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Classroom Experiences and Student Gender: Are There Differences and Do They Matter?*

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INTRODUCTION

The link between achievement beliefs and academic performance has been amply documented (cf. Crandall, 1969; Dweck & Elliott, 1983; Eccles, 1983; Eccles & Wigfield, in press; Stein & Bailey, 1973). Within this litera-ture, males and females are often found to have differing beliefs, which are assumed to account in part for sex differences in achievement behaviors. For example, the higher achievement levels of older boys and men is often

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attributed to the fact that boys have higher expectations than girls for success on some achievement tasks. Similarly, the lower incidence of behavior problems exhibited by girls has been attributed to the compatability between girls' gender-role orientation and the demands inherent in the student role. The developmental origin of these sex differences in beliefs and attitudes has interested psychologists for many years. Concern over the possible role of schools in socializing these differences has increased during the last 20 years and several investigators have suggested a variety of mechanisms that might yield sex-differentiated socialization in the classroom (e.g., Brophy, see Chapter 6, this volume; Dweck, Davidson, Nelson, & Enna, 1978; Parsons, Ruble, Hodges, & Small, 1976). The research reported in this chapter was designed to evaluate some of these mechanisms; in particular, the mechanisms that might yield sex differences in students' attitudes toward school and toward themselves as learners.

Over the past 6 years, we have observed teacher–student interaction in over 50 elementary and junior high school classrooms in an effort to investigate the impact of sex-differentiated classroom experiences on students' beliefs and motivation. This chapter presents a summary of our findings and some suggestions for classroom practices that might increase sex equity in educational outcomes. We expected to find rather blatant sex differences in children's school experience. We also expected to find evidence linking these differences in experience to children's attitudes toward school and learning. Surprisingly, we found few blatant sex differences. All of the sex differences we found were small; and even these were not consistent across the classrooms we studied. In addition, these differences were not particularly strong predictors of any of the student attitudes and beliefs that have been found to be sex-differentiated.

Based on our experiences, we now believe that teachers play a rather passive role in the maintenance of sex-differentiated achievement patterns. Students start school with sex-differentiated goals and attitudes (Eccles & Hoffman, 1984; Huston, 1983). These attitudes appear to consolidate into sex-differentiated beliefs regarding math and scientific abilities some time around early adolescence (Eccles Parsons, 1984). The role teachers play in this consolidation process is rather subtle. Although teachers do not appear to be the major source of these beliefs, they also do very little to change them or to provide boys and girls with the types of information that might lead them to reevaluate their sex-stereotyped beliefs. In this way teachers passively reinforce the sex-typed academic and career decisions made by their students, thus contributing to sex inequity in children's educational attainment.

These conclusions are based on two extensive observational studies: (1) an elementary school study conducted by Blumenfeld and her colleagues,

and (2) a junior high school math classroom study conducted by Eccles and her colleagues. The elementary school study was designed to investigate early socialization of sex-differentiated attitudes and beliefs. The junior high study was designed to investigate the socialization of sex-differentiated attitudes toward math and science during early adolescence. Two types of data were gathered in both studies: (1) detailed observational data on teacher–student interaction patterns and (2) detailed questionnaire information from students regarding their attitudes toward school and learning. Because integrating these two types of data allows us to assess the impact of interaction patterns on students' beliefs and attitudes, these two studies provide a unique look at socialization in the classroom. Furthermore, because the two studies cover such a wide grade range, they provide a test of the possibility that the process of sex-differentiated socialization varies with grade.

The results of these two studies are summarized in the next two sections. In each section we present an overview of the methods, a summary of the observational data, a summary of the student-attitudinal data, and a summary of the relations between the classroom interactional data and the student-attitudinal data. The final section of this chapter outlines suggestions for increasing sex equity in school outcomes. For brevities sake, we have not detailed our hypotheses. These can be found in the various articles we refer to throughout this chapter and most specifically in Parsons, Kaczala, and Meece (1982). And since Brophy (see Chap. 6, this vol.) provides an excellent review of the previous literature on sex-differentiated socialization in the classroom, we have not included a detailed literature review.

SOCIALIZATION IN ELEMENTARY SCHOOL: GRADES 1 AND 5

Study One involved 2 years of data gathering. The first year was designed to examine the relation of teacher communication patterns to children's perceptions of the student role. Consequently, a coding system for teacher communication was needed. Teachers talk to students about many things and try to provide both academic and citizenship training. Academic training involves instruction in both academic content and work procedures. Citizenship training involves instruction in the social and moral procedures necessary to facilitate working with or in the presence of others. Given these considerations, teacher communication was coded in terms of four domains: academic performance, academic procedure, social procedure, and social-moral norms. Furthermore, since there are both theoretical and empirical reasons for expecting sex differences in each of these domains,

we coded the communication patterns for the sex of the student recipient of each communication. This procedure made it possible to explore teachers' emphasis on one normative domain versus another as well as differences among domains in socializing strategies used with boys and girls.

Since the major goal of this study was the investigation of socialization into the student role, student perceptions of the student role were also assessed. We wanted to find the extent to which children had incorporated positive academic norms, social norms, and expectations and to explore the reasons children give for conforming with these norms. We expected to find evidence of increased understanding and more questioning of these norms with increasing age. More central to this chapter, we expected girls to evidence greater incorporation of and conformity to these norms than boys. Finally, we expected to find a relation between sex-differentiated teacher communication patterns and sex differences in the students' endorsement of the traditional good student role.

Teacher Communication Patterns

To gather teacher communication data, we recorded 10 hours of verbatim statements made by teachers in each of 9 first- and 9 fifth-grade classrooms representing both middle-class and working-class districts. Teacher statements were coded for domain of reference (academic performance, academic procedure, social procedure, and social-moral norm); for timing (whether the remark was proactive or reactive); for the quality of the behavior from the teacher's viewpoint (positive, negative, or ambiguous); for the target of the remark (male, female, small group, whole class); and for the affective intensity of the remark (whether the teacher raised her/his voice or appeared especially pleased or angry). Finally, the presence of additional information, such as explanations for role expectations, causal attributions, and sanctions, was coded into a set of categories labeled informatives. Results of this study are summarized below; more details can be obtained from Blumenfeld, Hamilton, Bossert, Wessels, and Meece (1983).

OVERALL FLOW OF TEACHER TALK

In order to provide a picture of the general classroom patterns, we summarize the general patterns of teacher communication before discussing gender differences. Since there were few grade-level differences, this general description represents a composite picture across grade levels.

Teachers were quite verbose (emitting an average of 59 clauses per hour). This communication was largely reactive and negative; it focused

predominantly on procedures (57%) and academic performance (41%). Since reference to moral concerns occurred rarely, it is not discussed further. In addition, fully 98.5% of all statements were low in affective intensity.

Not surprisingly, characteristics of communication varied across domains. Academic performance communication was more reactive and more positive than communication in the other domains, primarily because performance communication typically occurs after a response and responses are correct slightly more than half the time. In contrast, academic procedure communication tended to be proactive, typically involving directions for upcoming assignments or activities; when academic procedure communication was reactive, it was invariably negative. Communications regarding social procedures were typically reactive (78%) and negative (76%). Procedural conformity was almost never praised.

