance Flanagan, Rena Harold, Bonnie Barber, and Deborah Jozefowicz. This work was supported by grants from National Institutes of Mental Health and Child Health and Human Development, and National Science Foundation.

Address correspondence and reprint requests to: Jacquelynne S. Eccles, 5271 Institute for Social Research, P.O. Box 1248, Ann Arbor, MI 48106-1248.

Despite recent efforts to increase the participation of women in advanced educational training and high-status professional fields, women and men are still concentrated in different occupations and educational programs, and women are still underrepresented in many high-status occupational fields—particularly those associated with physical science, engineering, and applied mathematics (Eccles, 1987; National Center for Educational Statistics, 1980; National Science Foundation, 1990; Vetter, 1981; Vetter & Babco, 1986). These differences in educational and occupational attainment are evident even among highly gifted individuals in this country (see Eccles & Harold, 1992; Terman, 1926, 1930; Terman & Oden, 1947). For example, among a national sample of youth gifted in both mathematics and language, only 20% of the girls, compared to 40% of the boys, planned to pursue careers in mathematics or science (Benbow, 1988; Benbow & Minor, 1986). These differences are still evident in the occupational aspirations and plans of contemporary high-school students (Jozefowicz, Barber, & Eccles, 1993). Why? Many factors, ranging from outright discrimination to the processes associated with gender role socialization, undoubtedly contribute to these gendered patterns of educational and occupational choices. Discussing all possible mediating variables is beyond the scope of this paper. Instead, I will focus on the set of social and psychological factors that my colleagues and I have been studying for the past 15 years. My primary goal is to summarize the theoretical model we have used to guide our research efforts and some of the empirical support we have found for key aspects of this model.

Let me first make one essential caveat. Any discussion of gender differences in achievement must acknowledge the problems of societal influence on the very definitions of achievement as well as on the assessment of the differential worth of various forms of achievement. Defining achievement itself, much less defining appropriate or ideal ways of using one's talents, is a value-laden enterprise at best. Evaluating the meaning and consequences of gender differences on any particular criterion of achievement is equally value-laden. Too many social scientists have adopted a male standard of ideal achievement when judging the value of female achievements (see Parsons & Goff, 1980). Using this standard, they have focused on the question "Why aren't women more like men?" As a consequence, very little systematic, quantitative information has been gathered regarding more stereotypically female-typed achievements, such as the academic accomplishments of one's offspring and/or one's pupils and one's contributions to local organizations. Even less qualitative information has been gathered regarding the meaning of various achievement-related activities to either women or men. As a result, we know very little about the ways in which women think they are expressing their intellectual talents. Defining achievement in terms of typically male-typed activities inevitably leads us to the question "Why aren't the women selecting the same occupational fields as the men?" instead of the question "Why do women choose partic-

ular occupations?" Nonetheless, while acknowledging this value bias, it is still instructive to compare women and men on the set of activities assumed to be indicators of high achievement by the culture at large. It is important to bear in mind, however, that these indicators do favor men. To balance this bias, we have tried to pay particular attention to the reasons women themselves provide to explain their achievement-related choices.

A MODEL OF ACHIEVEMENT-RELATED CHOICES

Over the past 15 years, my colleagues and I have studied the motivational and social factors influencing such long- and short-range achievement goals and behaviors as career aspirations, vocational and avocational choices, course selections, persistence on difficult tasks, and the allocation of effort across various achievement-related activities. Given the striking differences in the educational and vocational patterns of intellectually able, as well as gifted, women and men, we have been particularly interested in the motivational factors underlying females' and males' educational and vocational decisions. Frustrated with the number of seemingly disconnected theories proliferating to explain gender differences in these achievement patterns, we developed a comprehensive theoretical framework to guide our research endeavor. Drawing upon the theoretical and empirical work associated with decision-making, achievement theory, and attribution theory (see Crandall, 1969; Weiner, 1974), we have elaborated on a comprehensive theoretical model of achievement-related choices that could be used to guide our subsequent research efforts. This model, depicted in Figure 1, links educational, vocational, and other achievement-related choices most directly to two sets of beliefs: the individual's expectations for success and the importance or value the individual attaches to the various options perceived by the individual as available. The model also specifies the relation of these beliefs to cultural norms, experiences, aptitudes, and to those personal beliefs and attitudes that are commonly assumed to be associated with achievement-related activities by researchers in this field (see Eccles [Parsons], Adler, Futterman, Goff, Kaczala, Meece, & Midgley, 1983; Eccles, 1987; Meece, Eccles [Parsons], Kaczala, Goff, & Futterman, 1982). In particular, the model links achievement-related beliefs, outcomes, and goals to interpretative systems like causal attributions, to the input of socializers (primarily parents and teachers), to gender role beliefs, to self-perceptions and self-concept, and to one's perceptions of the task itself. Each of these factors are assumed to influence both the expectations one holds for future success at the various achievement-related options and the subjective value one attaches to these various options. These expectations and the value attached to the various options, in turn, are assumed to influence choice among these options.

