Journal of Personality and Social Psychology
1984, Vol. 46, No. 1, 26–43

Sex Differences in Achievement: A Test of Alternate Theories

Jacquelynne Eccles (Parsons) and Terry Adler
University of Michigan

Judith L. Meece
University of Pittsburgh

To compare four major social cognitive theories of sex differences in achievement, 200 students in Grades 8–10 were given the following attitudinal measures regarding both math and English: self-concept of ability, subjective task value, perceived task difficulty, and continuing motivation. In a follow-up, the students' math course enrollment decisions were assessed each year through high school. One hundred forty-two of these students also participated in an experimental session in which they were exposed to two sets of trials: a number sequence set and an anagram set. Outcome was manipulated across trials (success, failure, success). For each series, students provided estimates of their ability, their expectations for continued success, and causal attributions. Their response time, persistence, and accuracy were recorded. Finally, teacher estimates of learned helplessness were obtained in Year 1 of the study for all students. Four important results emerged: (a) Subjective task value emerged as the strongest mediator of sex differences in achievement-related behaviors and plans; (b) there was little support for learned-helplessness models of sex differences in achievement; (c) there was some evidence of sex differences in ability attributions, but these differences occurred only among low-expectancy subjects; and (d) verbal and behavioral indexes of achievement beliefs were often inconsistent. The implications of these results for general attribution theory and for sex-difference theory are discussed.

Two areas of cognitive functioning reveal fairly consistent patterns of sex differences. Girls typically perform better than boys on verbal tasks, whereas boys perform better than girls on quantitative tasks; these differences, however, are quite small, accounting for only 1%–2% of variance in the criterion measure, and do not occur with regularity until the adolescent years (see Eccles, 1983; Hyde, 1981). Sex differences in high school courses enrollment, college majors, and adult careers reflect a similar, though more extreme, pattern. For example, among the bachelor degrees awarded in 1979, women received only 6% of those in engineering, 18% in computer and informational science, 18% in physical science, and 34% in mathematics. In contrast, 80% of bachelor degrees in letters, 68% in education, and 80% in library science went to women (Randour, Strasburg, & Lipman-Blumen, 1982). Several different explanations have been offered to account for these sex differences in academic achievement patterns. In this study, we compare and test the four most popular of the attitudinal and motivational explanations.[1] In particular, we compare explanations growing out of self-concept theory, attribution theory, learned-helplessness/mastery-orientation theory, and expectancy-value theory.

This research was funded by National Institute of Mental Health Grant 1 R01 MH 31724 and a Spencer Foundation grant to the first author. We extend grateful acknowledgments to Carol Midgley, Caroline Kaczala, Toby Jayaratne; to the countless work-study students, students, and teachers who helped throughout this project; and to Betty Collard who helped prepare the manuscript.

Requests for reprints should be sent to Jacquelynne Eccles (Parsons), Department of Psychology, 3441 Mason Hall, University of Michigan, Ann Arbor, Michigan 48109.

[1] Although these explanations overlap theoretically, we have separated them according to the operational definitions of the theoretical contructs and the research traditions of the theoreticians.

Self-Concept Theories

The importance of self-concept of ability has been discussed extensively in the achievement literature. Ability perceptions affect a variety of achievement behaviors including academic performance, task persistence, and task choice; people with positive perceptions of their ability approach achievement tasks with confidence and high expectations for success and, consequently, perform well on these tasks (e.g., Bandura, 1977; Battle, 1965; Eccles et al., 1983). That males and females have different perceptions of their competence has also been documented. Compared with males, females tend to have lower estimates of their abilities, performance, and expectations for future success in some achievement situations, even when they actually perform as well if not better than males (see Crandall, 1969; Meece, Eccles-Parsons, Kaczala, Goff, & Futterman, 1982; Parsons, Ruble, Hodges, & Small, 1976). It is not entirely clear, however, whether these sex differences reflect a generalized low-self-concept/low-expectancy pattern in females. Several researchers (e.g., McHugh, Frieze, & Hanusa, 1982) suggest that the male sex typing of experimental tasks typically used in research may account for the apparent consistency of these sex differences. When the sex appropriateness of the experimental task is manipulated, females expect to do less well than males on male-typed tasks; in contrast, females expect to do at least as well as males on "feminine" and neutral tasks, (Gitelson, Petersen, & Tobin-Richards, 1982; McHugh & Frieze, 1982; Stein & Smithells, 1969).

These results suggest that sex differences in ability ratings and expectancies are task specific. Both males and females may hold higher expectations for their performance on those tasks presented or perceived as more appropriate for their sex. If this is the case, then sex differences in the pattern of ability estimates could mediate the sex differences in achievement patterns discussed earlier. Both children and adolescents tend to sex type math and English. Mathematics, when it is sex typed, is viewed as a male domain (Eccles et al., 1983; Fennema & Sherman, 1978; Stein & Smithells, 1969). In contrast, reading and English are stereotyped as female domains as early as the sixth grade (Kaczala, 1981; Stein & Smithells, 1969). Therefore, sex differences in the ability and expectancy ratings of students should vary across these subject domains. Boys should evidence higher confidence than girls for mathematics, whereas girls should evidence higher confidence than boys for verbal tasks. In addition, girls should be more confident of their verbal abilities than their mathematical abilities, whereas boys should be more confident of their mathematical abilities than their verbal abilities.

Attribution Theories

Since first proposed by Weiner and his colleagues (Weiner et al., 1971), attribution theory has generated a great deal of research. The original theory proposed that causal attribution patterns are related in systematic ways to expectancies for future performance, to subsequent achievement strivings, and to the affect associated with achievement outcomes. Attributions implying that success is likely and that failure is surmountable have the most positive effects on both affect and subsequent achievement behavior (Weiner, Russell, & Lerman, 1978).

Sex differences in achievement patterns may be mediated by sex differences in causal attributions. It is generally argued that males tend to attribute their success to internal, stable causes and their failures to external or unstable causes, whereas females tend to reverse this pattern, taking personal responsibility for their failures but not for their successes (e.g., Bar-Tal, 1978). However, these trends are not evident in all studies, and in many instances results are mixed and equivocal (see Frieze, Whitley, Hanusa, & McHugh, 1982; Parsons, 1983). In addition, few studies have actually assessed attributional differences related either to achievement tasks presented in naturalistic settings or to specific school subject areas. Because sex differences in attributional patterns may be most marked for sex-typed achievement tasks (McHugh & Frieze, 1982) and because mathematics and English are typically sex stereotyped, more consistent findings might emerge in studies focusing specifically on mathematics and verbal performance. Studies focusing on mathematics have shown that females rate lack of ability and/or skill as a slightly more important cause of their math failures than males. Males also appear to rate ability as a slightly more important cause of success in mathematics than do females (Eccles et al., 1983; Parsons, Meece, Adler, & Kaczala, 1982; Wolleat, Pedro, Becker, & Fennema, 1980). Consequently, sex differences in math achievement might be mediated by sex differences in attributional patterns. Furthermore, if comparable differences emerge for verbal tasks, then attributions might mediate sex differences in this domain as well. This study tests for a Sex × Subject Area interaction on causal attributions.

Learned Helplessness Versus Mastery Orientation

Learned helplessness is yet another motivational construct that has been linked to both achievement behavior in general and to sex differences in achievement behavior. Extending the work of Seligman (1975) and his colleagues into the achievement domain, Dweck and her colleagues (Diener & Dweck, 1978; Dweck & Reppucci, 1973) have studied the achievement behavior and cognitions of "learned helpless" and "mastery-oriented" children. In these studies, learned-helplessness children readily give up or show a steady decline in the effectiveness of their problem-solving strategies when confronted with failure. Mastery-oriented children, on the other hand, show increased persistence or improved performance in the face of failure.