From the viewpoint of both attribution and social learning theory, causal attributions, explanations for compliance, and threats of potential sanctions are important socialization messages. Students' acceptance of norms of behavior and students' perceptions of their own academic potential should be influenced by these types of informatives. To our surprise, only a small proportion of teacher communications (14% on the average) contained such informatives. In addition, informatives were dramatically more negative and procedural than the other types of teacher communication, even though they were about equally reactive.

The types of informatives varied by domain. Causal attributions occurred primarily in the domain of academic performance; these attributions were predominately positive and effort-related; attributions to ability (either positive or negative) were rare. Whereas explanations about the value or interest of lessons were infrequent, explanations and sanctions were more common in the procedural and moral domains; these statements often referred to circumstances or to potential negative consequences to the self or others as justification for compliance with normative expectations.

Overall, then, the initial picture of teacher communication is mixed. It is reactive and overwhelmingly focused on procedural infractions. Informatives occur rarely and are even more negative and procedural in emphasis than the overall flow of talk. Communications regarding academic performance, although outnumbered by procedural concerns, were the most positive; but even in this domain, it is perhaps most honest to conclude that communications were simply less negative than in the other domains of teacher communication. We have replicated this study on another sample with almost identical results. The patterns of results from both samples are consistent with the reports of others (e.g., Jackson, 1968; Doyle, 1979) in suggesting that the everyday demands of the institution of the classroom,

rather than the long-term goal of socializing scholars and citizens, drive classroom interaction. The teacher is primarily a manager of the ongoing activities, and the immediate institutional imperatives of conducting these activities while preventing chaos override what might be judged the ideal socialization practices by those of us outside the classroom. Indeed, the teacher appears to be a manager who mainly reacts to those behaviors that interfere with the flow of classroom events (though generally with low affect). It is against this background of activity that we must evaluate sex differences in the experience of students.

GENDER DIFFERENCES

The major sex differences reflect the fact that boys are the recipients of more teacher talk than are girls: 39% of all communications was directed at boys, only 29% was directed at girls; the remaining communications were directed at mixed groups of students. This imbalance is even more pronounced in looking at informatives: 39% of which were directed at boys compared to 21% directed at girls.

Such differences in communication patterns could reflect several factors (e.g., the teacher might like boys better or boys might create more behavior problems). To get a clearer understanding of the possible cause, we examined the quality and the distribution of concerns addressed to boys and girls. Results indicate that the communications directed to both boys and girls were mostly, and about equally, reactive. There was a slight tendency for boys to receive proportionately more negative feedback than girls, a difference that may be explicable in terms of the concerns addressed to boys and girls. Girls received an appreciably higher proportion of their communications regarding academic performance, whereas communications to boys focused more on procedural issues. Since procedural communication tends to be more negative than academic performance communication, it is not surprising that boys were the recipients of more negative communication than girls.

For the most part, the picture of informatives for boys and girls resembled that for the overall remarks. Like other forms of communication, the informatives directed at boys and girls were equally reactive. However, in contrast to other forms of communication, boys and girls received equivalent proportions of negative informatives (approximately 80% of the informatives addressed to boys and girls were in reaction to violations of norms). Distribution of the informatives across domains was somewhat more skewed, with girls receiving a higher relative proportion of their informatives about academic performance (37%) than boys (22%). Given these differences in

concerns addressed to the two sexes, it is not surprising that only 17% of the negative informatives addressed to boys concerned academic performance compared to 33% of the negative informatives to girls. Since attributions were concentrated in this domain, it follows that girls received proportionately more attributions among their informatives (40%) than boys (28%). The majority of these attributions linked academic difficulties to insufficient effort.

In summary, despite some differences between the sexes in the nature and distribution of teacher talk received, the overall message of these data is similar to that reached by Brophy (see Chap. 6, this vol.). The striking difference in teacher handling of girls versus boys concerns the amount of attention paid to boys. Within that background fact, there are relatively more subtle tendencies for girls to receive disproportionately more academic performance communication and perhaps slightly more positive communication. Teachers do not appear to be attending to boys because they are disruptors—although they might be attending to boys in order to prevent them from becoming disruptors. In any case, although a simple explanation does not emerge from these data, the fact remains that boys are the recipient of more teacher communication than girls, especially teacher communications regarding proper procedure.

Student Perceptions of Classroom Norms

To assess student perceptions, 360 first- and fifth-grade students were questioned regarding their views of the importance of various classroom norms, their feelings about meeting these norms, and their reasons for comforming to these norms. Each child was presented with a series of pictures illustrating classroom behaviors in each of the four domains. Since responses to conformity were expected to differ from responses to norm violations, both good and bad behaviors were illustrated. The children were asked to assess how good (or bad) each behavior was, to show how good (bad) they would feel if they did what was pictured, and to explain why the behavior is good or bad. The first two responses were assessed on quantitative scales; the third response was recorded verbatim and coded into intrinsic and extrinsic categories.

OVERALL PATTERN

Children responded to the various domains as expected. Moral norms received significantly higher importance ratings and elicited more extreme

affective responses for both adherence and violation. Apparently children believe that the domain receiving the least emphasis in the classroom is the most important, suggesting that moral concerns are learned outside the classroom and are carried into the classroom as they are into any other setting the child encounters.

Although children rated achievement norms as least important, their affective response to these norms was more intense, placing achievement norms in an intermediate position between morals and procedures with respect to affect. In addition, children responded less to norm violation than to norm adherence both in terms of importance and affect. This asymmetry was especially marked for achievement norms. Apparently, children neither consider day-to-day academic failures very important nor feel very intensely about them relative to success, a pattern consistent with communication and sanctions in the elementary classroom.

GRADE LEVEL EFFECTS

Children's perceptions of the student role differed more by grade level than did the teacher talk variables. As anticipated, first graders reacted with greater conformity, more extreme affect, and less differentiation across domains than the fifth graders; first graders also reasoned more externally about the norms than the older children. The decline in ratings was most marked for social conventions and least marked for moral norms. Despite these grade level effects in the extremity of the ratings and in the externality of the reasons offered for compliance with the norms, the rank order of the norms in terms of importance and affective response to both violations and conformity were identical across these two grade levels. These findings, although surprising, are consistent with the fact that teacher communication about these school-related behavior norms differed little across these grade levels. The children's social cognitions apparently mirror these invariant realities of classroom life.

GENDER DIFFERENCES

There was a consistent pattern of sex differences in the student perceptions: Compared to boys, girls consistently reported that they would feel worse about violating procedural and moral norms. There were also some scattered instances in which girls reported that they would feel better about fulfilling a norm, but these effects were not as consistent as the pattern associated with norm violation. There were no sex differences in the reasons offered for complying with the norms.