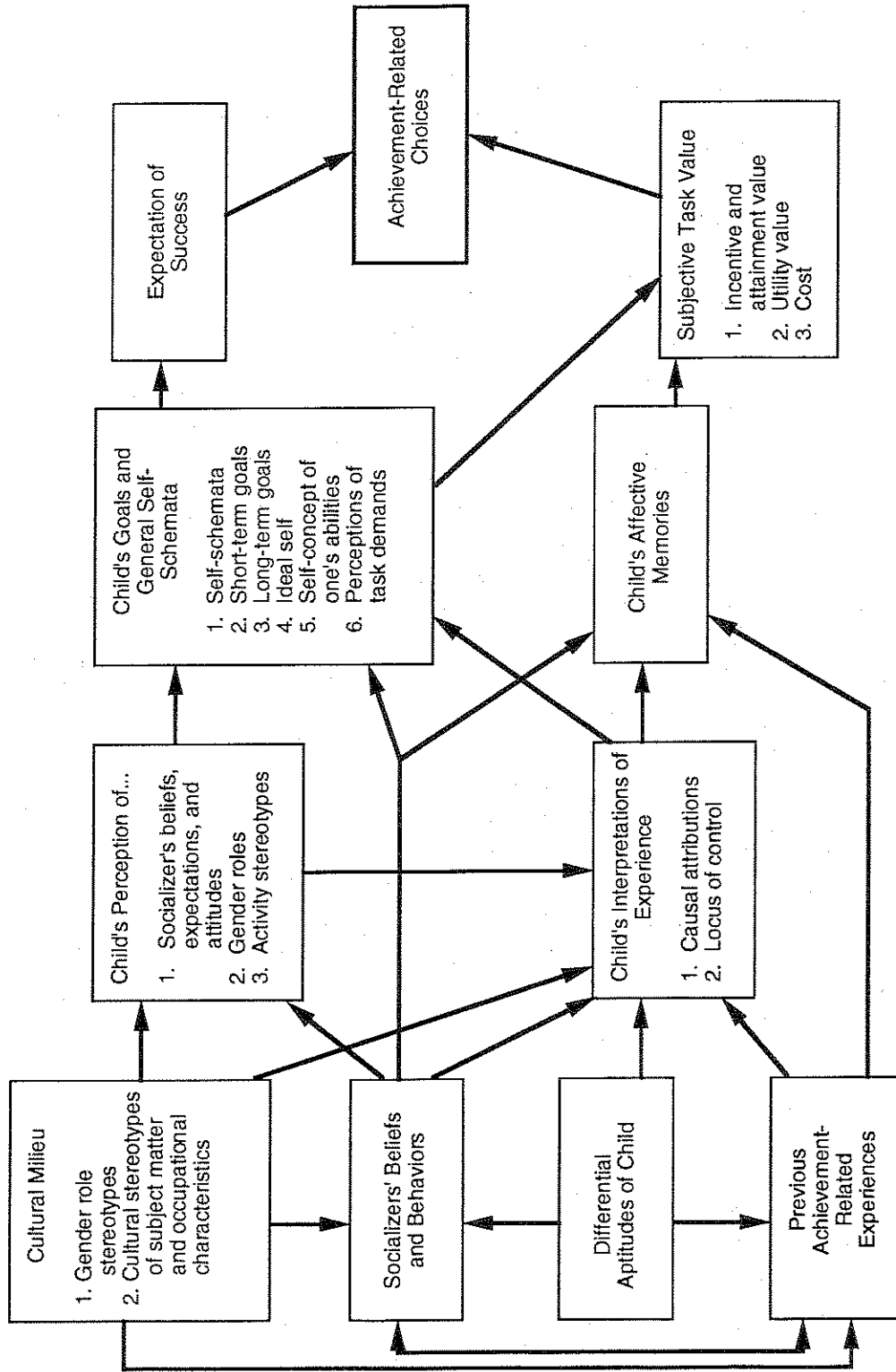


FIGURE 1. Theoretical model of achievement-related choices developed by Eccles (Parsons), Adler, Futerman, Goff, Kaczala, Meece, and Midgley, 1983.

For example, let us consider course enrollment decisions. The model predicts that people will be most likely to enroll in courses that they think they can master and that have high task value for them. Individuals' expectations for success (and a sense of domain-specific personal efficacy) depend on their confidence in their intellectual abilities and on their estimations of the difficulty of the course. These beliefs have been shaped over time by their experiences with the subject matter and by their subjective interpretation of those experiences (e.g., do people think that their successes are a consequence of high ability or lots of hard work?). Likewise, the value of a particular course to the individual is influenced by several factors. For example, does the person enjoy doing the subject material? Is the course required? Is the course seen as instrumental in meeting one of the individual's long- or short-range goals? Have the individual's parents or counselors insisted that the course be taken or, conversely, have other people tried to discourage the individual from taking the course? Is the person afraid of the material to be covered in the course?

Three features of this model are particularly important for understanding gender differences in educational and vocational decisions: The first of these is our focus on achievement-related choices as the outcome of interest. We believe that individuals continually make choices, both consciously and unconsciously, regarding how they will spend their time and their efforts. Many of the most significant gender differences in behavior (e.g., educational and vocational aspirations, and educational, vocational, and avocational activity choice/involvement) occur on achievement-related behaviors that involve the element of choice, even if the outcome of that choice is heavily influenced by socialization pressures and cultural norms. Conceptualizing gender differences in achievement patterns in terms of choice takes one beyond the question of "Why aren't women more like men?" to the question "Why do women and men make the choices they do?" Asking this latter question, in turn, legitimizes the choices that both women and men make and suggests several new variables as possible mediators of the gender differences we observe in these types of achievement patterns. By legitimizing the choices of both women and men, the model allows us to look at the gender differences from a choice perspective rather than a deficit perspective.

Conceptualizing gender differences in achievement-related behaviors in terms of choice highlights a second important component of our perspective: namely, the issue of what becomes a part of an individual's field of possible choices. Although individuals do choose from among several options, they do not actively, or consciously, consider the full range of objectively available options in making their selections. Many options are never considered because individuals are unaware of their existence. Other options are not seriously considered because individuals have inaccurate information regarding either the option itself or the possibility of achieving the option. For example, a girl may have inaccurate information regard-

ing the full range of activities an engineer can do or inaccurate information regarding the financial assistance available for advanced educational training. Still other options may not be seriously considered because they do not fit in well with the individual's gender role schema. Assimilation of the culturally defined gender role schema can have such a powerful effect on one's view of the world that activities classified as part of the other gender's role are rejected, often nonconsciously, without any serious evaluation or consideration. Research has provided some support of this hypothesis. By age 5, children have clearly defined gender role stereotypes regarding appropriate behaviors and traits (see Huston, 1983). In addition, children appear to monitor their behaviors and aspirations in terms of these stereotypes (e.g., see Eccles & Hoffman, 1984; Huston, 1983). Consequently, gender roles likely influence educational and vocational choices, in part, through their impact on individuals' perceptions of the field of viable options, as well as through their impact on expectations and subjective task value.

Understanding the processes shaping individuals' perceptions of their field of viable options is essential to our understanding of the dynamics leading women and men to make such different achievement-related decisions. Yet very little evidence exists regarding these processes and their link to important achievement-related choices. Socialization theory provides a rich source of hypotheses, only some of which have been tested. For example, one effect of role models may be the legitimization of novel and/or gender role deviant options. Parents, teachers, and school counselors can also influence individuals' perceptions of their field of options through the information and experiences they provide. Parents can directly affect both the options actually available to their children (e.g., by providing or withholding funds for a college education), and the options seriously considered (e.g., by mandating, encouraging, ignoring, and discouraging various options). Finally, peers can affect the options seriously considered by either providing or withholding support for various alternatives. These peer effects can be both quite direct (e.g., laughing at a girl when she says she is considering becoming a nuclear physicist), and very indirect (e.g., anticipation of one's future spouse's support for one's occupational commitments).

It should be clear from these examples that social agents can either encourage or discourage individuals from considering gender role stereotypic choices. Unfortunately, they typically operate in such a way that individuals are most likely to consider those options that are consistent with gender role stereotypes. The possible mechanisms underlying these effects are discussed in more detail further on.

The third important feature of our perspective is the explicit assumption that achievement-related decisions, such as the decision to enroll in an accelerated math program or to major in education rather than law or engineering, are made within the context of a complex social reality that

presents each individual with a wide variety of choices, each of which has both long-range and immediate consequences. Furthermore, the choice is often between two or more positive options or between two or more options that have both positive and negative components. For example, the decision to enroll in an advanced math course is typically made in the context of other important decisions such as whether to take advanced English or a second foreign language, whether to take a course with one's best friend, whether it is more important to spend one's senior year working hard or having fun, etc. Too often, theorists have focused attention on the reasons why capable women do not select high-status achievement options and have failed to ask why they select the options they do. This approach implicitly assumes that complex choices, such as career and course selection, are made in isolation of one another. For example, it is assumed that the decision to take advanced math is based primarily on variables related to math. We explicitly reject this assumption, arguing instead that it is essential to understand the psychological meaning of the roads taken, as well as the roads not taken, if we are to understand the dynamics leading to the differences in women's and men's achievement-related choices.

Consider, as an example, two juniors in high school: Mary and Barbara. Both young women enjoy mathematics and have always done very well. Both have been identified as gifted in mathematics and have been offered the opportunity to participate in an accelerated math program at the local college during the next school year. Barbara hopes to major in journalism when she gets to college and also has been offered the opportunity to work part-time on the city newspaper doing odd jobs and some copyediting. Mary hopes to major in biology in college and plans a career as a research scientist. Taking the accelerated math course involves driving to and from the college. Because the course is scheduled for the last period of the day, it will take the last two periods of the day as well as 1 hr of after-school time to take the course. What will the young women do? In all likelihood, Mary will enroll in the program because she likes math and thinks that the effort required to both take the class and master the material is worthwhile and important for her long-range career goals. Barbara's decision is more complex. She may want to take the class but may also think that the time required is too costly, especially given her alternative opportunity at the city paper. Whether she takes the college course will depend, in part, on the advice she gets at home and from her counselors. If they stress the importance of the math course, then its subjective worth to her is likely to increase. If the subjective worth of the course increases sufficiently to outweigh its subjective cost, then Barbara will probably take the course despite its cost in time and effort.