Many studies have examined possible attributional differences underlying learned helplessness (e.g., Diener & Dweck, 1978; Dweck & Reppucci, 1973; Klein, Fencil-Morse, & Seligman, 1976). In each of these studies, the attribution of failure to external, stable factors or to lack of ability has been associated with increased helplessness. In contrast, attributions to variable, situational factors or variable, controllable internal factors such as task difficulty or lack of effort have been associated with mastery orientation. These studies point to the importance of attributional processes as mediators of learned helplessness.

The sex differences in attributional patterns discussed earlier suggest that females may be more prone to a learned-helplessness response especially for tasks involving mathematics. If this is the case, then sex differences in math and language achievements may be mediated by sex differences in learned helplessness (Dweck & Licht, 1980). Although it has been argued that there is a sex difference in the incidence of learned-helpless behaviors, careful review of that literature suggests that the sex differences are neither as consistent nor as strong as one might expect (see Parsons, 1983). However, learned helplessness has rarely been studied for subject areas that are sex typed. Boys and girls may vary in the frequency of learned-helpless behaviors depending on the subject domain under consideration. Girls may be more likely to exhibit learned-helpless behaviors in a male-stereotyped subject such as mathematics, whereas boys may be more likely to exhibit learned-helpless behaviors in a female-stereotyped subject such as language arts.

Learned helplessness has been operationally defined in a variety of ways. To test the predicted Sex × Subject Domain interaction, we have chosen the following four operational definitions because they are the most common and because they are the most directly related to learned-helplessness models of achievement: (a) attributing failure to a stable, internal cause; (b) attributing both successes and failure to external, uncontrollable causes; (c) exhibiting a debilitating behavioral response to failure; and (d) teacher nomination.

Expectancy and Subjective Task Value

Eccles (Parsons) and her colleagues have suggested that sex differences in achievement can best be understood if a more complex model of choice behavior is used rather than models based primarily on expectancies and causal attributions. Building on expectancy-value theory, Eccles et al. (1983) have elaborated a model linking achievement choices to expectancies for success and to the importance or incentive value of the task (see Figure 1; see also Meece et al., 1982). Predictions regarding the potential role of expectancies were discussed in the self-concept section; only subjective task value is discussed here.

Inherent in expectancy-value models of behavior is the assumption that task value influences behavioral choices. Task value can be conceptualized in a variety of ways. Atkinson (1964) linked the value of engaging in a task to the degree of difficulty or challenge inherent in the task; success at hard tasks was assumed to have greater value than success at easy tasks. Several theorists have broadened Atkinson's concept of task value (Crandall, 1969; Parsons & Goff, 1980; Raynor, 1974). According to these theorists, the value of a task is determined both by the characteristics of the task and by the needs, goals, and values of the person. The degree to which a particular task is able to fulfill needs, to facilitate reaching goals, or to affirm personal values influences the value a person attaches to engaging in that task.

Elaborating on the work of these theorists, Eccles et al. (1983) suggested that task value be conceptualized in terms of four major components: attainment value, intrinsic value or interest, utility value, and cost. Attainment value represents the importance of doing well on a task. Intrinsic or interest value is the inherent enjoyment or pleasure one gets from engaging in an activity. Utility value is the value a task acquires because it is instrumental in reaching a variety of long- and short-range goals. Finally, cost is what is lost, given up, or suffered as a consequence of engaging in a particular activity. For example, a person's perception of the amount of effort needed for success can influence the perceived cost of various achievement activities. Given that career decisions are not made in a vacuum and that, in many cases, students must choose among several equally attractive alternatives, we have suggested that the perception of the amount of effort needed to do well in any given career will have a significant impact on career decisions (see Eccles et al., 1983). To the extent that the amount of effort needed to do well exceeds the perceived worth of the outcome, the value of engaging in the activity should decrease. Similarly, to the extent the amount of effort needed to succeed in a career is perceived to interfere with other salient adult roles (e.g., parenting), the perceived cost of pursuing such a career should increase. Perceived cost of engaging in an activity can also be influenced by psychological factors such as fear of failure, test anxiety, and conditioned affect (see Eccles, 1983, for fuller discussion of these constructs).

Individual differences on subjective task value are created by differential past experiences, by social stereotypes, and by differential information from parents, teachers, or peers about the importance of and/or the difficulty involved in doing well at any particular activity. Because males and females have quite different socialization experiences regarding the relative importance of various achievement activities, sex differences in achievement may result from sex differences in the subjective value attached to various achievement activ-

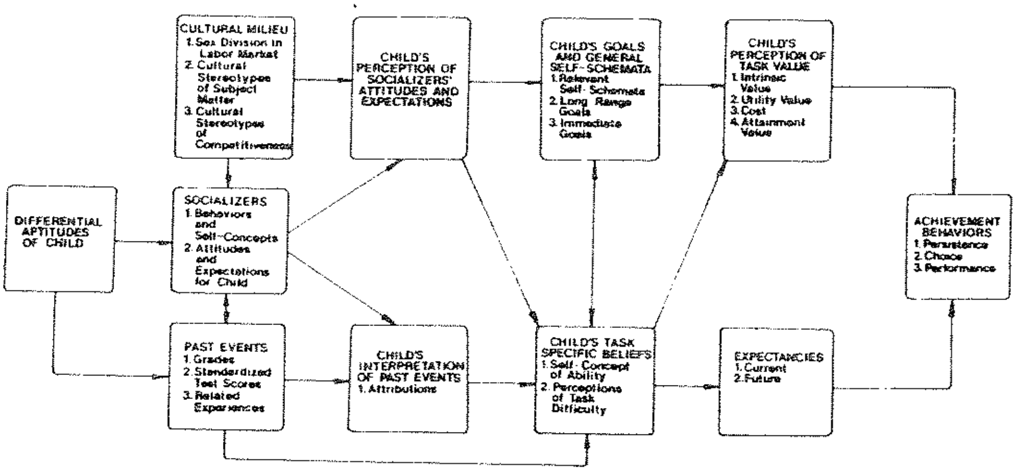

Figure 1. General model of academic choice. (Adapted from "Expectancies, Values, and Academic Behaviors" (pp. 80, 100, 123) by J. Eccles, T. F. Adler, R. Futterman, S. B. Goff, C. M. Kaczala, J. L. Meece, & C. Midgley, 1983. In J. T. Spence (Ed.), *Achievement and Achievement Motives.* San Francisco: Freeman. Copyright 1983 by W. H. Freeman. Adapted by permission. This adaptation previously appeared in an article by Meece et al., 1982.)

ities. If this hypothesis is correct, then we should obtain Sex × Subject Area interactions on measures of subjective task value.

Comparative Analysis

In addition to testing the predictions associated with each of the four theoretical perspectives outlined above, this study evaluates the comparative utility of these theories in explaining sex differences in academic achievement patterns. It is assumed in each of the four perspectives outlined above that sex differences in the proposed mediator variable contribute to sex differences in achievement choices and behaviors; this link, however, is rarely tested, and the comparative importance of the various mediators has not been assessed. Parsons and Goff (1980) argued that subjective task value is a more powerful predictor of sex differences in academic achievement plans and actual course enrollment than are the variables associated with expectancies and self-concept. By assessing all of the constructs associated with each theory, we can test this hypothesis as well as the link of each proposed mediator to actual achievement behaviors.

Study 1 was designed to test the predictions associated with the attribution and the learned-helplessness theories. Subjects were given a series of anagram and number sequences of increasing difficulty to solve; their attributions, expectations for future success, and behavioral responses to failure were assessed. Self-concept of ability was also assessed for each domain. Study 2 used a different methodology to test the expectancy/self-concept and the subjective task value hypotheses. Subjects completed a questionnaire designed to measure their attitudes toward their math and English courses. Sex differences in ability, expectancy, and value ratings were assessed, and the hypotheses associated with these measures are tested. Study 2 was also designed to test Parsons and Goff's hypothesis and to test the relation between student beliefs and actual performance, plans, and choices.