Interestingly, the pattern of sex differences that emerged was unrelated to the pattern of differential treatment the sexes received from their teachers. Girls reported greater conformity to the norms, despite receiving much less socializing attention than the boys. Girls were also most different from boys in the social-moral domain, the one domain that is least salient in the classroom life. Boys and girls differed least in the domain of academic performance, the domain in which teachers target the highest proportion of effort at girls. For example, there was a significant relationship between the percentage of attributions focused on academic performance and students' ratings of the importance of success on academic tasks. Girls received a higher percentage of their attributions for academic performance. One might expect therefore that girls would rate academic success as more important than the boys. They did not. Thus, despite the fact that they were recipients of the positive teacher communication pattern, they did not evidence the expected advantage in their attitudes. In general, evidence from the student perception measures supports a relatively "sugar and spice" picture of girls—certainly more so than is true of the teacher talk data, and in ways not particularly consistent with teacher talk. These results suggest that girls acquire their values outside the classroom just as students in general appear to acquire their moral values and norms outside school.

But what about boys? Recall that a higher percentages of boys' informatives were focused on social procedural explanations and sanctions. In addition, these informatives tended to be negative. Overall, this pattern of informatives (high percentage on social procedural explanations and sanctions and high percentage negative) was associated with low endorsement of academic and social procedural norms. Consequently, one might expect boys to rate the importance of adhering to these norms lower than did the girls. This was not the case. Once again, the sex difference in classroom communication patterns did not translate into the expected sex difference in student attitudes.

What can we conclude? Despite the fact that there are some consistent sex differences in teacher communication patterns, these differences do not translate into the expected sex differences in student attitudes. These results suggest that the sex differences in student attitudes that do exist are not created by differential teacher communication patterns. Instead, like moral norms in general, we believe these sex differences are acquired in daily life. They reflect widely held cultural beliefs that children are exposed to in a variety of settings. Children bring these beliefs with them to school and continue to believe them unless they are forced to reconsider their validity. If teachers are guilty of sexism, it is their failure to get students to reconsider these beliefs that condemns them.

SOCIALIZATION INTO THE STUDENT ROLE:
GRADES 2 AND 6

The second year of the elementary school study was designed to explore in more depth the relation of classroom experiences to student perceptions. The study population included 158 students (101 second graders and 57 sixth graders) and their 11 teachers. Data were obtained from three sources: student interviews, teacher ratings, and classroom observations. Student interviews consisted of both open- and closed-end quantitative questions tapping perceptions of the teacher, of the other students in the class, of schoolwork, of the causes of success and failure in school, and of one's own ability, effort, and conduct. Teachers rated each of the students in terms of their achievement, conduct, work habits, social skills, and personality characteristics. To gain detailed information on classroom interaction patterns, 85 of the children were observed individually for 120 minutes per child. Codes similar to those of Brophy and Good (1974) were used to record (1) the frequency and quality of academic and behavioral feedback from teachers and peers, (2) the frequency and quality of instructional interaction with the teacher, and (3) the frequency of personal conversations with the teacher. Peer interaction codes concerned (1) seeking and giving help, (2) social comparison, (3) negative interchanges like enforcing, fighting, or provoking, (4) positive interactions like stroking, and (5) personal conversations. Every 5 minutes students were rated as to their on-task behavior. These observations were conducted during academic work times, especially during math and reading periods. No child was observed for more than 20 minutes at one time. Whenever an interaction was recorded the activity structure in which it occurred also was noted. These structures were defined as individual seatwork, small group with teacher, whole-group recitation, and transition.

Interactional Patterns

The observational measures yielded data very similar to other reports of teacher and child interactions. The number of interactions for any one child ranged from 7 to 124 over the 2 hours, with a mean of 44. The quality and focus of teacher feedback to individuals was similar to that reported by Blumenfeld, Hamilton, Wessels, and Falkner (1979), Brophy and Evertson (1981), and Parsons et al. (1982). Sixteen percent of a child's interactions with the teacher involved praise. Other frequent teacher behaviors were negative feedback (21%) and commands (20%). The peer interactions also paralleled other descriptions of student classroom behavior (e.g., Hoge &

Luce, 1979). Children were most likely to be talking socially to a peer (19%), seeking help (21%), or seeking to play or work with a peer (11%). Finally, the frequency and quality of children's social comparison behavior (about 9%) was similar to that reported by Ruble and Frey (1982). Although there were some differences in teacher and student behavior associated with student characteristics, the differences were not large. On the whole, different types of children were treated and acted more similarly than differently. A more detailed description of these results can be found in Pintrich (1982).

GENDER DIFFERENCES

There were few sex differences in the students' behavior. Contrary to what one might expect, boys and girls did not differ in the frequency of disruptive behaviors such as defying, fighting, or arguing. They also did not differ in the frequency of off- or on-task behaviors. The only noteworthy sex difference was that boys engaged in more social comparisons of all kinds than girls.

Surprisingly, given the general lack of sex differences in social behavior, boys were the targets of more negative statements from the teacher. Teachers criticized boys more for misbehavior, even though boys did not misbehave more than girls. Boys also got more interactions in general. However, when the larger frequency of teacher behavioral feedback to boys is taken into consideration using proportion variables, there was only one sex difference in the pattern of teacher feedback: Compared to girls, a higher proportion of boys' conduct feedback was negative. Consequently, although boys received more of many kinds of feedback, the sexes did not differ markedly in the general pattern of their feedback.

Sex differences become even more elusive when activity is taken into account. Teachers did not treat boys and girls differently except during periods of transition in which boys received more negative feedback than girls. These results are especially interesting because although boys' and girls' behavior varied by structure, it was quite similar during transitions. This greater teacher reactivity to boys may be a carry-over from recitation periods, during which boys misbehaved more than girls, and may reflect the teachers concern over preventing possible disruptions from the boys during managerially difficult transition periods.

Teachers did not respond differently to boys and girls during other activities, even though student behavior varied by sex. In small-group settings boys talked more than girls; in contrast, girls sought more help than did boys. In seatwork, boys engaged in more social comparisons than girls. Thus, compared to boys, girls seem more conforming, behave more appro-

priately during recitation and small groups periods, and appear less interested in social comparison.

Student Perceptions of Classroom and Self

We examined the relation of students' perceptions of teachers and peers to their satisfaction. We also explored the impact of classroom experiences on these and on self-perceptions for the sample as a whole and for each sex separately. Results are summarized below. More details can be found in Blumenfeld, Pintrich, and Meece (1983) and Pintrich and Blumenfeld (1983).

PERCEPTIONS OF TEACHERS, PEERS, AND SCHOOLWORK

In general, children, regardless of age, sex, or socioeconomic status, rated teachers and peers similarly. In addition, both boys and girls were most satisfied when they thought their teacher was good-tempered, funny, interesting, enthusiastic, and did special things for the class. Older children (both boys and girls) were less satisfied if they felt their teacher was overreactive and too controlling.

Generally, perceptions of schoolwork differed somewhat by grade but not by sex. As anticipated, most students thought it extremely important to do well in school, but the chief reason mentioned, namely, avoiding failure, suggests a rather negative motivational set. Older children focused more on future considerations than did younger children. When asked specifically about topics they like and dislike working on, math was the subject many children (31%) preferred, especially second graders. However, about the same number chose math as the subject they liked least. In addition, in response to the question, "What do you work hardest on?" children overwhelmingly answered, "math" (61%). Finally, contrary to what we had expected, responses regarding specific subject matter did not differ by sex at either grade level. Not surprisingly, older children evidenced greater concern both with their marks and with their ability to do the work.