In summary, as outlined in Figure 1, we assume that achievement-related choices (e.g., educational and occupational choices), whether made consciously or nonconsciously, are guided by the following: (a) one's

expectations for success in, and sense of personal efficacy for, the various options; (b) the relation of the options both to one's short- and long-range goals and to one's core self-identity and basic psychological needs; (c) the individual's gender role schema; and (d) the potential cost of investing time in one activity rather than another. All of these psychological variables are influenced by one's experiences, by cultural norms, and by the behaviors and goals of one's socializers and peers.

My colleagues and I have spent the past 15 years testing the hypotheses implicit in this model. By and large our studies support most of the key components of this model. In the next section we review briefly some of this support. First I summarize the results related to the most proximal predictors of achievement-related choices—expectations for success and subjective task value. I discuss the concept of task value more extensively, because this is the most novel aspect of our model. In both of these sections, I pay particular attention to research on intellectually able and gifted individuals to highlight the relevance of our psychological analysis of gendered behaviors in populations with sufficient intellectual aptitude to be successful in the selected occupations. In the last section of the article, I discuss more specifically how gender roles relate to the model in Figure 1.

Expectations and Personal Efficacy as Mediators of Achievement-Related Choices

Expectations for success, confidence in one's abilities to succeed, and personal efficacy have long been recognized by decision and achievement theorists as important mediators of behavioral choice (e.g., Atkinson, 1964; Bandura, 1977, 1986; Lewin, 1938; Weiner, 1974). Numerous studies have demonstrated the link between expectations for success and a variety of achievement-related behaviors including educational and vocational choices among both average and gifted populations. For example, Hollinger (1983) documented a fairly strong relation between gifted girls' confidence in their math abilities and their aspirations to enter math-related vocations such as engineering and computer science. Similarly, Terman (1926) found a positive relation between gifted students' subject matter preferences and their ratings of the ease of the subject for themselves. More recently, Betz and Hackett (1981, 1986) have demonstrated a link between ratings of personal efficacy in various academic subjects and career choice (see also Betz & Fitzgerald, 1987).

But do women and men differ on measures commonly linked to expectations for success? And even more importantly do girls and boys differ in their expectations for success at various academic subjects and in various occupations? In most, but not all studies, the answer to both these questions is yes. For example, Fox (1982) found that highly motivated gifted

girls have lower self-confidence than equally highly motivated gifted boys. Similarly, both Terman (1926) and Strauss and Subotnik (1991) found that gifted girls were more likely to underestimate their intellectual skills and their relative class standing, whereas gifted boys were more likely to overestimate theirs. Strauss and Subotnik (1991) also found that gifted high-school girls reported more test anxiety than their gifted male peers. Similarly, in our work, girls enrolled in a special gifted elementary school program rated their test anxiety higher than did their male peers (Eccles & Harold, 1992). These girls also rated themselves as having more English ability but less athletic ability than their male peers. In studies of more normative populations, we also have found consistent evidence of gender differences in expectations for success and confidence in one's abilities for mathematics, athletics, and English, especially among junior and senior high-school students (e.g., Eccles, 1984, 1989; Eccles [Parsons], Adler, & Meece, 1984; Eccles & Harold, 1991; Eccles, Wigfield, Flanagan, Miller, Reuman, & Yee, 1989; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). In addition, in a recent analysis of our longitudinal study of the educational and occupational choice of adolescents, we found clear evidence of gender differences in personal efficacy for various occupations among high-school seniors. The females were less confident of success than were the males in science-related professions and in male-typed skilled labor occupations. In contrast, the males were less confident of their success than were the females in health-related professions and female-typed skilled labor occupations (Jozefowicz, Barber, & Eccles, 1993). Furthermore, these differences in occupational efficacy were significant predictors of occupational choice in a discriminant function analysis.

In contrast, several studies of gifted youths have found no gender differences on measures of general self-concept, locus of control (a construct often linked to self-confidence and personal efficacy beliefs; e.g., Bandura, 1977), general self-confidence and assertiveness, and general self-esteem (Dauber & Benbow, 1990; Tidwell, 1980; Tomlinson-Keasey & Smith-Winberry, 1983). Furthermore, although the girls in our study of gifted elementary school children reported higher estimates for their reading ability than did the boys, the girls and boys reported equivalent confidence in their mathematical ability. Similarly, Benbow and Stanley (1982) found no substantial gender difference in gifted students' estimates of their math and science competence. And, although the gifted students in the Terman study did prefer courses that they thought were easier for them, the girls and boys in this study (1926) did not differ in their perceptions of the ease of mathematics. Schunk and Lilly (1982) also found no gender difference in gifted children's expectations for success on a laboratory math task. Finally, in our longitudinal study of intellectually capable students, gender differences in expectations for success in future math courses did not mediate the gender differences in math course enrollment;

the perceived value of the math course did (Eccles [Parsons] et al., 1984). Given this mixed set of results for intellectually able and gifted youths, it is not clear that gifted girls are either less confident than gifted boys of their intellectual abilities in general or less confident of their mathematical ability in particular. Although the differences, when found, do support this conclusion, these differences are always quite small and often are not found. It also is not clear whether this difference, even when found, is the primary mediator of gender differences in the educational and occupational decisions of either intellectually able or gifted youths. Thus, it is also not clear that the gender differences in selection of careers in math and science among intellectually able youths are primarily due to gender differences in expectations for success in mathematics. Gender differences in task value may be just as important. These differences are discussed in the next section.

Two additional comments are worth noting. First, according to both the Eccles et al. expectancy/value model of activity choice and Bandura's theory of personal efficacy, expectations for success vary by domain and their influence on behavioral choices is assumed to be domain-specific. Thus, it is important that studies assess the relevant expectations. To predict occupational success, we must assess expectations for success (or personal efficacy) for specific occupations. Typically, study participants are asked to report on their confidence about succeeding on an upcoming task or course. They are not asked how confident they are that they can succeed in particular professions or in particular advanced training programs. Studies asking this question have yielded more consistent evidence of the mediating role of gender differences in expectations and personal efficacy in explaining gender differences in the selection of math-related occupations (see in particular the work by Betz and her colleagues; Betz & Fitzgerald, 1987; Betz & Hackett, 1981, 1986).

Second, according to the Eccles et al. choice model, occupational choices are assumed to be influenced by the intraindividual hierarchy of expectations and efficacy. The model predicts that people select those activities for which they feel most efficacious (or for which they have the highest expectations for success). If this is true, then the critical comparisons are not gender comparisons within domain but domain comparisons within individual. If individuals are more likely to pursue activities that they are the most confident about, then it is more important to determine whether women and men have different rank orderings for their ability self-concepts across an array of domains than to determine whether women and men differ in their ability self-concepts across various domains. In our recent study, for example, we found that the gifted girls had more confidence in their reading ability than in their math ability, even though they did not have lower confidence in their math ability than their male peers (Eccles & Harold, 1992). This within-gender difference is evident in all our studies (e.g., Eccles, 1984, 1989; Eccles [Parsons] et al.,

1984; Eccles & Harold, 1991; Eccles et al., 1989; Eccles et al., 1993; Wigfield et al., 1991). But few studies have used such an ipsative approach to study educational and occupational choices.

Subjective Task Values as Mediators of Achievement-Related Choices

Subjective task value is the second major component of the expectancy/value model of achievement-related choices shown in Figure 1. This model predicts that decisions regarding course enrollments, college majors, and occupational choice are influenced by the value individuals attach to the various achievement-related options they believe are available to them. Furthermore, subjective task value is hypothesized to have at least as much influence on educational and vocational choices as do expectations for success. Finally, given the probable impact of gender role socialization on the variables associated with subjective task value, gender differences in the subjective value of various achievement-related options are predicted to be important mediators of gender differences in educational and occupational choices in both typical and gifted populations.