We have divided our presentation into Study 1 and Study 2 for ease of presentation and discussion because different methodologies were required to provide the best test of each perspective, using the most ecologically valid procedures. It is important to note, however, that the total study was designed to assess the four different theoretical perspectives and that the subjects in Study 1 were a large subset of the subjects in Study 2.

Study 1

Method

Subjects

The subjects were drawn from a sample of approximately 200 junior high school students participating in the second year of a study of the social psychological factors influencing student's course enrollment decisions in mathematics and English. Consistent with other studies, there were no sex differences on either the students' math and English grades or on their performance on standardized tests of verbal and math ability at the beginning of the study (Eccles et al., 1983); sex differences on these performance measures do not typically emerge until the high school years. However, because attitudinal differences, at least for mathematics, typically emerge in the junior high school years, we selected these grades for study. In the second year of the longitudinal study, 142 of the students were selected randomly from the available subject pool to participate in Study 1; 91 students were in the 8th and 9th grade (43 boys and 48 girls), and 51 were in the 10th grade (24 boys and 27 girls).

Student Behavioral Measure

Overview. To assess responses to failure (learned helplessness) in mathematics and English, we gave the students a series of anagrams and a series of number sequence problems. They were tested by an adult tester in groups of three. Each series followed this sequence: six solvable problems of increasing difficulty, five unsolvable problems, and five solvable problems of decreasing difficulty. This format was chosen as an experimental simulation of testing across the school years. Math gets more difficult with each grade, and most testing is done in public with the teacher as administrator. We felt the best short-term simulation of this reality was an adult-administered group test consisting of items that increased sequentially in difficulty. Children who experience learned helplessness ought to give up in the face of increasing failure earlier than non-learned-helpless children. Because the performance of learned-helpless children does not recover when the task becomes easier, the second series of solvable problems was included after the insolvable problem sequence as an additional indicator of learned helplessness.

Two sets of test booklets were developed: one for the 8th and 9th graders and one for 10th graders. Selection of items for these booklets was based on two pilot studies. Pilot testing was used to establish age norms for the items, to get error rates on the specific items as an indicator of task difficulty, to test the procedures, to establish reliability for the observer/tester coding procedures, and to train testers.

Experimental booklets. The test booklets contained the problem sets and questions dealing with student ability perceptions and expectations. The order of the problems

Table 1
Order of Problem Trials and Experimental Questions Followed by All Subjects

Practice Trials 1 and 2
Ability question
Solvable problem trials 1, 2, and 3
Expectancy questions
Success attribution question
Failure attribution question
Solvable problem trials 4, 5, and 6
Insolvable problem trials 7, 8, and 9
Expectancy questions
Success attribution question
Failure attribution question
Insolvable problem trials 10 and 11
Solvable problem trials 12, 13, and 14
Expectancy questions (postfailure 1)
Solvable problem trials 15 and 16
Expectancy questions (postfailure 2)

and questions is summarized in Table 1. The difficulty of the problems followed this sequence: solvable problem Trials 1–3 had been solved by 75%–88% of the age-appropriate pilot samples; solvable problem Trials 4–6 had been solved by 45%–55% of the age-appropriate children; solvable problem Trials 12–14 had been solved by 45%–55%; and solvable problem Trials 15–16 had been solved by 75%–88%. (If, based on our second pilot study, an item did not meet these criteria, a new item was substituted from the pool of items generated in the first pilot study. Only 5 out of 44 items tested fell into this category.) The insolvable problem trials (Trials 7–11) consisted of either extremely difficult number sequence problems requiring advanced mathematical operations or nonsense anagrams. Correct answers were provided as the outcome feedback for the number sequence problems. These answers were hidden by a colored flap that could be removed easily. No answers were provided for the anagrams. It was assumed that the children would know whether they had formed a word or not. Pilot testing substantiated this assumption. For both booklets, two orders were used. Order 2 was the mirror image of Order 1. Children could give one of four responses on each problem trial: a correct answer, an incorrect answer, a "DK" (don't know), or no response. They were encouraged to respond with one of the first three rather than give no response.

The ability question asked children to rate, on a 7-point Likert-type scale anchored at the extremes, how good they were at these kinds of puzzles. The expectancy measure consisted of two questions. The first asked whether they thought they would get the next problem correct or not. The second asked them to rate how sure they were of their response on a 7-point Likert-type scale anchored at the extremes. These two responses were transposed into a 14-level continuous variable ranging from *very sure I'll fail* (1) to *very sure I'll succeed* (14).

Responses to the attribution question required the children to decide whether they had gotten the previous problem correct or incorrect. If they felt that they had gotten it correct, they were directed to the success attribution question; if they felt that they had gotten it wrong, they answered the failure attribution question. The attribution question asked the children to rank order effort, ability, task difficulty, and luck in terms of importance as a causal explanation for their performance. Justification for this procedure is provided by Parsons et al. (1982).

Administration. Booklets (number sequence problems first and anagrams second) were administered in mixed-sex groups of 4 to 6 children by one tester (either male or female). The tester introduced himself or herself, had the children read the directions and do the first practice trial, and answered any questions. The tester then started all the children on practice Trial 2, timed the trial (30 s per trial) and told the children to stop after 30 s. Any questions were then answered. The children proceeded through the experimental trials one by one; each trial was initiated and timed by the tester. Children were asked to work silently, to look up when finished, and to wait for the next trial to begin before turning the page. All children were stopped after 30 s, and the next trial was begun.

While the children worked on each problem, the tester recorded two pieces of information: a rating of each child's persistence at the task and the time it took each child to write a response in the booklet. The persistence ratings were recorded on a qualitative scale ranging from *giving up on the task almost immediately* (1) to *working on the task with sporadic persistence* (2) to *working on the task with consistent persistence throughout the trial* (3). These ratings were assigned after the completion of each trial. Pilot testing indicated that these ratings could be made with high reliability (90% or better). The second measure, response time, was recorded as each child wrote his or her response on the page (reliability = 90% or better). After completing both booklets, the children were appropriately debriefed. They were told that some of the problems were extremely difficult to solve, requiring knowledge beyond their level.

Results

Overview of Analysis

A series of analyses of variance (ANOVAS) with repeated measures were run to examine content, sex, and expectancy group differences on each of the dependent measures. When interaction terms were found to be significant, Duncan's new multiple-range test (Kirk, 1969) with $p < .05$ as the criterion was used to assess the significance of selected planned comparisons.

A major distinction made in analyses of the causal attribution measure is the difference between students in high- and low-expectancy groups. Feather and Simon (1971) have argued that causal attributions vary depending on initial expectations. Because males and females have been found to have different expectancies and because sex effects have been found to vary according to initial expectancy level, we considered it important to test for expectancy groups effects as well as sex effects. Therefore, expectancy groups were derived from subjects' responses to the first expectancy question taken during the series of prefailure trials. Scores were divided at the median to form two expectancy groups. Approximately an equal number of males and females fell into each group.

Subjects were also grouped according to their actual experience on specific trials. Within the math trials, two separate groups of subjects had to be created. Despite our efforts to select items that children could succeed on in the "success" trials, a substantial portion of the children ($n = 54$) failed on Trial 3. This situation required the creation of two groups of subjects. Subjects who had succeeded on Trial 3 of the math sequence and failed on Trial 8 of the failure sequence were designated the success–failure group; subjects who had failed on both of these trials were designated the failure–failure group. The distinction between these two groups was necessary *only* for analyses based on the math problem data; during the anagram trials most subjects experienced the planned sequence of events, that is, success in the first set of trials and failure in the second. Those few who did not were eliminated from the analyses. All analyses comparing content areas used only subjects who had experienced the planned success–failure sequence. Separate analyses were performed for the math trials in order to assess the possible consequences of being in the failure–failure group rather than the success–failure group. Because the sample sizes in the various subgroups necessitated several ANOVAS, effects at the $p < .05$ level should be interpreted with caution.