Impact of Classroom Experiences on Student Perceptions

We used stepwise regression to examine the relation of classroom experiences to children's perceptions of their teachers and peers and to their

satisfaction with their class. Variables were selected on the basis of high zero-order correlations between the classroom interaction variables and student perceptions. Contrary to expectations, teacher praise did not significantly influence students' perceptions of their teacher. Not surprisingly, children who were the target of more teacher commands and reprimands concerning behavior rated their teacher as more strict and less nice. Since teachers are basically reactive to student behavior, students who elicit more negative feedback are also likely to be the ones who most often misbehave (Brophy & Evertson, 1976). Congruent with this finding, students who were on task more, and talked, defied, or acted out less, reported higher levels of overall satisfaction.

There were some interesting differences in the pattern of predictors of satisfaction depending on grade level and students' sex. We had assumed that younger children and girls would be more affected by teacher behaviors, because both groups are assumed to be more adult-oriented. This was only partially confirmed. Younger children's ratings were more influenced by the amount of negative feedback and commands they received, but positive interaction had similar effects at both grade levels. Most significantly, and contrary to our predictions, there were no sex differences in the impact of teacher interactions on either student perceptions or satisfaction.

In contrast, there were some sex differences in the student behaviors associated with satisfaction. Social comparison with peers and enforcement behaviors designed to keep one's peers in line were both related to satisfaction but in opposite directions for boys and girls. These student behaviors were positively associated with boys' satisfaction and negatively associated for girls'. Since social comparisons generally focused on work completion rate, both of these student behaviors may indicate a concern with conforming with classroom norms. Given that girls feel more strongly about meeting classroom norms, display of these behaviors by girls may reflect anxiety about and dissatisfaction with other students' failure to do assignments and behave properly. The same behavior on the part of boys, who feel less strongly about these matters, may signal higher levels of commitment or concern and thus be associated with more satisfaction.

Self-Perceptions

Since one major goal of this study was to investigate the socialization of students' perceptions of themselves as learners, we examined students' ratings of their own ability, effort, and conduct, the linkages among these, and the criteria used for each rating. In addition we tested the impact of classroom experiences on these ratings. Our findings concerning age and sex

differences parallel those of other studies in that (1) students' self-percep-
tions corresponded significantly with their teacher's assessments of their
achievement, which, in turn, are closely related to the students' actual
performance; (2) students used grades, speed, work habits, and completion
rate as criteria for assessing their own ability; (3) students' self-ratings
showed a general decline with age; (4) grades increased in importance as
evaluative criteria with age; and (5) girls rated themselves as better be-
haved. There were no sex differences in the students' ratings of their own
ability and all students primarily used absolute rather than comparative
standards in assessing their ability, effort, and conduct.

The pattern of relations among self-ratings did not differ by age or sex.
Moreover, contrary to our expectations, girls and boys did not differ in the
link of conduct and ability perceptions, the sources of information for judg-
ing each, or their overlap. Congruent with other studies, girls did see them-
selves as better behaved. But they did not confuse this with being smart or
trying hard. This finding suggests that girls do not form ability perceptions
in a different manner than boys. Although they care about being good and
see themselves that way, this perception has little to do with their self-
ability ratings.

The Impact of Classroom Experience on
Self-Perceptions

Once again, stepwise regression analyses were used to assess the impact
of classroom experience on self-perceptions for the group as a whole and
for each grade level and each sex separately (see Pintrich, 1982, for more
detail). Selection of variables for inclusion in these analyses was again based
on high zero-order correlations of classroom interaction variables with the
three self-perceptions scores studied. Perceptions of ability and effort were
positively influenced by achievement level and by work praise; work criti-
cism negatively influenced perceptions of effort but not of ability. Negative
feedback about behavior also depressed effort perceptions but had its larg-
est impact on conduct ratings. Conduct perceptions were, however, most
closely tied to level of misbehavior exhibited.

The results for the subsamples showed the same basic relationships as for
the total sample. However, there were some interesting sex differences.
Compared to boys, achievement level (as rated by the teacher) accounted
for more variance in the girls' ratings of their ability, their effort, and their
conduct. Classroom experiences also affected boys' and girls' ratings differ-
ently, but the nature of the difference depended on the particular rating
being made. Classroom experiences had similar effects on boys' and girls'

ability ratings; namely, positive academic feedback increased these self-perceptions. And as was true for the group at large, conduct feedback had no impact on either boys' or girls' ability ratings. In contrast, the classroom experiences relating to effort and conduct ratings differed for boys and girls. On the one hand, negative feedback about work and positive feedback about conduct depressed boys' effort ratings; on the other hand, girls' effort ratings were depressed most by teacher-monitoring behaviors. A boy's self-conduct rating was not affected by either teacher feedback patterns or by his own achievement level; instead, it covaried with the boy's own level of misbehavior. In contrast, girls' self-conduct ratings were enhanced by their achievement level and by their own good conduct, and were depressed by negative conduct-related feedback from the teacher.

In summary, classroom perception and self-ratings seem to be affected primarily by factors related to teacher control and student performance. As Jackson (1968) suggested, life in classrooms is predominantly one of rules, regulations, and routines that do not vary much by grade level or sex of the child. Teacher communication patterns are remarkably similar across grade level and sex of student. Consequently, although students' experiences do affect their perceptions, these effects do not appear to differ substantially for boys and girls, at least during the elementary school years. Not surprisingly, then, there were also no major differences in boys' and girls' self-perceptions during these years. As noted earlier, sex differences in self-perceptions do not appear consistently until late in elementary school, and even then they depend on the subject area. Consequently, sex differences may be more marked in junior high school and in subject areas that are sex-typed. This hypothesis is explored in the next section.

SOCIALIZATION OF SEX DIFFERENCES IN JUNIOR HIGH SCHOOL MATH CLASSROOMS

The junior high school study was designed to investigate the socialization of sex differences in students' attitudes toward mathematics. Previous studies have shown that sex differences in attitudes toward both oneself as a math learner and mathematics as a subject area emerge in junior high school (see Eccles Parsons, 1984, and Meece, Eccles-Parsons, Futterman, Goff, & Kaczala, 1982, for reviews). Several investigators have suggested that classroom experiences in the upper elementary grades and in junior high school might contribute to this decline in girls' attitudes toward math. In particular, they have suggested that teachers, especially during these years, pay more attention to boys than girls and engage boys in more of the

kinds of interactions that foster self-confidence and interest in math and science. Furthermore, they have suggested that these differences in teacher—student interaction may be most marked among the brightest students in the class (for reviews, Brophy, see Chapter 6, this volume; Eccles Parsons, 1984; Meece et al., 1982). The junior high school study was designed to evaluate these hypotheses using low-inference observational procedures derived from the coding systems of Brophy and Good (1974) and Dweck et al. (1978), a teacher questionnaire, and student record data.