Our own data support this hypothesis. In a longitudinal study of the math course enrollment decisions of intellectually able, college-bound students, gender differences in students' decisions to enroll in advanced mathematics were mediated primarily by gender differences in the value that students' attached to mathematics (Eccles [Parsons] et al., 1984). More specifically, the girls were less likely than the boys to enroll in advanced mathematics, primarily because they felt that math was less important, less useful, and less enjoyable than did the boys. We also found clear evidence of gender differences in the value attached to various school subjects and activities in our study of elementary school-aged children enrolled in a gifted program (Eccles & Harold, 1992). Even though there was no gender difference in expectations for success in mathematics, these girls reported liking math less than did boys; the girls also rated math as less useful than did the boys. In addition, the boys also attached greater importance to sports than did the girls.

Other studies of the gifted have yielded similar findings. When asked to name their favorite school subjects, gifted girls rated English, foreign languages, composition, music, and drama higher than did gifted boys; in contrast the boys rated the physical sciences, physical training, U.S. history, and sometimes mathematics higher than did the girls (Benbow & Stanley, 1984; George & Denham, 1976; Terman, 1926, 1930). The gender differences in interest in mathematics are typically quite weak, if present at all. In contrast, the gender differences in interest in physics and applied mathematical fields like engineering are quite consistent and fairly large (Benbow, 1988; Benbow & Minor, 1986). Similarly, when asked

their occupational interests and/or anticipated college major, gifted girls rated domestic, secretarial, artistic, biological science, and both medical and social service occupations and training higher than did boys. The boys expressed more interest than the girls in both higher-status and business-related occupations in general, and in the physical sciences, engineering, and the military in particular (Benbow & Stanley, 1984; Fox, Pasternak, & Peiser, 1976; Terman, 1926, 1930). Finally, when asked about their leisure time activities and hobbies, similar differences in interest patterns emerge. At all ages, gifted girls both like and report spending more time than boys reading, writing, and participating in a variety of activities related to arts and crafts, domestic skills, and drama. In contrast, gifted boys spend more time engaged in sports, working with machines and tools, and involved with scientific, math-related, and/or electronic hobbies (Dauber & Benbow, 1990; Fox, 1976; McGinn, 1976; Terman, 1926, 1930; Terman & Oden, 1947).

In summary, substantial evidence of gender differences in the valuing of various educational and occupational options exists. But do these differences explain gender differences in educational occupational choice? As noted above, we found evidence that the answer is yes (see Eccles [Parsons] et al., 1984). Additional support for this hypothesis comes from the work of Benbow and Stanley. Gifted girls in their study were less likely than gifted boys to take advanced mathematics, in part because they liked language-related courses more than they liked mathematics courses (Benbow & Stanley, 1982). In addition, Benbow and Stanley (1984) found weak but consistent positive relations in their gifted samples between liking of biology, chemistry, and physics, and subsequent plans to major in biology, chemistry, and physics, respectively. In addition, students' interests predicted course-taking in high school and college (Benbow & Minor, 1986).

The more fundamental question, however, is whether individual differences in relative perceived value of occupations mediate individual differences in occupational choice. We have been studying this question for the last 10 years. Before I summarize our most recent findings, I will discuss how my colleagues and I conceptualize task value.

Like others (e.g., Raynor, 1974; Stein & Bailey, 1973), we assume that task value is a quality of the task that contributes to the increasing or decreasing probability that an individual will select it. We have defined this quality in terms of four components: (a) the utility value of the task in facilitating one's long-range goals, or in helping the individual obtain immediate or long-range external rewards; (b) intrinsic interest in, and enjoyment of, the task; (c) attainment value, or the value an activity has because engaging in it is consistent with one's self-image; and (d) the cost of engaging in the activity. The last two of these are especially important for any consideration of the impact of gender roles on the value people attach to various activity choices.

Attainment value. We conceptualize attainment value in terms of the needs and personal values that an activity fulfills. As individuals grow up, they develop an image of who they are and what they would like to be. This image is made up of many component parts including: (a) conceptions of personality and capabilities, (b) long-range goals and plans, (c) schema regarding the proper roles of men and women, (d) instrumental and terminal values (Rokeach, 1973), (e) motivational sets, (f) ideal images of what one should be like, and (g) social scripts regarding proper behavior in a variety of situations. Those parts of an individual's self-image that are central or critical to self-definition should influence the value the individual attaches to various educational and vocational options. These differential values, in turn, should influence the individual's achievement-related choices (Eccles, 1984, 1987, 1989; Markus, 1980; Nash, 1979; Parsons & Goff, 1980). For example, if helping other people is a central part of individual *B*'s image, then *B* should place higher value on helping occupations than on nonhelping occupations.

Essentially, we argue that personal needs, self-images, and values operate in ways that both decrease the probability of engaging in those activities or roles perceived as inconsistent with one's central values and increase the probability of engaging in roles or activities perceived as consistent with one's definition of self. More specifically, we believe that individuals perceive tasks in terms of certain characteristics that can be related to their needs and values. For example, a difficult task requiring great effort for mastery may be perceived as an achievement task; if it also involves pitting one's performance against others, it may be perceived as a competitive task. Other tasks may be perceived in terms of nurturance, power, or aesthetic pleasure. Participating in a particular task will require the demonstration of the characteristics associated with the task. Whether this requirement is seen as an opportunity or a burden will depend on the individual's needs, motives, and personal values, and on the individual's desire to demonstrate these characteristics both to her/himself and to others (see Bell, 1989, and Kerr, 1985, for examples of these dynamics among the gifted).

In summary, we assume the following: (a) individuals seek to confirm their possession of those characteristics central to their self-image, (b) various tasks provide differential opportunities for such confirmation, (c) individuals place more value on those tasks that either provide the opportunity to fulfill their self-image or are consistent with their self-image and long-range goals, and (d) individuals are more likely to select tasks with higher subjective value than tasks with lower subjective value. To the extent that women and men have different self-images, various activities will come to have different subjective value for women and men. And, to the extent that women and men place differential subjective value on various educational and vocational characteristics, they should also differ in their educational and vocational choices. This hypotheses is discussed in more detail later.

Perceived cost. According to our model, the value of a task should also depend on a set of beliefs that best can be characterized as the cost of participating in the activity. Cost is influenced by many factors, such as anticipated anxiety, fear of failure, and fear of the social consequences of success. Gender differences are quite likely on each of these psychological costs (e.g., see Bell, 1989; Eccles, 1984, 1987, 1989; Kerr, 1985). Cost also can be conceptualized in terms of the loss of time and energy for other activities. People have limited time and energy. They cannot do everything they would like; therefore they must choose among activities. To the extent that one loses time for activity *B* by engaging in activity *A* and to the extent that activity *B* is high in one's hierarchy of importance, then the subjective cost of engaging in *A* increases. Alternatively, even if the attainment value of *A* is high, the value of engaging in *A* will be reduced to the extent that the attainment value of *B* is higher and to the extent that engaging in *A* jeopardizes the probability of successfully engaging in *B* (see Kerr, 1985, for good examples of this process in action in gifted women's lives).

Empirical support. We return to the question of whether individual differences in the relative subjective task value of a variety of occupations mediate individual differences in occupational choice. As predicted in the model in Figure 1, several studies provide support for the hypothesized link between personal values and achievement-related choices. Duntzman, Wisenbaker, and Taylor (1978) studied the link between personal values and selection of one's college major using a longitudinal, correlational design. They identified two sets of values that both predicted students' subsequent choice of major and differentiated the sexes. The first set (labeled thing-orientation) reflected an interest in manipulating objects and understanding the physical world. The second set (labeled person-oriented) reflected an interest in understanding human social interaction and a concern with helping people. Students who were high on thing-orientation and low on person-orientation were more likely than other students to select a math or a science major. Not surprisingly, women in their study were more likely than men to be person-oriented and to major in something other than math or science. In contrast, the men were more likely than the women both to be thing-oriented and to major in math and science.