Beliefs

Student perception of ability. Students rated their ability to do the number sequence task ($M = 5.5$, $SD = 1.3$) higher than their ability to do the anagram task ($M = 4.3$, $SD = 1.5$), $F(1, 118) = 30$, $p < .001$. In addition, over both content areas, males rated their ability slightly higher ($M = 5.0$, $SD = 1.4$) than did females ($M = 4.8$, $SD = 1.4$), $F(1, 118) = 5.81$, $p = .02$. Contrary to predictions, sex differences in ability ratings were not influenced by the content of the task.

Expectations. Consistent with past research, subjects' expectancies were high during the success trials, dropped dramatically during the failure trials, and then increased during the final success trials. In addition, whereas males and females started and ended with similar expectancies, females' expectancies dropped lower than males' during the failure trials (see Table 2). Contrary to prediction, the content area of the task did not influence the response of either males or females to the failure trials.

Attributions

The results for the attributional measures are summarized in Table 3 (F ratios not presented on the table are reported here).

Table 2
Expectations: Sex × Trial Effect[a]

		Expectation trial			
Subjects	n	Prefailure	Failure	Postfailure 1	Postfailure 2
Females					
M	56	10.5^{a}	5.7^{b}	7.6_{c}	9.0_{d}
SD		2.3	3.1	2.9	3.1
Males					
M	51	10.8^{a}	7.1_{c}	8.7_{d}	9.5_{d}
SD		2.7	3.7	3.2	3.1
Marginal[b]					
M	107	10.6	6.4	8.1	9.2
SD		2.5	3.4	3.1	3.1

Note. Means with different subscripts differ from one another ($p < .05$). Postfailure Trial 1 occurred after three postfailure trials. Postfailure Trial 2 occurred after five postfailure trials.
[a] $F(3, 92) = 4.66$, $p < .01$. [b] $F(3, 92) = 61.13$, $p < .001$.

Table 3
Mean Ranking of Causal Attributions: Success–Failure Subjects

Causal attributions	High-expectancy subjects: Females Success	High-expectancy subjects: Females Failure	High-expectancy subjects: Males Success	High-expectancy subjects: Males Failure	Low-expectancy subjects: Females Success	Low-expectancy subjects: Females Failure	Low-expectancy subjects: Males Success	Low-expectancy subjects: Males Failure	Critical F ratios: Trial × Expectancy Group	Critical F ratios: Sex × Trial Effect	Critical F ratios: Sex × Expectancy Group × Trial Effect	Critical F ratios: Sex × Content Area Effect for Failure
Number sequence problems												
	n = 18		n = 19		n = 10		n = 6		df = 1, 49–52	df = 1, 49–52	df = 1, 49–52	df = 1, 103–106
Ability	1.9 (.8)	2.9 (.8)	1.9 (.8)	3.2 (.8)	2.6 (1.2)	1.9 (1.3)	1.5 (.8)	3.3 (1.2)	2.45	13.53***	7.53**	4.47*
Effort	2.4 (1.2)	2.8 (1.1)	2.0 (.9)	2.6 (.9)	2.2 (.9)	3.0 (1.0)	2.3 (1.0)	2.8 (1.2)	< 1.0	< 1.0	< 1.0	2.27
Task difficulty	1.9 (1.0)	1.2 (.4)	2.5 (1.1)	1.1 (.3)	2.2 (1.2)	1.9 (.7)	2.7 (1.0)	1.5 (.8)	< 1.0	3.63	< 1.0	< 1.0
Luck	3.6 (.7)	3.0 (1.0)	3.6 (.9)	3.0 (1.0)	3.0 (1.2)	3.2 (.8)	3.5 (.8)	2.3 (.5)	< 1.0	3.39	4.34*	< 1.0
Anagrams												
	n = 26		n = 26		n = 25		n = 14		df = 1, 79–80	df = 1, 79–80	df = 1, 79–80	
Ability	2.0 (.9)	3.1 (1.0)	2.0 (1.0)	3.0 (1.0)	3.1 (1.0)	2.1 (1.0)	2.9 (1.1)	2.5 (1.2)	20.8***	< 1.0	< 1.0	—
Effort	2.3 (1.0)	2.5 (1.1)	2.4 (.8)	2.8 (1.0)	2.2 (1.0)	3.0 (.9)	2.4 (1.1)	3.1 (.7)	2.47	< 1.0	< 1.0	—
Task difficulty	2.1 (1.1)	1.4 (.6)	1.9 (.9)	1.3 (.7)	1.6 (.8)	1.6 (.8)	1.9 (.9)	1.5 (.9)	3.29	< 1.0	< 1.0	—
Luck	3.6 (.7)	3.1 (.8)	3.6 (.8)	2.9 (1.0)	3.1 (1.0)	3.2 (1.0)	2.9 (1.2)	2.9 (1.1)	7.76**	< 1.0	< 1.0	—

Note. Standard deviations are in parentheses. Because the degrees of freedom vary slightly due to missing data, the range for the degrees of freedom are given at the top of each F ratio column.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Ability. Sex emerged as a significant factor in only two ANOVAS: the Sex × Content Area × Outcome ANOVA and the Sex × Expectancy Group × Math Trial Outcome ANOVA. Although males' and females' ranking of ability did not differ for the success trials, they did differ for the failure trials, $F(1, 103) = 4.54$, $p = .04$. Females rated ability as a more important cause of their failure than did males. This effect, however was significant only for the math task and only among the low-expectancy subjects (see Table 3). Contrary to the predictions, all males and females responded quite similarly to the anagram task, and high-expectancy males and females responded quite similarly to the math task.

Several other interesting effects emerged. First, subjects rated ability as a more important cause of math success than of anagram success, $F(1, 47) = 4.19$, $p < .05$. Second, some interesting Expectancy Group × Trial effects emerged that depended on the content area of the task (see Table 3). On the anagrams, ability was rated as a more important reason for failing than for succeeding by the low-expectancy subjects; the high-expectancy subjects rated ability as a more important reason for succeeding than for failing. The comparable effect for the success–failure math group was dependent on the sex of the subject. Low-expectancy females ranked ability as a more important cause of failure than of success; high-expectancy females and all males ranked ability as a less important cause of failure than of success. No significant sex or expectancy group effect emerged for the failure–failure group.

In summary, there was little support for the predictions regarding sex differences in the use of the ability attributions. One group conformed to predictions: Low-expectancy females rated lack of ability as a more important cause of their failure on the math trials than did low-expectancy males. All other predicted sex comparisons were nonsignificant.

Effort. Only one significant sex effect emerged for the effort attribution: the Sex × Expectancy Group interaction for the failure–failure math group, $F(1, 51) = 5.03$, $p = .03$. Whereas planned comparisons yielded no significant mean differences, inspection of the means suggested that the significant interaction was a consequence of the contrasting direction of the sex effect within each expectancy group. There was no apparent sex difference in the low-expectancy group. In contrast, and contrary to the learned-helplessness hypotheses, the high-expectancy males ranked lack of effort as a less important cause of their failures ($M = 2.59$, $SD = 1.0$) than did the high-expectancy females ($M = 3.06$, $SD = 0.9$).

One additional effect emerged for both the math and the anagram trials. Subjects ranked effort as a less important cause of failure than of success: math, $F(1,52) = 7.85$, $p = .007$; anagrams, $F(1, 80) = 10.78$, $p = .002$.

Task difficulty. There were no significant sex effects for the task difficulty attribution. Two other effects were significant. For both the math and anagram trials, subjects ranked task difficulty as a more important cause of failure than of success: math, $F(1, 52) = 22.31$, $p < .001$; anagrams, $F(1, 80) = 10.09$, $p = .002$. In addition, on the math trials, high-expectancy subjects ranked task difficulty as more important cause of both success and failure than did low-expectancy subjects.