Like the elementary school study, the junior high school study was designed to test the relation of classroom experience and teacher expectations for individual students to students' beliefs and attitudes. Too often researchers interested in the socialization of sex differences in achievement behaviors seem content to document the existence of sex differences in the socialization variables they are studying. However, the mere existence of a sex difference on a socialization variable does not prove its importance in explaining sex differences in achievement behavior. The difference might be important, but then again it might not be. Indeed, it may be that boys and girls develop different achievement patterns not only because they are treated differently but also because similar teacher behaviors affect boys and girls differently. If so, then an interactional variable that does not discriminate between boys and girls may play just as important a role in shaping or reinforcing sex differences in achievement behaviors as an interactional variable that does differ by sex of student. The importance of any socialization experience for explaining sex differences in achievement behaviors needs to be established rather than inferred. The junior high school study was designed with this goal in mind.

To accomplish this goal, we had a subset of the students in our sample fill out an extensive questionnaire assessing their achievement-related beliefs and attitudes regarding both math and English. Because the student—teacher interaction data were coded at the level of the individual student, we were able to correlate summary scores derived from the student questionnaire with the student—teacher interactional data in order to estimate the magnitude of the relation between particular classroom experiences and subsequent student beliefs and attitudes. Although not proving the causal impact of classroom experience achievement outcomes, these correlational procedures can confirm or disconfirm the existence of a relation between these sets of variables thus providing a first step in the investigation of the causal impact of classrooms experience on boys' and girls' achievement beliefs and behavior.

The main student sample discussed in this chapter consisted of 428 students from 17 math classrooms in Grades 5, 6, 7, and 9. All of these students are included in the descriptive analyses of classroom interactive patterns.

There were 3 fifth- and sixth-grade classrooms, 8 seventh-grade classroom, and 6 ninth-grade classrooms. Ten hours of observations, coded at the individual student level, were completed in each of the classrooms. Teachers' expectations for each student were measured by having the teacher rate each child in his/her class in terms of the child's math ability, the child's potential performance in future math courses, the level of the child's effort in math that year, and the grade the teacher expected the child to earn that year. Students' beliefs and attitudes regarding math were assessed with a survey questionnaire; 275 students filled this questionnaire out in their classroom about 2 weeks after the completion of the observations. Results of this study are summarized here. More details on the classroom findings can be found in Heller & Parsons, (1981) and Parsons et al. (1982). Results from a second sample of approximately 200 junior high school students given the same questionnaire and observed using the same coding system are discussed where appropriate. These students were members of 12 different seventh- to ninth-grade math classes.

Classroom Interaction Patterns

The coding system, derived from the Brophy–Good Dyadic Interaction Coding System (Brophy & Good, 1974), focused on academically relevant student–teacher interactions that involved a student and the teacher in direct dialogue with one another. Table 5.1 outlines major coding categories. Each interaction was coded in terms of the initiator (student or teacher); whether the interaction was private or public; the type of question being asked (academic, discipline, self-referrant); how the student got into the interaction (raised a hand, called out an answer, was called on without volunteering); the nature of the student's response (correct, incorrect, non-responsive); the nature of the teacher's feedback (no explicit response, simple affirm or negate, prolonged interchange with additional opportunites for the student to respond, ask another student the answer, provide explanatory feedback, provide correct answer); and the affective intensity and direction of the feedback (positive and negative; high, medium, low). Based on the work of Dweck et al. (1978), we also coded whether academic feedback focused on the academic content of the answer or on the form in which the answer was given. In addition, all incidences of conduct feedback (both positive and negative) were recorded as well as all explicit incidences of causal attributions for any student's performance and all explicit statements regarding the teacher's expectations for a student's, or a group of students', performance on an upcoming task. Finally, we began by noting all incidences of a teacher explaining why a child might want to be able to do

Table 5.1

Overview of Observational System

I. Response opportunities: Situation in which teacher publicly questions students in the class
  A. Type of question
    1. Discipline: Teacher calls on student to redirect student's attention
    2. Direct: Teacher calls on student who has not volunteered
    3. Open: Teacher calls on student who has raised his/her hand
    4. Call-out: Student calls out the answer without permission
  B. Level of question
    1. Response: Questions that have a right or wrong answer
    2. Self-reference: Questions that ask for opinion or prediction
  C. Type of student response
    1. Answer
    2. Don't know
    3. No response at all
  D. Teacher's feedback
    1. Praise or criticism directed to quality of the work
    2. Praise or criticism directed to the form of the work
    3. Praise or criticism directed to conduct
    4. Affirm
    5. Negate
    6. No feedback
    7. Give answer
    8. Ask other: Calls on another student to answer the question
    9. Sustaining feedback: Gives the student another opportunity to answer the question
    10. Attributions to ability, effort, and task difficulty
II. Student-initiated questions
  A. Type of question
    1. Content
    2. Procedural
  B. Teacher's feedback (same as #I.D. 1–10)
III. Dyadic interactions: Situations in which teacher interacts privately with student
  A. Initiator of interaction
    1. Teacher
    2. Student
  B. Feedback
    1. Brief
    2. Long
    3. Same as #I.D. 1–10
IV. Explicit expectation statements

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the assigned math work, or doing something explicit to make the assignment enjoyable, or tying the assignment to some enjoyable quality of mathematics. These incidences were so rare we stopped recording them.

This observational system yielded approximately 70 distinct raw frequency codes that were converted into 50 more meaningful units by summing across categories and by creating proportional variables describing the relative frequency of various interaction types. To facilitate interpretation of the student–teacher interaction data, we divided the interactional variables into three categories: (1) Teacher style variables (interactions primarily under the teacher's control, e.g., praise following a correct answer, use of public criticism); (2) Student style variables (interactions controlled primarily by the student, e.g., student-initiated private interactions); and (3) Joint style variables (interactions requiring initiative of both the student and the teacher, e.g., number of interactions initiated by the teacher with a student who has raised his/her hand). These three categories acknowledge the fact that student–teacher interaction depends on characteristics of both students and teachers. Many of the differences we found in interaction patterns were as much a consequence of student characteristics as of any sexist orientation of the teacher. By explicitly pointing out the major controlling party or parties for each of our interaction variables, we hope to sensitize the reader to the need for caution in interpreting the meaning and origin of any differences that might emerge.

Based on previous research, on our theoretical predictions, and on the frequency of occurrence, we focused our analyses on 36 variables: 28 frequency count variables and 8 proportional variables (see Parsons et al., 1982, for more details on the selection of these variables). The 28 frequency count variables are listed in Table 5.2 by category. The eight proportional variables focused on the relative frequency of praise and criticism and on the relative focus of one's praise and criticism on academic content, academic form, and conduct (e.g., percentage of one's praise or criticism focused on academic content, proportion of one's interaction yielding praise or criticism). These variables were used to compare our results with those of Dweck et al. (1978) and to provide an estimate of the general affective experience of each student. The proportional variables were either teacher style or joint style variables.

Because several investigators have suggested that teacher–student interactions depend on the teacher's perceptions of the student's ability level as well as on the student's gender, we included both student's gender and the teacher's expectation for the student in our analyses. To obtain the teacher's expectation for each student, we summed the teacher's ratings for each student and divided the class into two groups, high teacher-expectation

students and low teacher-expectation students, based on each classes' me-
dian teacher-expectation score.