We have also studied this question in our longitudinal study of approximately 1,000 adolescents from southeastern Michigan (The Michigan Study of Adolescent Life Transitions [MSALT]). Our results provide further support for the predicted relation between personal values, subjective task values, and occupational choices. When these adolescents were seniors in high school, we assessed the following constructs: (a) occupational aspirations, (b) the value and importance they attached to a wide array of occupations and of occupational characteristics (e.g., work that allows

one to help other people, work that allows one to earn a lot of money, etc.), and (c) their personal efficacy for success in the same array of occupations. We then used discriminant analysis to determine the strongest predictors of occupational choice within gender rather than across genders (for details see Jozefowicz et al., 1993). As predicted in the model in Figure 1, for every occupational category, the relevant dimension of personal efficacy/expectations for success was an important predictor (e.g., efficacy for health-related occupations was a strong predictor only of plans to enter a health-related profession; efficacy for working with people was a strong predictor only of plans to enter a human service occupation). In addition, as predicted in the model in Figure 1, the values attached to relevant job characteristics were significant predictors of occupational aspirations. But the findings for values were more complex in that values had both positive and negative predictive power. As we had predicted in our model, for any given occupational category, the extent to which the individual valued characteristics associated with the occupation predicted plans to enter that occupational category (e.g., valuing creativity predicted women's plans to become artists or writers, valuing helping others predicted women's plans to enter either human service or health-related professions). In addition, however, and consistent with the notion that the individual hierarchy of values is most important, valuing helping others predicted not aspiring to either a physical science-related profession or a business/law-related profession. Similarly, valuing occupational prestige predicted not aspiring to a human service occupation.

These results suggest that although expectations for success and personal efficacy predict occupational choice, they are not the only predictors. The evidence suggests that positive expectations are a necessary, but not sufficient, predictor of occupational choice. Believing that one can succeed at an occupation is critical to one's decision to enter that occupational field. But, as predicted by the Eccles et al. model of task choice, the particular occupation selected also appears to depend on the value attached to various occupational characteristics. These findings support the hypothesis that women select the occupation that best fits their hierarchy of occupationally relevant values.

Gender Roles and Gender Differences in Occupational Choice

This analysis has a number of important implications for our understanding of gender differences in the educational and vocational choices. Because socialization shapes both individuals' self-perceptions and their goals and values, women and men should acquire different self-concepts, different patterns of expectations for success across various activities, and different values and goals through the processes associated with gender role socialization. Through their potential impact on both expectations for

success and subjective task value, these socialization experiences can affect educational and vocational choices in several ways.

First, gender role socialization could lead women and men to have different hierarchies of core personal values (such as their terminal and instrumental values; Rokeach, 1973). Several studies have documented such differences. For example, among the high-school seniors in our longitudinal study of adolescent life transitions (MSALT), girls placed more value than boys on the importance of making occupational sacrifices for one's family and on the importance of having a job that allows one to help others and do something worthwhile for society. In contrast, the boys placed more value on becoming famous, making lots of money, seeking out challenging tasks, and doing work that involves the use of math and computers (Jozefowicz et al., 1993). These women and men did not differ in the value they attached to doing one's best at one's job and to doing creative and/or intellectually stimulating work. A somewhat similar pattern of results emerges in studies of gifted children. Gifted girls typically score higher than gifted boys on scales tapping social and aesthetic values; in contrast, gifted boys typically score higher than the girls on scales tapping theoretical, economic, and political values (Fox, 1976; George & Denham, 1976; McGinn, 1976). Gifted boys and girls, however, typically score equally high on investigative interests (Fox et al., 1976; George & Denham, 1976; McGinn, 1976). To the extent that these differences exist, tasks embodying various characteristics should have different subjective values for women and men. For example, both girls and boys stereotype mathematicians and scientists as loners who have little time for their families or friends because they work long hours in a laboratory on abstract problems that typically have limited immediate social implications (Boswell, 1979). If the analysis developed in the previous section is correct, such a profession should hold little appeal to someone who rates social values high and thinks it is very important to devote time and energy to one's family.

Secondly, gender role socialization also could lead females and males to place different values on various long-range goals and adult activities (Nash, 1979). The essence of gender roles (and of social roles in general) is that they define the activities that are central to the role. In other words, they define what one should do with one's life in order to be successful in that role. If success in one's gender role is a central component of one's identity, then activities that fulfill this role should have high subjective task value and activities that hamper efforts at successfully fulfilling one's gender role should have lower subjective task value. Gender roles mandate different primary activities for women and men. Women are supposed to support their husbands' careers and raise their children; men are supposed to compete successfully in the occupational world in order to confirm their worth as human beings and to support their families. To the extent that a woman has internalized this culture's definition of the female role, she

should rank order the importance of various adult activities differently from her male peers. In particular, she should rate parenting and spouse-support roles as more important than professional career roles, and she should be more likely than her male peers to resolve life's decisions in favor of these family roles. We found evidence of these gender differences in our longitudinal study of adolescents (MSALT). As noted earlier, the women in this study indicated they would be more likely to make sacrifices in their professional life for the needs of their family than did the men (Jozefowicz et al., 1993). Both Sears (1979) and Kerr (1985) provided compelling examples of how this process influenced the career-related decisions of gifted women – many of whom chose to limit their career development to do their best as wives and mothers. In contrast, men should rate family and career roles as equally important. In fact, because they can fulfill their family role by having a successful career, men should expect these two sets of roles to be compatible. Consequently, aspiring to a high-status, time-consuming career should not pose as much of a conflict for men as for women. And such careers should have high subjective value not only because of the rewards inherent in these occupations, but also because they fulfill the male gender role mandate.

Thirdly, gender roles can influence the definition one has of successful performance of those activities considered to be central to one's identity. Consequently, women and men may differ in their conceptualization of the requirements for successful task participation and completion. If so, women and men should approach and structure their task involvement differently even when they appear to be selecting a similar task. The parenting role provides an excellent example of this process. If males define success in the parenting role as an extension of their occupational role, then they may respond to parenthood with increased commitment to their career goals and with emphasis on encouraging a competitive drive in their children. In contrast, if women define success in the parenting role as high levels of involvement in their children's lives, they may respond to parenthood with decreased commitment to their career goals. Furthermore, if staying home with her children and being psychologically available to them most of the time are central components of a woman's gender role schema, then involvement in a demanding, high-level career should have reduced subjective value, precisely because it conflicts with a more central component of her identity.

Fourth, women and men could differ in the density of their goals and values. Some evidence suggests that men are more likely than women to exhibit a single-minded devotion to one particular goal, especially their occupational goal. In contrast, women seem more likely than men to be involved in, and to value, competence in several activities simultaneously (Baruch, Barnett, & Rivers, 1983; Maines, 1983). Similar results have emerged in studies of gifted children and adults (e.g., McGinn, 1976; Terman & Oden, 1947). For example, in one study the gifted boys evi-

denced a more unidimensional set of interests than gifted girls on the Strong-Campbell Vocational Interest test. That is, the boys scored quite high on investigative interests and low on most other interests; in contrast, the girls scored higher than average on several interest clusters (McGinn, 1976). A similar discrepancy emerged when these gifted girls and boys were asked to rate several occupations on the Semantic Differential Scales. The boys gave positive ratings only to traditional male scientific and mathematical professions; all of the female professions and homemaker roles were rated negatively. In contrast, the gifted girls gave both male- and female-typed professions, as well as the homemaker roles, very positive ratings. A similar pattern emerged on a recent wave of data collection from the Terman sample (Sears, 1979). The gifted women and men were asked to rate how important each of six goals were to them in making their life plans during early adulthood. The men rated only one area (occupation) as having had higher importance than did the women; in contrast, the women rated four areas as having had higher importance than did the men (family, friends, richness of one's cultural life, and joy in living). These data suggest that these gifted women had desired a more varied, or multifaceted, life than the men had desired at the time in life when people make major decisions about their life plans.