Luck. Sex effects emerged only on the math task. Low-expectancy males rated luck as a more important cause of their failure than every other group; none of the other groups differed from one another. Although no sex differences emerged on the anagram trials, there was a significant Expectancy Group × Trial interaction. High-expectancy subjects ranked luck as a more important cause of failure than of success, whereas low-expectancy subjects did not vary their ranking of the importance of luck across outcomes.

Learned-Helpless Behavioral Responses

We used two performance measures to test for a learned-helpless response to failure: the average amount of time spent on each trial within each trial sequence and the average number of correct responses for each trial sequence. According to the learned-helplessness models of achievement, children experiencing learned helplessness should give up during failure,[2] and their performance should dete-

[2] We measured persistence in two ways: a subjective rating of effort and concentration evidenced before responding, and time spent trying to solve the problem before responding. Because virtually all of our subjects worked

riorate. These models thus predict a Sex × Trial × Content Area effect for both of our behavioral measures.

Time spent per trial. Contrary to predictions, failure on the anagrams and the number sequence problems affected males and females similarly. There was, however, a significant trial effect, $F(2, 81) = 332.29$, $p < .001$. The average amount of time spent on each trial was related to the type of trial involved; more time was spent on the failure trials ($M = 27.1$, $SD = 2.9$) than on the success trials (prefailure $M = 17.3$, $SD = 4.1$; postfailure $M = 17.0$, $SD = 4.3$). There was also a significant Content × Sex interaction, $F(1, 87) = 8.60$, $p = .004$; males spent approximately the same amount of time on the math ($M = 20.6$) and the anagram trials ($M = 20.2$), whereas females spent more time on the math ($M = 21.7$, $SD = 3.6$) than on the anagram trials ($M = 19.4$, $SD = 3.3$).

Percentage correct per trial. Contrary to predictions, sex did not interact significantly with either content area or trial. Two significant main effects did emerge, but these were superseded by the significant Content Area × Trials interaction, $F(2, 81) = 16.78$, $p < .001$. The change in the percentage correct over the anagram pre- and postfailure trials ($M = 0.80$, $SD = 0.18$; $M = 0.62$, $SD = 0.17$, respectively) was greater than the change in percentage correct over math pre- and postfailure trials ($M = 0.63$, $SD = 0.21$; $M = 0.58$, $SD = 0.28$, respectively).

Discussion

Study 1 was designed to test the utility of attribution and learned-helplessness theories in explaining the sex differences in academic achievement patterns. In general, we found very little *consistent* evidence of sex differences on either indicators of learned helplessness or on the attribution patterns believed to underlie this phenomenon for either math or verbal tasks. By and large, the sexes did not differ on the majority of the measures commonly associated with learned helplessness, especially the behavioral indexes. The support that did emerge is limited to four paper-and-pencil measures of social cognitions: attributions for success and failure in math to ability, and expectancies during the failure trials for both the math and verbal tasks. None of these differences, however, translated into a sex difference in actual behavior. These results suggest two conclusions: (a) It is important to establish empirically, rather than merely to infer, the positive or negative consequences of attributions and expectancies on actual behavior, and (b) inferences regarding sex differences in learned-helpless behavior based on verbal indicators should be made with great caution. We have argued elsewhere that sex differences in expectancy statements and other overt, verbal appraisals of one's own ability might reflect self-presentational goals rather than a true difference in confidence in one's ability to succeed at the task (Parsons & Ruble, 1977). The finding that the girls' expectancies started as high as boys' and recovered to the same levels as the boys' following failure, in conjunction with the finding that the girls worked just as long as the boys during the failure trials, supports this self-presentation interpretation of sex differences in verbal report measures of confidence in one's abilities. The results of two recent studies (Berg, Stephan, & Dodson, 1981; Gould & Slone, 1982) provide further support for this interpretation.

The strongest support for the learned-helplessness perspective is provided by the two ability attribution variables. Even for these variables, however, the results are equivocal. Low-expectancy females in the success–failure math group rated lack of ability as a more important cause of their failures than did anyone else. Similarly, they rated ability as a less important cause of their math success than did the other groups. This pattern, however, is quite specific to the low-expectancy females in the success–failure math group. It is not replicated for either the verbal task or in the failure–failure math group. Furthermore, there were no sex differences in attributions among the high-expectancy success–failure subjects.

Equally equivocal is the pattern associated with the significant Sex × Content Area interaction on the lack of ability attribution. Females rated the importance of lack of ability

up to the point of responding, the two measures were redundant, and time spent until response was a better indicator of variations in persistence on the failure trials. Therefore, we have only reported the results for response time.

higher for failure at the math task than did males. This was the only instance in which we found that the content of the task significantly influenced a dependent variable. Contrary to the logic underlying the Sex × Content Area predictions, however, females did not rate the causal importance of lack of ability higher for the math task than for the verbal task. Therefore, the support provided by even this interaction for attribution predictions is equivocal.

Two sets of results suggest a different pattern of sex differences. Males, especially low-expectancy males, may be more prone to the self-enhancement bias (Snyder, Stephan, & Rosenfield, 1978), whereas females, especially low-expectancy females, may be more prone to the expectancy effects bias (Feather & Simon, 1971). In support of this suggestion, low-expectancy males in the success–failure math group rated bad luck as a more important cause of their math failure than any other group. Similarly, in the failure–failure math group, the males rated the causal importance of bad luck higher than did the females, again suggesting a higher self-enhancement bias in these males. In addition, in this group the females, but not the males, responded in accord with the expectancy confirmation model (Feather & Simon, 1971). Thus, as was true for the success–failure condition, it was primarily the females who exhibited the expectancy confirmation pattern.

Study 2

One of the major hypotheses underlying this study was that sex differences in self-concepts of ability, in expectations for success, and in learned-helplessness behaviors would depend on the content of the task. With the exception of ability attribution patterns for the math task, we found very little support for this hypothesis in Study 1. This hypothesis, however, rests on the assumption that students would view these tasks as masculine or feminine. Perhaps students did not sex type these tasks. Although the content was different for the two tasks, they did share several common features. Both involved logic, direct feedback, timed intervals, some novel group administration, and perhaps even some subtle group competition. These commonalities may have led students to perceive the two tasks similarly and not as analogs for English and math course material.

To provide a more sensitive and ecologically valid test of the four models outlined in the introduction, we gathered a second set of data directly related to math and English courses. To assess the expectancy and self-concept models, we assessed students' expectations for success and their estimates of their abilities in both math and English. To assess the value model, we assessed the students' subjective value for both math and English. Constraints imposed by the larger study prevented us from testing learned helplessness in the classroom directly. Instead, we had to rely on teacher nomination and were able to obtain these data for mathematics only. Attributions for performance on math tests were gathered in Year 1 of the project. These results are reported elsewhere; they yielded little support for the learned-helplessness model (Parsons et al., 1982). Study 2 was also designed to test the relative influence of expectancy/ability and value concepts on students' course enrollment plans in English, on actual course enrollment decision in mathematics, and on grades in both math and English. Because grades were available from Year 1 in the study, Study 2 also tested for the differential impact of past grades on each of the proposed mediators.

Method

Subjects

The subjects in Study 2 included the subjects in Study 1 plus the remaining 8th, 9th, and 10th graders from Year 2 of the larger master sample, making the total sample size for Study 2 approximately 200.

Measures

Student questionnaire. The student questionnaire was developed for use in the larger longitudinal project. Items on the questionnaire were grouped into scales.[3] The following math scales were used for this study:

[3] Complete information about the questionnaire and the derived scales can be obtained from Jacquelynne Eccles (Parsons), Department of Psychology, University of Michigan, Ann Arbor, Michigan 48109. Items and pilot testing details are contained in the Parsons (1980) report.

a. Difficulty of current math courses (α coefficient = .81).
b. Difficulty of future math courses (α coefficient = .77).
c. Current expectancies (α coefficient = .83).
d. Future expectancies (α coefficient = .79).
e. Self-concept of ability and performance in math (α coefficient = .80).
f. Perception of effort involved in math (α coefficient = .76).
g. Utility of advanced math (α coefficient = .75).
h. Perceived importance of math (α coefficient = .74).
i. Interest in math (α coefficient = .80).
j. Perceived worth of effort needed to do well in math (α coefficient = .72).