The total frequency count data (summed across all 10 observational peri-
ods) for these four groups of students and for the sample as a whole are
summarized in Table 5.2. Since a very high proportion of students do not
participate in most types of teacher–student dyadic interactions, Table 5.2
also lists the number of students actually represented in each frequency
count. In general, these classrooms appear slightly more work-oriented than
the elementary school classrooms discussed earlier, but this may be an
artifact of the coding system. Certainly, the general impression of the ob-
servers was one of only slightly controlled chaos; and in support of this
impression, 34% of all public response opportunities contained some de-
gree of criticism, almost always focused on misbehavior, and almost always
mild in its intensity. As was true of the elementary school classrooms, the
level of affect associated with academic work was very low; academic work
was rarely criticized and only occasionally praised (8% of the time). Causal
attributions were also rare and almost always (94% of the time) focused on
lack of sufficient effort or attention.

GENDER DIFFERENCES

To assess differential treatment of boys and girls, we compared the actual
distribution of each interaction variable across our four expectancy by sex-
of-student groups to the expected distribution using a 95% simultaneous
confidence interval (Goodman, 1965). Low teacher-expectancy girls re-
ceived more praise and asked more procedure questions than expected;
high teacher-expectancy girls received fewer teacher-initiated private dy-
adic interactions but asked more questions, engaged in more total interac-
tions, and had more of their public responses negated (announced publicly
as incorrect) than other groups. Girls in both groups received less criticism
and asked more questions than boys.

Low teacher-expectancy boys received more criticism, more teacher-
initiated interactions, engaged in fewer response opportunites, and received
fewer affirms than the other three student groups. In contrast, high teacher-
expectancy boys received fewer teacher-initiated interactions but received
more affirms than other students.

As was true with the elementary school classrooms, one is struck in these
data by the relative lack of sex differences in teacher treatment of the
students. With the exception of criticism, of which the low teacher-expect-
ancy boys clearly got more than their share, boys and girls were treated
differently in only four ways: Teachers initiated an unusually high number of
private dyadic interactions with low teacher-expectancy boys, they ad-

Table 5.2

Frequencies of Observation Variables for Boys and Girls for Whom Teachers Have High and Low Expectancies[a]

Variables	Total frequency	Female		Male	
		Low expectancies frequency	High expectancies frequency	Low expectancies frequency	High expectancies frequency
Teacher style behaviors					
Teacher-initiated dyadics[b]					
Direct questions[c]	291 (155)	60 (36)	51[c] (33)	126[d] (47)	54[c] (39)
Teacher-initiated interactions	671 (224)	172[d] (47)	179 (61)	153 (58)	167 (58)
Response opportunities yielding criticism[b]	1078 (306)	253 (67)	265 (79)	309[d] (80)	251[c] (80)
Response opportunities yielding work criticism	672 (207)	107[c] (36)	131[c] (44)	272[d] (62)	162[c] (65)
Conduct criticism[b]	18 (16)	1 (1)	3 (3)	6 (5)	8 (7)
Total work criticism[b]	619 (189)	98[c] (32)	123[c] (38)	253[d] (56)	145[c] (63)
Total criticism[b]	41 (34)	4 (4)	6 (6)	19[d] (14)	12 (10)
Response opportunities yielding praise	727 (219)	117[c] (41)	137[c] (47)	297[d] (64)	176[c] (67)
Response opportunities yielding work praise	174 (92)	49 (23)	35 (18)	40 (23)	50 (28)
Total work praise	154 (86)	45 (23)	30 (17)	32 (19)	47 (27)
Total praise	295 (137)	83[d] (32)	63 (32)	72 (34)	77 (39)
Attribution statements	319 (141)	90[d] (32)	69 (33)	80 (36)	80 (40)
Negates with feedback[b]	88 (64)	13[c] (10)	22 (19)	26 (18)	27 (17)
Ask other	97 (59)	13 (7)	22 (13)	34 (18)	28 (21)
Sustaining feedback	129 (86)	28 (22)	41 (21)	30 (23)	30 (20)
Negates with sustaining feedback	263 (154)	58 (34)	65 (42)	59 (32)	81 (46)
	36 (29)	10 (6)	12 (10)	5 (5)	9 (8)

(continued)

Table 5.2 (continued)

Variables	Total frequency	Female		Male	
		Low expectancies frequency	High expectancies frequency	Low expectancies frequency	High expectancies frequency
Student style behaviors					
Student-initiated procedure questions[e]	221 (106)	66[d] (25)	73 (33)	38[c] (23)	44[c] (25)
Student-initiated dyadics	1491 (321)	311 (67)	416 (86)	364 (78)	400 (90)
Student-initiated questions[e]	969 (199)	219 (38)	409[d] (59)	157[c] (48)	184[c] (54)
Joint style behaviors					
Total response opportunities	2003 (309)	413 (63)	563 (83)	433[c] (75)	594 (88)
Open questions	950 (180)	188 (41)	279 (47)	199[c] (43)	284 (49)
Total dyadics	1780 (349)	371 (73)	467 (90)	488[d] (87)	454 (99)
Total interactions[e]	5034 (413)	1052 (85)	1520[d] (112)	1150[c] (101)	1312[c] (115)
Affirms	1340 (275)	268 (58)	377 (72)	277[c] (64)	418[d] (81)
Negates	277 (132)	46 (25)	96[d] (32)	72 (37)	63 (38)
Student-initiated questions yielding praise	14 (12)	0 (0)	6 (4)	2 (2)	6 (6)
Student-initiated questions yielding criticism	7 (6)	2 (2)	1 (1)	2 (2)	2 (1)
Total N	428	89	114	105	120

[a] Number of students having nonzero frequencies is shown in parentheses.
[b] The proportion of interactions involving males significantly greater than that involving females, $p < .05$.
[c] Lower frequency than one would expect based on proportion of sample included in this group, $p < .05$.
[d] Higher frequency than one would expect based on proportion of sample included in this group, $p < .05$.
[e] The proportion of interactions involving females higher than that involving males, $p < .05$.

dressed an unusually high number of direct questions and work praise at low teacher-expectancy girls, and they were more likely to provide boys with some form of short feedback following an incorrect answer than girls. Since the other differences reflect student or joint style variables, they cannot be attributed to the teacher. Furthermore, high teacher-expectancy boys and girls were involved in fairly comparable patterns of interactions with their math teachers.

Although we cannot determine from our data the reasons teachers might have for the patterns of differential treatment that did emerge, three of the four differences make sense in light of Cooper's (1979) analysis of teacher strategies. Cooper argued that teachers use strategies that direct potentially disruptive students into private interactions rather than encouraging them to participate in public interactions. The low teacher-expectancy boys appeared to be *the* group that was giving these teachers the most trouble. It makes sense then for these teachers to try to discourage these boys from public interactions through the use of public criticism and to encourage them to engage in more private dyadic interactions by initiating such interactions with them. In contrast, the low teacher-expectancy girls did not appear to be a source of disruption; instead the teachers may have perceived them as too docile and uninvolved. If so, then the teachers' treatment of this group also seems an appropriate remedial strategy.