A fifth pattern characterized the responses of these gifted women and men: Consistent with our hypothesis and with our findings, the men rated family and occupation as of equal importance, whereas the women rated family as more important than occupation. Several researchers have suggested that the perceived conflict of traditional female values and roles with the demands of male-typed achievement activities is very salient to women (e.g., Barnett & Baruch, 1978; Baruch et al., 1983; Eccles, 1984, 1987, 1989; Farmer, 1985). How this conflict affects women's lives is a complex issue. Some studies emphasize its negative consequences. For example, recent interviews with the Terman women suggest they now have regrets about the sacrifices they made in their professional development for their family's needs (Sears, 1979). Similarly, studies with children and adolescents suggest that girls and young women feel caught between their need to be "nice" and their need to achieve. This conflict in gifted girls' lives is well illustrated by a recent ethnographic study of a group of gifted elementary school girls by Lee Anne Bell (1989). She interviewed a multiethnic group of third to sixth grade gifted girls in an urban elementary school regarding the barriers they perceived to their achievement in school. Five gender role-related themes emerged with great regularity: (a) concern about hurting someone else's feelings by winning in achievement contests, (b) concern about seeming to be a braggart if one expressed pride in one's accomplishments, (c) overreaction to nonsuccess experiences (apparently not being the very best is very painful to these girls), (d) concern over their physical appearance and what it takes to be beautiful, and (e) concern with being overly aggressive in

terms of getting the teacher's attention. In each case the gifted girls felt caught between doing their best and either appearing feminine or doing the "caring" thing. Similarly, in his study of the worries of doctoral students in mathematics, Maines (1983) found that the men were most concerned about their professional status and about their mentors' estimates of their professional potential. In contrast, the women were most concerned about the impact of their graduate training on their families and their other interests. They felt that graduate training was taking too much time and energy away from other activities that they valued just as much. Thus, the women appeared to place high attainment value on several goals and activities. In contrast, the men appeared more likely to focus on one main goal: their professional development. If this is true then the psychological cost of engaging in their primary goal in terms of time and energy lost for other important goals would certainly be less for these men than for their female colleagues.

In contrast, several investigators have pointed out that this conflict results, in part, from the fact that women have multiple roles and multiple goals (e.g., Baruch et al., 1983; Baruch & Barnett, 1987; Crosby, 1987, 1991; Eccles, 1987; Frieze, Parsons, Ruble, Johnson, & Zellman, 1978; Grossman & Chester, 1990). These multiple roles provide richness to women's lives as well as stress. There is growing evidence that women with multiple roles are healthier both mentally and physically than women with few roles and healthier than men in general (Baruch & Barnett, 1987; see also Crosby, 1987, 1991, for extensive review).

Finally, as predicted in the model in Figure 1, gender roles could affect the subjective value of various educational and vocational options by indirectly influencing the behaviors and attitudes of the people individuals are exposed to as they grow up. If, for example, parents, friends, teachers, and/or counselors provide girls and boys with different feedback on their performance in various school subjects, with different advice regarding the importance of various school subjects, with different information regarding the importance of preparing to support oneself and one's family, with different information regarding the occupational opportunities that the student should be considering, and with different opportunities to develop various skills, then it is likely that girls and boys will develop different self-perceptions, different patterns of expectations for success, and different estimates of the value of various educational and vocational options. Similarly, if the women and men around the children engage in different educational and vocational activities, then girls and boys should develop different ideas regarding those activities for which they are best suited. Finally, if one's peers reinforce traditional gender role behaviors and values, girls and boys will likely engage in different activities as they are growing up. Thus, they are likely to acquire different competencies, different patterns of expectations or success and different values and long-term goals. Growing evidence exists that each of these processes operate in

the lives of American children as they grow up in this culture (e.g., Braine, 1988; Brophy & Good, 1974; Brush, 1980; Casserly, 1975; Eccles, 1993; Eccles & Harold, 1991, 1992; Eccles & Hoffman, 1983; Eccles, Jacobs, & Harold, 1990; Fox & Cohen, 1980; Fox & Denham, 1974; Huston, 1983; Kahle, 1983; Maccoby, 1990; Parsons, Adler, & Kaczala, 1982; Parsons, Kaczala, & Meece, 1982; Solano, 1977; Zerega & Walberg, 1984).

My colleagues and I are working most intensively on the role of parents and teachers. Our findings clearly indicate that parents and teachers distort their perception of the competencies of particular girls and boys in various domains in a gender role stereotypic fashion. That is, when parents who endorse the traditional gender role stereotypes regarding the distribution of talent and interests among girls and boys are asked to rate their children's competencies in a male-typed activity like athletics or physics, they underestimate their daughters' talent and overestimate their sons' talent (Eccles et al., 1990; Jacobs, 1991; Jacobs & Eccles, 1992). Furthermore, parents provide girls and boys with very different experiences and messages regarding their talent and their best educational and vocational options. For example, they provide boys with more opportunities to do sports and computing; in contrast, they provide girls with more opportunities to read and to interact socially with their peers (Eccles, 1993). They also make different attributions for daughters' versus sons' academic successes and failures (Yee & Eccles, 1988). In turn, these gendered experiences and messages appear to undermine girls' confidence in their own math abilities and interest in applied math-related courses and fields—likely leading quite capable females to decide not to pursue careers in these fields (Eccles, 1993; Eccles & Harold, 1992; Parsons, Adler, & Kaczala, 1982).

CONCLUSION AND POLITICAL COMMENTARY

In conclusion, I began this chapter with a question “Why do women choose the particular occupations they do?” I then presented one theoretical model—the Eccles et al. expectancy-value model of achievement-related choices—designed to guide a research program aimed at answering this question. The evidence I summarized, by and large, supports the hypotheses laid out in this model. Both gender differences and individual differences within each gender in educational and occupational choices are linked to differences in individuals' expectations for success and subjective task value. With regard to the gender difference in the occupations linked to math and physical science in particular, women are less likely to enter these fields than men, both because they have less confidence in their abilities and because they place less subjective value on these fields than on other possible occupational niches. Furthermore, gendered socialization

practices at home, in the schools, and among peers play a major role in shaping these individual differences in self-perceptions and subjective task values.

In addition, evidence also supports our hypothesis that understanding women's occupational choices requires a broad view of the options and roles available to women. Occupational choices are not made in isolation of other life choices, such as the decision to marry and have children, and the decision to balance one's occupational behaviors with one's other life roles. It is clear that many high-achieving girls and women experience a conflict between traditionally feminine values and goals and the demands of traditionally male-typed highly competitive achievement activities. But many women resolve these conflicts in ways that appear to benefit both their physical health and the quality of their lives. The cost they pay for this resolution is often seen in their wages, their rate of advancement, and the stress they experience because society does not provide the types of services, supports, and employment policies that recognize and support the importance of their dual roles and that reward their accomplishments and competencies appropriately (see Crosby, 1987, 1991; Eccles, 1987; Epstein, 1988).

We have seen major shifts in the participation of women in the work force over the last 30 years. By and large, the evidence indicates that women benefit from such participation both financially and psychologically. However, women have tended to enter female-dominated occupations and professions. Why? The work summarized in this paper suggests that given the socialization history of most women, and given the integrated lives many women want to lead, this choice is both reasonable and predictable. In addition, most women know that women in male-dominated occupations often face discrimination and harassment on their jobs, as well as more subtle forms of disapproval from their colleagues, friends, and relatives. The anticipation of these kinds of negative experiences can also deter women from selecting male-dominated and excessively time-consuming occupations. More equitable treatment and more family-sensitive social policies and supports would likely facilitate women's willingness to consider a wide variety of occupational choices.