Each of these math scales consists of two or more items. Because math attitudes were the primary focus of the larger project, fewer English items were included in the questionnaire; one or two English items were designed to represent an equivalent construct for each of the math scale constructs. The math scales were factor analyzed by using the exploratory factor analytic procedures developed by Joreskog and Sorbom (1978). A three-factor solution best described the underlying relations. The three factors were Self-Concept of Math Ability (Scales c, d, and e), Perception of the Difficulty of Math (Scales a and f), and Perceptions of Value of Math (Scales g, h, i, and j). Factor analyses of the English items yielded an identical factor structure; factor scale scores for each factor were formed by averaging the students' responses on each item composing the factor.

To assess subjective educational plans, students were asked whether they would take more math (English) if they did not have to. The 7-point scale ranged from *I'm absolutely sure I'd take more math (English)* to *I'm absolutely sure I won't take any more math (English)*.

Course enrollment. Because English is required for all 4 years of high school, we had no measures of actual enrollment decisions for English. In contrast, mathematics is required for only 1 year in high school. We followed our subjects each year and recorded their enrollment pattern for mathematics. These data were collected each summer until all of the 9th- and 10th-grade subjects had made their enrollment decisions for their senior year in high school.

Grades. At the end of Year 1 and again at the Year 2 of the study, we collected all students' course grades in math and English from their school records.

Teacher questionnaire. The children's math teachers in Year 1 were asked the following three questions: How well do you think ___ would do in an advanced math course? How much mathematical aptitude or ability do you feel ___ has? and How well is ___ doing in math this year compared to how well you believe he or she could do? The teacher responded to each question on a 7-point Likert-type scale anchored with appropriate positive and negative labels at the extremes. The first two questions were combined to form a scale for teachers' ratings of the students' math ability. The last question was used as a gross indicator of learned helplessness, which undoubtedly includes underachievers as well as children suffering from learned helplessness. Yet because the distinction between underachievers and learned-helpless students has not yet been specified in the existing literature on learned helplessness in the classroom, we felt justified in using this measure.

Procedure

The student questionnaire was administered in the spring during Years 1 and 2. Only student questionnaire data from Year 2 are used in this article. The behavioral measure was administered in the spring term of Year 2. The math teacher questionnaire was administered in the spring term of Year 1.

Results

Descriptive Analyses

Student attitudinal measures for students participating in Study 1 are displayed in Table 4.[4] The only significant sex differences emerged for the students' ratings of the value of math and English. Females rated math as less important and English as more important than did the males. Females also rated English as more important than math, whereas the males rated math as more important than English. Comparable sex differences emerged on the subjective task value measure for the entire sample; males, however, rated English and math as equally important ($p < .05$), whereas females rated English more important than math ($p < .05$).

Neither students' own ratings of their competence nor the teachers' ratings of their students' math ability and performance yielded significant sex main effects for either the Study 1 sample or for the entire sample. With regard to subjects' estimates of their cognitive abilities, all subjects' rated their English ability higher than their math ability. A significant content area effect also emerged on the students' ratings of task difficulty. All students rated English as easier than math.

Relational Analyses

The second goal of Study 2 was to test the relation of the student attitudinal measures to achievement outcome measures. To provide the best estimates of these relations, we used the entire sample for these analyses. To assess whether the relation might differ for males and females, we ran the analyses for the two sexes separately as well as for the entire sample.

[4] To maintain comparability with the descriptive data reported in Study 1, only the students in Study 1 are used in this table.

Table 4
Student Beliefs

Beliefs	Female	Male	F ratios: Content	F ratios: Content × Sex
Self-concept of ability				
Math				
M	4.8	4.8		
SD	0.9	1.0	36.44**	< 1.0
English				
M	5.4	5.2		
SD	0.6	0.7		
Perceived task difficulty				
Math				
M	4.0	4.1		
SD	0.7	0.6	4.01*	< 1.0
English				
M	3.8	3.8		
SD	1.4	1.3		
Subjective task value				
Math				
M	4.5	4.8		
SD	1.0	1.2	< 1.0	11.77**
English				
M	4.7	4.3		
SD	0.8	0.9		

Note. Degrees of freedom for each test = 1, 127.
* $p < .05$. ** $p < .001$.

Table 5 presents the zero-order correlations. Two longitudinal effects are represented: the relation of grades in Year 1 to student attitudes in Year 2, and the relation of student attitudes during Year 2 to both grades at the end of Year 2 and math course enrollment in one's senior year in high school. The following patterns are clear: (a) Consistent with the Parsons and Goff (1980) hypothesis, math course enrollment is related most strongly to subjective task value; in contrast, grades in Year 2 are related most strongly to self-concept of ability. (b) Grades in Year 1 relate positively to both subsequent self-concept of ability and math course enrollment. (c) Although the patterns of the relations are very similar for males and females, self-concept of ability tends to yield higher correlations for males, and grades in Year 1 predict subsequent subjective task value only for males and only in math.

To assess the independent predictive power of the attitudinal variables and course grades in Year 1 to subsequent achievement outcomes, we ran a series of step-wise hierarchical multiple regressions. Two steps were adequate to describe the significant interpretable relations in all 15 analyses. These are presented in Table 6. The results confirm the patterns described in the previous paragraph.

Mediating Effects

The final goal of Study 2 was to test the hypothesized mediating role of subjective task value in explaining sex differences in achievement choice behavior. Path analyses were used. Unfortunately, it was necessary to use different choice measures for math and English. Because students were required to enroll in 4 years of high school English, actual course enrollment could not be used as the outcome measure for English; the subjective educational plans variable had to be used instead as an indicator of future enrollment plans. Because math is required for only 1 year in high school, actual course enrollment data could be used as the choice measure for math.

There was a significant sex difference on English subjective educational plans, $F(1, 199) = 7.46$, $p < .01$. Females expressed a stronger interest in continuing to take English courses ($M = 5.8$, $SD = 1.5$) than did males ($M = 5.2$, $SD = 1.9$). The results of the path analysis on the English items are depicted in Figure 2 (left panel). The results are consistent with the predicted mediational model.

There was a significant sex effect for math enrollment in the 12th grade, $F(1, 111) = 5.38$, $p = .02$. Males were more likely to enroll in a math course that year than were females. There were no significant sex differences in enrollment in math courses prior to the 12th grade. The results of the path analysis are depicted in Figure 2 (right panel). As is the case for the English subjective educational plans variable, the results are consistent with the predicted mediation model. Sex differences in math enrollment appear to be mediated by the sex differences in the subjective value of math variable, despite the fact that in the subsample of students who had complete data for all four of the measures in this analysis, the females had a slightly lower self-concept of math ability than the males. (Note significant path from sex to self-concept of ability.)

Discussion

As predicted by Parsons and Goff (1980), subjective task value emerged as the most powerful predictor of students' educational plans and as the significant mediator of sex differences in both subjective educational plans and actual course enrollment. Furthermore, the significant Sex × Content Area interaction on subjective task value yielded the predicted pattern of sex differences; the females had a more positive attitude toward English and a less positive attitude toward math than did the males. Comparable results did not emerge for measures reflecting expectancies for success and confidence in either one's math or English abilities. Finally, as predicted by Eccles et al. (1983), there were sex differences in actual achievement choices but not in the grades the students attained while they were enrolled in the courses.