The data just described are aggregated at the group level. Since we are primarily interested in psychological processes that occur at the level of the individual student, we needed interactional data aggregated at the level of the student. Since not all students were present for all 10 days of observation, we could not use each student's frequency counts; instead, the frequency counts for each of the 28 frequency variables were converted to mean frequencies per session observed. The eight proportional variables were already in a form that could be used for analysis at the level of the individual student. These are the scores discussed in the remainder of this chapter. Every student has a score for each of these 36 variables; even though for many of the variables this score is zero.

To test for sex and teacher expectancy group differences at the individual level, analyses of variance were run on each of the 36 interactional variables discussed thus far and on a measure of each student's past performance in math. By and large these effects mirror the findings obtained using the raw frequency count data: The girls received less criticism and asked more questions than the boys; the low teacher-expectancy boys, in particular, received more criticism, especially conduct criticism, and more teacher-initiated dyadics than any of the other three student groups.

One additional result emerged: High teacher-expectancy girls received praise in a smaller percentage of their interactions than any of the other

three student groups. This result probably reflects a student style variable rather than differential teacher treatment. High teacher-expectancy girls asked more questions and, as a consequence, had more total interactions with the teacher than the other three student groups; praise, however, was rare in student-initiated questions. Thus, despite the fact that on the average these girls engaged in more teacher–student interactions, they did not receive more total or more work praise than the other student groups. Consequently, a smaller proportion of their total interactions involved praise than was true for the other three student groups, not because the teacher praised their academic performance less but because they asked more questions.

As was true with the frequency code data, by and large teachers treated these boys and girls, especially the high teacher-expectancy boys and girls, in a fairly similar manner. In addition, the boys and girls had done equally well in math in previous years; and not surprisingly, the teachers expected the boys and girls to do equally well in that year's math course.

Contrary to what we had predicted, we did not find any evidence that teachers were praising and criticizing boys and girls for different behaviors. Dweck et al. (1978) suggested that girls receive a disproportionate amount of their praise for good conduct and good form rather than good work, while boys receive most of their praise for good work; in contrast, they suggested that boys receive most of their criticism for bad conduct, whereas girls are more likely to be criticized for bad work as well as for bad conduct; we did not find either of these patterns. Both boys and girls got most of their praise (93%) for good work and most of their criticism (92%) for bad conduct. Boys did, however, get more of the latter, and we could not determine whether they deserved more or not.

The general pattern of few sex differences other than amount of criticism was replicated in our second sample of junior high school classrooms. In this sample, the low teacher-expectancy boys again stood out in terms of the level and amount of criticism directed at them by their teacher. In addition, in this second sample, the girls had a higher percentage of their praise directed at the quality of their academic work than did the boys. No other interactional variables yielded sex differences consistent enough across classrooms to be significant.

Student Beliefs and Attitudes

The majority of students in the main sample ($N = 275$) filled out an extensive questionnaire assessing their achievement-related attitudes and beliefs regarding both math and English (see Eccles, 1983; and Parsons et

al., 1980, for more details on the questionnaire and on the scale construction procedures). In particular, scales on this questionnaire assessed self-concept of math ability, self-concept of English ability, perceptions of how difficult both math and English are to master, perceptions of the value and importance of studying both math and English, estimates of the likelihood of success in future math and English courses and on jobs requiring either math or English skills, and perceptions of how well the student's math teacher expected him/her to do on math in the future. Since English is not the focus of this chapter and since there were no sex differences of note on the English scales, only the math scales are discussed here.

To be consistent with the analyses reported thus far, analyses of variance were conducted on each of the math scales using student sex and teacher expectancy group as the independent variables. The results form a consistent pattern favoring the boys. Boys thought math was easier to master than did the girls; boys also had higher expectations for success in future math courses and in jobs requiring math skills. To make matters even worse, the high teacher-expectancy girls had less confidence in their math ability than did the high teacher-expectancy boys, despite the fact that they had done as well as the boys in previous math courses and that their math teachers had equally high expectations for them. Finally, these sex differences were more marked among the ninth graders than among the seventh graders. In fact, by ninth grade, the girls also felt it was less important and useful to study math than did the boys.

Relations between Interactional Variables and Student Attitudes

Correlations across the sexes and within each sex provided the first test of the relations between classroom interaction variables and attitudes. Very few significant relations emerged and the general pattern was similar for boys and girls. Positive attitudes were associated most strongly with the teacher expectation measures taken from the teacher rating form. These positive correlations held up even when the relations of past performance to both the teacher expectation measure and the students' attitudes were statistically controlled. Apparently, teacher expectations are being conveyed to the students and are influencing the students' attitudes. Exactly how is not clear from our data, since only two of the observational variables correlated significantly and substantially ($r > .20$) with the teacher expectation measure; and even these two correlated only for boys.

Among the observed interactional variables, work criticism had the strongest, most consistent effect on student attitudes. Boys and girls who

received more work criticism had more positive attitudes toward math; they thought math was easier, had more confidence in their own math ability, and had higher future expectations. Although this result may seem counterintuitive and is certainly at odds with the findings in the elementary study, it can be explained. Work criticism occurred very rarely in this group of classrooms. Perhaps these teachers used work criticism only when they expected a student to do better. If so, then work criticism could convey a positive message despite its surface negativity. Some support for this interpretation is offered by the elementary school results. While work criticism did not relate positively to ability concepts in this group, it also did not relate negatively. Clearly, even the elementary schoolchildren were not incorporating the negative surface message into their self-concepts.

The relation between praise and students' attitudes was less clear and varied by sex. In particular, high levels of praise and high proportions of praise focused on work were associated with confidence in one's math ability for boys *only*. Praise did not appear to have similarly positive effects on girls' self-concepts. Recall that praise was used most liberally with low teacher-expectancy girls. These girls were also the recipients of unusually high levels of teacher-initiated response opportunities. If this pattern of teacher behavior reflected a strategy to draw these girls into classroom discussion, as suggested earlier, then it is unlikely that these girls would interpret this praise as a sign of high teacher expectations. Rather, they probably interpreted it for what it was, a positive gesture designed to make them feel comfortable and more willing to volunteer to participate in the future.

The use and interpretation of student-initiated questions also distinguished boys and girls. Among boys the number of questions asked related positively to how hard they thought math was, whereas the number of questions girls asked was unrelated to their estimates of difficulty. Finally, a high number of affirms related to high ability concepts *only* for boys.

To shed additional light on these relationships, we asked the students to give us their estimate of their teachers' expectations for them. If teachers' influence on students' attitudes was mediated by inferential processes, then there ought to be a relation between the interactional variables and the students' perceptions of their teachers' expectations for them. To test this hypothesis, we correlated the interactional variables with the students' perceptions of their teachers' expectations for them. For both boys and girls, the frequencies of both direct questions and teacher-initiated interactions were positively related to the students' perceptions of their teachers' expectancies. In contrast, the percentage of student questions yielding praise was positively related to the students' perceptions of their teacher's expectations among the girls but negatively related among the boys. In addition,

total work praise was positively related to the students' perceptions of their teacher's expectations among the boys *only*.