Society pays a high cost for its inadequate support of women's dual roles, as well as its failure to combat discrimination and harassment—the loss of women's talent and perspective from many high-status, time-consuming occupations. It is not clear that the benefits society derives from structuring these occupations to be so time-consuming is worth the loss of so many potentially qualified and interested individuals. At present, both women and men tend to go into gender-stereotypic occupations. Evidence suggests that these choices are not necessarily based on individuals' aptitudes and interests. Policies that would support greater flexibility for both women and men to integrate work and family roles could increase the range of choices seriously considered by both women and men, which,

in turn, might increase the range of individuals filling all types of adult work and family roles.

First draft received: December 1, 1993

Final draft received: June 26, 1994

REFERENCES

- Atkinson, J. W. (1964). *An introduction to motivation*. Princeton, NJ: Van Nostrand.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review*, *84*, 191-215.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Barnett, R. C., & Baruch, G. K. (1978). *The competent woman*. New York: Irvington.
- Baruch, G., Barnett, R., & Rivers, C. (1983). *Life prints*. New York: McGraw-Hill.
- Bell, L. A. (1989). Something's wrong here and it's not me: Challenging the dilemmas that block girls' success. *Journal for the Education of the Gifted*, *12*, 118-130.
- Benbow, C. P. (1988). Sex differences in mathematical reasoning ability in intellectually talented preadolescents: Their nature, effects, and possible causes. *Behavioral and Brain Sciences*, *11*, 169-183.
- Benbow, C. P., & Minor, L. L. (1986). Mathematically talented males and females and achievement in the high school sciences. *American Educational Research Journal*, *23*, 425-436.
- Benbow, C. P., & Stanley, J. C. (1982). Consequences in high school and college of sex differences in mathematical reasoning ability: A longitudinal perspective. *American Educational Research Journal*, *19*, 598-622.
- Benbow, C. P., & Stanley, J. C. (1984). Gender and the science major. A study of mathematically precocious youth. In M. W. Steinkamp & M. L. Maehr (Eds.), *Women in science*. Greenwich, CT: JAI Press.
- Betz, N. E., & Fitzgerald, L. F. (1987). *The career psychology of women*. Orlando, FL: Academic Press.
- Betz, N. E., & Hackett, G. (1981). The relationship of career-related self-efficacy expectations to perceived career options in college women and men. *Journal of Counseling Psychology*, *28*, 399-410.
- Betz, N. E., & Hackett, G. (1986). Applications of self-efficacy theory to understanding career choice behavior. *Journal of Social and Clinical Psychology*, *4*, 279-289.
- Boswell, S. (1979). *Nice girls don't study mathematics: The perspective from elementary school*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco.
- Braine, L. G. (1988). Sex differences in mathematics: Is there any news here? *Behavioral and Brain Sciences*, *11*, 185-186.
- Brophy, J. E., & Good, T. (1974). *Teacher-student relationships: Causes and consequences*. New York: Holt, Rinehart, and Winston.
- Brush, L. (1980). *Encouraging girls in mathematics: The problem and the solution*. Boston: ABT Books.
- Casserly, P. (1975). *An assessment of factors affecting female participation in advanced placement programs in mathematics, chemistry, and physics*. Report to the National Science Foundation. Reprinted in L. H. Fox, L. Brody, & D. Tobin (Eds.). (1980). *Women and the mathematical mystique*. Baltimore: Johns Hopkins University Press.
- Crandall, V. C. (1969). Sex differences in expectancy of intellectual and academic reinforcement. In C. P. Smith (Ed.), *Achievement-related behaviors in children* (pp. 11-45). New York: Russell Sage Foundation.

- Crosby, F. J. (Ed.). (1987). *Spouse, parent, worker: On gender and multiple roles*. New Haven, CT: Yale University Press.
- Crosby, F. J. (1991). *Juggling*. New York: Free Press.
- Dauber, S. L., & Benbow, C. P. (1990). Aspects of personality and peer relations of extremely talented adolescents. *Gifted Child Quarterly*, 34, 10-15.
- Dunteman, G. H., Wisenbaker, J., & Taylor, M. E. (1978). *Race and sex differences in college science program participation*. Report to the National Science Foundation. North Carolina: Research Triangle Park.
- Eccles, J. S. (1984). Sex differences in achievement patterns. In T. Sonderegger (Ed.), *Nebraska symposium on motivation, 1983* (pp. 97-132). Lincoln, NB: University of Nebraska Press.
- Eccles, J. S. (1987). Gender roles and women's achievement-related decisions. *Psychology of Women Quarterly*, 11, 135-172.
- Eccles, J. S. (1989). Bringing young women to math and science. In M. Crawford & M. Gentry (Eds.), *Gender and Thought: Psychological perspectives* (pp. 36-57). New York: Springer-Verlag.
- Eccles, J. S. (1993). School and family effects on the ontogeny of children's interests, self-perceptions, and activity choice. In J. Jacobs (Ed.), *Nebraska Symposium on Motivation, 1992: Developmental perspectives on motivation* (pp. 145-208). Lincoln, NB: University of Nebraska Press.
- Eccles (Parsons), J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectations, values and academic behaviors. In J. T. Spence (Ed.), *Perspective on achievement and achievement motivation* (pp. 75-146). San Francisco: W. H. Freeman.
- Eccles (Parsons), J., Adler, T., & Meece, J. L. (1984). Sex differences in achievement: A test of alternate theories. *Journal of Personality and Social Psychology*, 46, 26-43.
- Eccles, J. S., & Harold, R. D. (1991). Gender differences in sport involvement: Applying the Eccles' expectancy-value model. *Journal of Applied Sport Psychology*, 3, 7-35.
- Eccles, J. S., & Harold, R. D. (1992). Gender differences in educational and occupational patterns among the gifted. In N. Colangelo, S. G. Assouline, & D. L. Ambroson (Eds.), *Talent development: Proceedings from the 1991 Henry B. and Jocelyn Wallace National Research Symposium on Talent Development* (pp. 3-29). Unionville, NY: Trillium Press.
- Eccles, J., & Hoffman, L. W. (1984). Sex roles, socialization, and occupational behavior. In H. W. Stevenson & A. E. Siegel (Eds.), *Research in child development and social police: Volume 1* (pp. 367-420). Chicago: University of Chicago Press.
- Eccles, J. S., Jacobs, J. E., & Harold, R. D. (1990). Gender-role stereotypes, expectancy effects, and parents' role in the socialization of gender differences in self perceptions and skill acquisition. *Journal of Social Issues*, 46, 182-201.
- Eccles, J. S., Wigfield, A., Flanagan, C. A., Miller, C., Reuman, D. A., & Yee, D. (1989). Self-concepts, domain values, and self-esteem: Relations and changes at early adolescence. *Journal of Personality*, 57, 283-310.
- Eccles, J. S., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Ontogeny of children's self-perceptions and subjective task values across activity domains during the early elementary school years. *Child Development*, 64, 830-847.
- Epstein, C. (1988). *Deceptive distinctions: Sex, gender, and the social order*. New Haven, CT: Yale University Press.
- Farmer, H. S. (1985). Model of career and achievement motivation for women and men. *Journal of Counseling Psychology*, 32, 363-390.
- Fox, L. H. (1976). Sex differences in mathematical precocity: Bridging the gap. In D. P. Keating (Ed.), *Intellectual talent: Research and development*. Baltimore: The Johns Hopkins University Press.
- Fox, L. H. (1982). *The study of social processes that inhibit or enhance the development of*