This is not to say that variables associated with confidence in one's academic abilities do not influence achievement behavior. Our data indicate that self-concept of ability has a significant positive longitudinal effect on course grades in both math and English, but subjective task value had a stronger effect than did confidence in one's academic ability on students' plans and decisions regarding enrollment in both math and English courses. These results suggest that performance and choice are influenced most directly by different motivational constructs. Several investigators (Atkinson, 1964; see also Eccles & Wigfield, in press) have argued that achievement motivation is aroused once one is in an achievement situation. In addition, self-concept of ability has been suggested as the motivational construct most closely linked to the arousal components of the achievement motive: high self-concepts eliciting positive arousal and low self-concepts eliciting negative arousal. Thus, one would expect that variables related to expectancies and self-concept of ability would have their most direct impact on performance measures in situations involving little opportunity for escape, situations likely to arouse the achievement motive system. In contrast, variables related to subjective value may have their largest impact on the decision to place oneself in a particular achievement setting and perhaps on performance when escape is a viable option.

Table 5
Zero-Order Correlations: Attitudes to Performance and Plans

	Math				English		
Grades and attitudes in math or English	Grade (Year 1)	Grade (Year 2)	Future enrollment plans	Senior year enrollment decision[a]	Grade (Year 1)	Grade (Year 2)	Future enrollment plans
Grade (Year 1)	—	.41** .33** .49**	.17 .15 .19	.42** .45** .43**	—	.55** .53** .53**	.20* .17 .18
Self-concept of ability	.29** .29** .29**	.46** .37** .57**	.46** .35** .52**	.16 .00 .11	.31** .27** .33**	.38** .32** .43**	.51** .47** .53**
Perceived task difficulty	−.01 −.01 −.02	−.22* −.13 −.34**	−.08 −.09 −.07	.15 .18 .19	−.12 −.02 −.24*	−.17 −.11 −.28**	−.21* −.22* −.21*
Subjective task value	.16 .04 .31**	.15 .13 .17	.49** .51** .48**	.37** .37** .30*	.07 .17 −.10	.17 .15 .07	.64** .65** .61**

Note. For each cluster, top number is for the entire sample; middle number is for females only; bottom number is for males only. Correlations differing by sex ($p < .01$) are boxed. $N = 200$ (females = 108, males = 92).
[a] For this outcome variable, $N = 122$ (females = 65, males = 47).
* $p < .05$. ** $p < .01$.

Table 6
Hierarchical Regression Analyses

	Total sample		Females		Males	
	Variable	Cumulative R^2	Variable	Cumulative R^2	Variable	Cumulative R^2
			Math			
Grade (Year 2)						
Step 1	Self-concept of ability	.22*** (.04)	Self-concept of ability	.13*** (.09)	Self-concept of ability	.34*** (.08)
Step 2	Grade (Year 1)	.32*** (.08)	Grade (Year 1)	.20** (.09)	Grade (Year 1)	.47*** (.08)
Plans						
Step 1	Subjective task value	.22*** (.06)	Subjective task value	.26*** (.08)	Self-concept of ability	.23*** (.09)
Step 2	Self-concept of ability	.27*** (.06)	Self-concept of ability	.29* (.09)	Subjective task value	.29** (.09)
Enrollment						
Step 1	Grade (Year 1)	.22*** (.09)	Grade (Year 1)	.24*** (.11)	Grade (Year 1)	.25*** (.14)
Step 2	Subjective task value	.32*** (.08)	Subjective task value	.31** (.11)	Subjective task value	.32* (.13)
			English			
Grade (Year 2)						
Step 1	Grade (Year 1)	.28*** (.06)	Grade (Year 1)	.22*** (.09)	Grade (Year 1)	.29*** (.09)
Step 2	Self-concept of ability	.33*** (.06)	Self-concept of ability	.26* (.08)	Self-concept of ability	.36** (.09)
Plans						
Step 1	Subjective task value	.42*** (.05)	Subjective task value	.41*** (.07)	Subjectiv task value	.41*** (.08)
Step 1	Self-concept of ability	.47*** (.05)	Self-concept of ability	.44* (.07)	Self-concept of ability	.48*** (.07)

Note. Standard errors are in parentheses. Sample sizes are approximately the same as in Table 5. *$p < .05$, ** $p < .01$, *** $p < .001$ for the increment in the R^2 value.

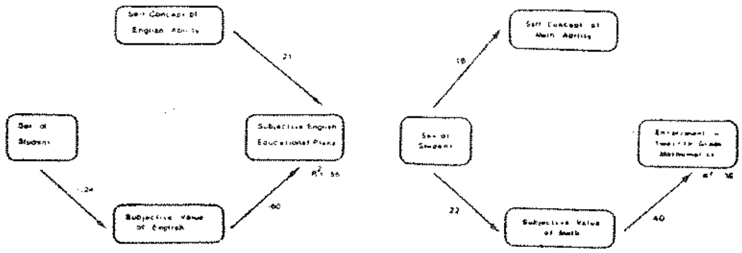

Figure 2. Path analyses for English and math variables. (Column-wise multiple regression equation procedures were used to estimate the path coefficients. The standardized path coefficients, which are regression coefficients, reflect the relative predictive power of each variable. All paths are significant at the $p < .05$ level or better.)

If this is the case, then subjective task value should play the more important role in mediating achievement-related decisions like whether to enroll in a math course, what to major in, and what occupation to select. Certainly confidence in one's ability to succeed is an important factor. We would not expect most people to select achievement tasks on which they expect to fail, but we also do not expect them to select every task for which they have a reasonable expectation of success. Subjective task value appears to be a major influence on which particular achievement tasks an individual selects. Confidence, personal efficacy, and/or future expectations may also have an effect on the development of subjective task value, but this is yet to be assessed.

Our data also do not rule out the possibility that sex differences in confidence in one's academic abilities, when they are present, contribute to sex differences in some achievement behaviors. Our data, however, as well as other studies, suggest that sex differences in the variables traditionally associated with self-concept of ability are not as large nor as consistent as once believed (see Parsons, 1983; Parsons et al., 1982). Sex differences may be more consistent on measures of subjective task value. If, as our data suggest, males and females attach different values to various achievement tasks, then it seems likely that this sex difference is the more important influence on sex differences in achievement-related choices, such as course and career selection.

General Conclusions

Sex Differences in Achievement

In the introduction, we outlined four major theoretical perspectives on the issue of sex differences in academic achievement patterns. This study was designed to compare the utility of these four perspectives. Many different specific hypotheses were evaluated. Four important conclusions are suggested by the results. First, the most consistent and strongest support emerged for the importance of subjective task value as a mediator of both academic achievement plans in general and of sex differences in academic choices. Second, there was very little support for learned-helplessness models of sex differences in academic achievement behavior. Third, there was some evidence of sex differences in ability attributions that is consistent with the expectancy/self-concept perspective, but these differences occurred only among low-expectancy subjects and were not evident on the related measures of expectancies and confidence in one's abilities. Fourth, paper-and-pencil indexes and behavioral indexes of achievement attitudes did *not* yield converging evidence of sex differences. Therefore, great caution should be used in interpreting sex differences on the verbal measures.

Additional Issues

Our results have implications for an additional issue: the impact of subject domain on attributional processes. There are some interesting differences in perceptions of math and English. Students rated English as easier than math and were more confident of their English ability than their math ability. Given the availability of these two alternative, positive explanations for success on an English task, students should discount the importance of ability as a causal explanation for both success and failure in English; the results of Study 1 provide support for this prediction, even though the ability ratings in Study 1 run counter to the ability ratings in Study 2. Apparently, math is not only considered to be a more difficult subject, it is also conceived of as a subject in which performance is influenced relatively more strongly by ability than is performance in English. These results suggest that people have different belief structures for different subject areas and that these beliefs may predispose the use of different causal schemes for different tasks. For example, if math is seen as an intellectually difficult task and if we stereotype math ability as a fairly unique, stable ability, then we will be biased toward the use of ability as the important causal explanation for math performance.

The motivational consequences of such differences in causal schemes between math and English are intriguing. Because they are biased to attribute their math successes to ability, students doing very well in math should be confident of continued success, even if their courses get more difficult, and should experience great pride in their successes (Weiner et al., 1978). Children doing well in English are in a more ambiguous causal situation both in terms of their future expectations, given that courses may get more difficult, and in terms of their affective response. Doing poorly in math and English should also yield different motivational consequences. If lack of ability is assumed to be a stable characteristic of the individual that cannot be modified easily through practice or skill acquisition, then students doing poorly in math should be more likely to experience helplessness, to feel shame, and to give up than students doing poorly in English. In support of these hypotheses, several studies have found that math elicits the most extreme positive and negative reactions from students (e.g., Blumenfeld & Pintrich, 1982). Whether math ability is actually seen as stable or modifiable through practice and instruction, however, has yet to be determined. Nonetheless, these data indicate the importance of assessing the causal schemes and belief structures associated with different achievement domains in order to understand the motivational dynamics associated with these different domains.

References

Atkinson, J. W. (1964). *An introduction to motivation.* Princeton, NJ: Van Nostrand.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 191–215.

Bar-Tal, D. (1978). Attributional analysis of achievement-related behavior. *Review of Educational Research, 48,* 259–271.

Battle, E. S. (1965). Motivational determinants of academic task persistence. *Journal of Personality and Social Psychology, 2,* 209–218.

Berg, J. H., Stephan, W. G., & Dodson, M. (1981). Attributional modesty in women. *Psychology of Women Quarterly, 5,* 711–727.

Blumenfeld, P., & Pintrich, P. (1982, March). *Children's perception of school and schoolwork.* Paper presented at the meeting of the American Educational Research Association, New York.

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.

Diener, C., & Dweck, C. S. (1978). An analysis of learned helplessness: Continuous change in performance, strategy, and achievement cognitions following failure. *Journal of Personality and Social Psychology, 36,* 451–462.

Dweck, C. S., & Licht, B. G. (1980). Learned helplessness and intellectual achievement. In J. Garber & M. E. P. Seligman (Eds.), *Human helplessness: Theory and application* (pp. 197–221). New York: Academic Press.

Dweck, C. S., & Reppucci, N. D. (1973). Learned helplessness and reinforcement responsibility in children. *Journal of Personality and Social Psychology, 25,* 109–116.

Eccles, J. (1983). Sex differences in mathematics participation. In M. Steinkamp & M. Maehr (Eds.), *Women in science* (pp. 80–110). Greenwich, CT: JAI Press.

Eccles, J. E., 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.), *Achievement and achievement motives* (pp. 75–145). San Francisco: W. H. Freeman.

Eccles, J., & Wigfield, A. (in press). Student expectations and motivation. In J. B. Dusek (Ed.), *Teacher expectancies.* Hillsdale, NJ: Erlbaum.

Feather, N. T., & Simon, J. G. (1971). Causal attributions for success and failure in relation to expectation of success based on selective or manipulated control. *Journal of Personality, 37,* 527–541.

Fennema, E., & Sherman, J. (1978). Sex-related differences in mathematics achievement and related factors: A further study. *Journal for Research in Mathematics Education, 9,* 189–203.

Frieze, I. H., Whitley, B., Hanusa, B., & McHugh, M. (1982). Assessing the theoretical models for sex differences in causal attributions for success and failure. *Sex Roles, 8,* 333–343.

Gitelson, I., Petersen, A., & Tobin-Richards, M. (1982). Adolescents' expectancies of success, self-evaluations, and attributions about performance on spatial and verbal tasks. *Sex Roles, 8,* 411–419.

Gould, R., & Slone, C. (1982). The "feminine modesty" effect: A self-presentational interpretation of sex differences in causal attribution. *Personality and Social Psychology Bulletin, 8,* 477–485.

Hyde, J. S. (1981). How large are cognitive gender differences? A meta-analysis using *w* and *d. American Psychologist, 36,* 892–901.

Joreskog, K. G., & Sorbom, D. (1978). *EFAP: Exploratory factor analysis program. User's Guide.* Chicago: National Educational Resources.

Kaczala, C. M. (1981, April). *Sex role identity, stereotypes and their relationship to achievement attitudes.* Paper presented at the meeting of the American Educational Research Association, Los Angeles.

Kirk, R. E. (1969). *Experimental design: Procedures for the behavioral sciences.* Belmont, CA: Brooks/Cole.

Klein, D. C., Fencil-Morse, E., & Seligman, M. E. P. (1976). Learned helplessness, depression, and the attribution of failure. *Journal of Personality and Social Psychology, 33,* 11–26.

McHugh, M., & Frieze, I. H. (1982, March). *The effects of sex linkage of task, ambiguity of feedback, and competition on the performance expectations of males and females.* Paper presented at the meeting of the American Educational Research Association, New York.

McHugh, M., Frieze, I. H., & Hanusa, B. (1982). Attributions and sex differences in achievement. Problems and new perspectives. *Sex Roles, 8,* 467–479.

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.

Parsons, J. E. (1980). *Self-perceptions, task perceptions and academic choice: Origins and change.* Washington, DC: National Institute of Education. (ERIC Document Reproduction Service No. ED 186 477)

Parsons, J. E. (1983). Attributions, learned helplessness, and sex differences in achievement. *Journal of Educational Equity and Leadership, 3,* 19–27.

Parsons, J. E., & Goff, S. B. (1980). Achievement motivation: A dual modality. In L. J. Fyans (Ed.), *Recent trends in achievement motivation: Theory and research* (pp. 349–373). Englewood Cliffs, NJ: Plenum Press.

Parsons, J. E., Meece, J. L., Adler, T. F., & Kaczala, C. M. (1982). Sex differences in attributional patterns and learned helplessness? *Sex Roles, 8,* 421–432.

Parsons, J. E., & Ruble, D. N. (1977). The development of achievement-related expectancies. *Child Development, 48,* 1075–1079.

Parsons, J. E., Ruble, D. N., Hodges, K. L., & Small, A. W. (1976). Cognitive-developmental factors in emerging sex differences in achievement-related expectancies. *Journal of Social Issues, 32,* 47–61.

Randour, M., Strasburg, G., & Lipman-Blumen, J. (1982). Women in higher education: Trends in enrollment and degrees earned. *Harvard Education Review, 52,* 189–202.

Raynor, J. O. (1974). Future orientation in the study of achievement motivation. In J. W. Atkinson & J. O. Raynor (Eds.), *Motivation and achievement* (pp. 121–154). Washington, DC: Winston.

Seligman, M. E. P. (1975). *Helplessness: Depression, development, and death.* San Francisco: Freeman.

Snyder, M. L., Stephan, W. G., & Rosenfield, D. (1978). Attributional egotism. In J. H. Harvey, W. Ickes, & R. F. Kidd (Eds.), *New directions in attribution research* (Vol. 2, pp. 91–117). Hillsdale, NJ: Erlbaum.

Stein, A. H., & Smithells, T. (1969). Age and sex differences in children's sex role standards about achievement. *Developmental Psychology, 1,* 252–271.

Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, S., & Rosenbaum, R. M. (1971). *Perceiving the causes of success and failure.* New York: General Learning Press.

Weiner, B., Russell, D., & Lerman, D. (1978). Affective consequences of causal ascriptions. In J. H. Harvey, W. Ickes, & R. J. Kidd (Eds.), *New directions in attribution research* (Vol. 2, pp. 59–90). Hillsdale, NJ: Erlbaum.

Wolleat, P. L., Pedro, J. D., Becker, A. D., & Fennema, E. (1980). Sex differences in high school students' causal attributions of performance in mathematics. *Journal of Research in Mathematical Education, 11,* 356–366.

Received June 3, 1982
Revision received June 2, 1983 ■