- competence and interest in mathematics among highly able young women*. Final report to the National Institute of Education: Washington, DC.
- Fox, L. H., & Cohen, S. J. (1980). Sex differences in the development of precocious mathematical talent. In L. H. Fox, L. Brody, & D. Tobin (Eds.), *Women and the mathematical mystique* (pp. 94-111). Baltimore: The Johns Hopkins University Press.
- Fox, L. H., & Denham, S. A. (1974). Values and career interests of mathematically and scientifically precocious youth. In J. C. Stanley, D. P. Keating, & L. H. Fox (Eds.), *Mathematical talent: Discovery, description, and development*. Baltimore: Johns Hopkins University Press.
- Fox, L. H., Pasternak, S. R., & Peiser, N. L. (1976). Career-related interests of adolescent boys and girls. In D. P. Keating (Ed.), *Intellectual talent: Research and development*. Baltimore: The Johns Hopkins University Press.
- Frieze, I., Parsons, J. E., Johnson, P., Ruble, D. N., & Zellman, G. (1978). *Women and sex roles: A social psychological perspective*. New York: Norton.
- George, W. C., & Denham, S. A. (1976). Curriculum experimentation for the mathematically talented. In D. P. Keating (Ed.), *Intellectual talent: Research and development*. Baltimore: The Johns Hopkins University Press.
- Grossman, H., & Chester, N. L. (Eds.). (1990). *The experience and meaning of work in women's lives*. Hillsdale, NJ: Erlbaum.
- Hollinger, C. L. (1983). Self-perception and the career aspirations of mathematically talented female adolescents. *Journal of Vocational Behavior*, 22, 49-62.
- Huston, A. C. (1983). Sex-typing. In P. Mussen & E. M. Hetherington (Eds.), *Handbook of Child Psychology, Vol. IV* (pp. 387-467). New York: Wiley.
- Jacobs, J. E. (1991). Influence of gender stereotypes on parent and child mathematics attitudes. *Journal of Educational Psychology*, 83, 518-527.
- Jacobs, J. E., & Eccles, J. S. (1992). The influence of parent stereotypes on parent and child ability beliefs in three domains. *Journal of Personality and Social Psychology*, 63, 932-944.
- Jozefowicz, D. M., Barber, B. L., & Eccles, J. S. (1993, March). *Adolescent work-related values and beliefs: Gender differences and relation to occupational aspirations*. Paper presented at Biennial Meeting of the Society for Research on Child Development, New Orleans, LA.
- Kahle, J. (1984). *Girl friendly science*. Paper presented at the annual meeting of the American Association for the Advancement of the Sciences, New York.
- Kerr, B. A. (1985). *Smart girls, gifted women*. Dayton, OH: Ohio Psychology Publishing Co.
- Lewin, K. (1938). *The conceptual representation and the measurement of psychological forces*. Durham, NC: Duke University Press.
- Maccoby, E. (1990). Gender and relationships: A developmental account. *American Psychologist*, 45, 513-20.
- Maines, D. R. (1983). *A theory of informal barriers for women in mathematics*. Paper presented at the annual meeting of the American Educational Research Association, Montreal.
- Markus, H. (1980). The self in thought and memory. In D. M. Wegner & R. R. Vallacher (Eds.), *The self in social psychology*. New York: Oxford University Press.
- McGinn, P. V. (1976). Verbally gifted youth: Selection and description. In D. P. Keating (Ed.), *Intellectual talent: Research and development*. Baltimore: The Johns Hopkins University Press.
- Meece, J. L., Eccles (Parsons), J., Kaczala, C. M., Goff, S. B., & Futterman, R. (1982). Sex differences in math achievement: Toward a model of academic choice. *Psychological Bulletin*, 91, 324-348.
- Nash, S. C. (1979). Sex role as a mediator of intellectual functioning. In M. A. Wittig & A. C. Petersen (Eds.), *Sex-related differences in cognitive functioning: Developmental issues*. New York: Academic Press.

- National Center for Educational Statistics. (1980, January 28). Degrees awarded in 1978. Reported in *Chronicle of Higher Education*.
- National Science Foundation. (1990). *Women, minorities and persons with physical disabilities in science and engineering*. Washington, DC: National Science Foundation.
- Parsons, J. E., & Goff, S. G. (1980). Achievement motivation: A dual modality. In L. J. Fyans (Ed.), *Recent trends in achievement motivation: Theory and research*. Englewood Cliffs, NJ: Plenum Press.
- Parsons, J. E., Adler, T. F., & Kaczala, C. M. (1982). Socialization of achievement attitudes and beliefs: Parental influences. *Child Development*, 53, 310-321.
- Parsons, J. E., Kaczala, C., & Meece, J. (1982). Socialization of achievement attitudes and beliefs: Classroom influences. *Child Development*, 53, 322-339.
- Raynor, J. O. (1974). Future orientation in the study of achievement motivation. In J. W. Atkinson & J. O. Raynor (Eds.), *Motivation and achievement*. Washington, DC: Winston Press.
- Rokeach, M. (1973). *The nature of human values*. New York: The Free Press.
- Schunk, D. H., & Lilly, M. W. (1982). *Attributional and expectancy change in gifted adolescents*. Paper presented at the annual meeting of the American Educational Research Association, New York.
- Sears, P. S. (1979). The Terman genetic studies of genius, 1922-1972. In A. H. Passow (Ed.), *The gifted and the talented: Their education and development. The seventy-eighth yearbook of the National Society of the Study of Education*. Chicago: The University of Chicago Press.
- Solano, C. H. (1977). Teacher and pupil stereotypes of gifted boys and girls. *Talents and Gifts*, 19, 4.
- Stein, A. H., & Bailey, M. M. (1973). The socialization of achievement orientation in females. *Psychological Bulletin*, 80, 345-366.
- Strauss, S., & Subotnik, R. F. (1991). *Gender differences in classroom participation and achievement: An experiment involving advanced placement calculus classes. Part I*. Unpublished manuscript, New York City: Hunter College of the CUNY.
- Terman, L. H. (1926). *Genetic studies of genius: Volume 1*. Stanford, CA: Stanford University Press.
- Terman, L. M. (1930). *Genetic studies of genius: Volume 3*. Stanford, CA: Stanford University Press.
- Terman, L. M., & Oden, M. H. (1947). *Genetic studies of genius. Volume IV: The gifted child grows up*. Stanford, CA: Stanford University Press.
- Tidwell, R. (1980). Gifted students' self-images as a function of identification procedure, race, and sex. *Journal of Pediatric Psychology*, 5, 57-69.
- Tomlinson-Keasey, C., & Smith-Winberry, C. (1983). Educational strategies and personality outcomes of gifted and nongifted college students. *Gifted Child Quarterly*, 27, 35-41.
- Vetter, B. M. (1981). Women scientists and engineers: Trends in participation. *Science*, 214, 1313-1321.
- Vetter, B., & Babco, E. (1986, February). *Professional women and minorities*. Washington, DC: Commission on Professionals in Science and Technology.
- Weiner, B. (1974). *Achievement motivation and attribution theory*. Morristown, NJ: General Learning Press.
- Wigfield, A., Eccles, J. S., Mac Iver, D., Reuman, D. A., & Midgley, C. M. (1991). Transitions at early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology*, 27, 552-565.
- Yee, D., & Eccles, J. S. (1988). Parent perceptions and attributions for children's math achievement. *Sex Roles*, 19, 59-68.
- Zerega, M. E., & Walberg, H. J. (1984). School science and femininity. In M. W. Steinkamp & M. L. Maehr (Eds.), *Women in science*. Greenwich, CT: JAI Press.