What does all this mean? If you are a girl, you think the teacher has high expectations for you to the extent that the teacher asks you many academic questions and considers your questions worthy of the rare praise that is given out in response to a student's question. In contrast, if you are a boy, you think the teacher has high expectations for you to the extent that the teacher asks you many academic questions and praises your answers but does not praise your questions.

Interestingly, only the relation between work praise and boys' perceptions of their teachers' expectations for them coincides with the relations existing between the interactive variables themselves and the students' own attitudes: Praise was related to self-concept of math ability for boys *only*. Even more interestingly, amount of teacher praise did not in fact relate significantly to the teacher's expectations for either boys or girls. The girls appear to be aware of this fact and to discount the meaning of teacher praise accordingly. The boys, in contrast, are not aware of this fact and appear to be incorporating the praise into both their perception of their teachers' expectations for them and their own self-concept.

REGRESSION ANALYSES

Since we were most interested in the biasing effect of teacher–student interactions, we needed to find a way to separate the effects of teacher–student interactions from the effects of previous performance level. Teachers treat high- and low-expectation students differently. To a large extent, teachers base these expectations on the students' performance in previous math courses. Consequently, it is quite possible that any relations that might emerge between the interactional variables and students' beliefs, attitudes, and subsequent performance are an artifact of the relation of both the interactional variables and student beliefs and attitudes to previous performance. To test for this possibility and to provide an unconfounded estimate of the relation of interactional variables to subsequent attitudes, the variables identified in the correlational analyses were entered along with past performance into stepwise regression analyses of self-concept of ability and future expectancies.

The results were essentially the same for both attitudinal variables. For both boys and girls, past performance accounted for the largest share of the variance. But, contrary to the results in the elementary school study, past performance accounted for more variance in the boys' self-perceptions (between 16 and 27%) than in the girls' (between 7 and 9%). Among girls the number of student-initiated questions yielding criticism was the only inter-

actional variable that accounted for an additional significant amount of variance in their self-perceptions; it depressed their self-perceptions to a very limited degree (accounting for an additional 3 to 5% of variance). In contrast, among boys three interactional variables added significantly to the regression equation (adding between 6 and 10% to the variance accounted for); the number of negates with feedback related negatively, while both the amount of praise and number of response opportunities yielding work criticism related positively to their self-perceptions. In interpreting this latter relationship, recall that work criticism was a rare event. In this context it may convey high teacher expectations, leading to its positive relation with self-concept. Finally, both past performance and interactional variables accounted for more variance in the attitudes of boys (between 22 and 37%) than of girls (between 10 and 14%).

Summary

Student sex was related to student–teacher interaction patterns but not in the manner predicted by Dweck et al. (1978). Instead, the effects largely replicated the findings reported by Brophy and Good (1974): Girls as a group received less criticism than boys and high teacher-expectancy girls received less praise than other student groups. Low teacher-expectancy boys received a disproportionate amount of criticism and teacher-initiated dyadics, whereas low teacher-expectancy girls received more praise especially in response to teacher-controlled questioning. Thus, although these teachers treated high-expectancy boys and girls similarly, they appeared to be using different control strategies for low-expectancy boys and girls. They acted as though they were trying to draw the low teacher-expectancy girls into public participation and the low teacher-expectancy boys into private interaction. This pattern mirrors the pattern of preventive control for boys and proactive control for girls reported in the elementary study. Other than these few differences, boys and girls were treated similarly, and even these differences were small.

Although classroom experiences appeared to have some effect on student attitudes, these effects were not very large and were clearly less powerful than students' own performance and teachers' expectations, neither of which differed by sex of student. And for both boys and girls, the impact of any particular experience seemed to depend on the subjective meaning the child attached to the experience. These meanings may well differ across boys and girls, especially since teachers' behaviors relate to their own attitudes differently depending on whether the target child is male or female.

Students' are undoubtedly aware of these subtle variations in the meaning of teacher behavior and should respond accordingly.

To the extent that boys and girls were influenced by different experiences, the girls seemed more reactive to criticism and less receptive to the effects of praise than the boys; but these differences again were slight and not consistent across measures. As was the case in elementary school study, these sex differences seemed as much a consequence of student characteristics as a consequence of differential treatment by teachers.

One major discrepancy emerged between the junior high school and elementary school studies: In the elementary school study, girls' self-perceptions were more strongly related to their achievement level than were boys'; in contrast, among the junior high school students, girls' self-perceptions related less strongly to their previous grades than did the boys'. The reason for this discrepancy is not clear. Possibly girls form more stable self-concepts than do boys at a young age but become less certain of their self-evaluations as they enter early adolescence. Alternatively, this discrepancy could reflect the difference in the level of specificity of the perceptions being assessed. The elementary school students were asked to rate their general level of academic ability; in contrast, the junior high school students were asked to rate their math ability. At any rate, the self-perceptions of the boys in both age groups seem to be more affected by the immediate situation, especially positive teacher feedback, than the girls' self-perceptions. This difference might make boys' self-concepts more resilient to negative classroom experiences during these school years.

Comparison of Classroom Types

The analyses reported thus far were performed on the entire sample. It is probable that the effects of teachers' behaviors are different across classrooms. For example, some teachers may treat boys and girls differently, whereas others may not. By combining across all of our teachers, these effects would be masked. To explore this possibility, we selected from the sample of 17 classrooms the 5 classrooms with the largest sex difference in the students' expectations for themselves and the 5 classrooms with no significant sex difference on the measure of student expectations and compared them on two levels. First, we compared the two types of classrooms in terms of general teaching practices, teacher style, and student behavior in order to get a picture of variations in general classroom climate. Then we compared the classrooms in terms of the specific behaviors of the students within the classrooms.

However, before proceeding to discuss these comparisons, it is important to note whether it was the boys' or the girls' expectations that were related to classroom-type. To test this we used analysis of variance with classroom-type and student sex as the two independent variables and student expectations as the dependent variable. Boys' expectancies did not differ across the two types of classroom while girls' did; in fact, girls' expectancies in the high-difference classrooms were lower than the expectancies of the other three student groups.

CLASSROOM LEVEL COMPARISONS

Although few significant differences emerged, these classrooms clearly differed from one another. Stepwise regressions were performed to determine which interactional variables best discriminated between these two classroom-types. To add generalizability, three stepwise regressions were performed, each using a random 60% of the sample. Six variables emerged as significant predictors in all three samples: total dyadics, total open questions (questions answered by a student who raised his/her hand prior to being called upon), total criticism, total conduct criticisms, total criticisms in teacher-initiated response opportunities, and total work praises (listed in order of importance). In general, teachers in the high sex-differentiated classrooms were quite critical, in many cases using very pointed sarcasm to put a student in his or her place; they also tended to use a public teaching style rather than a more private teaching style and to rely heavily on student volunteers for answers. In contrast, teachers in the low sex-differentiated classes were less openly critical toward their students, tended to rely on a more private teaching style characterized by a high proportion of student–teacher conferencelike interactions, and took a more active role in calling on specific students for answers rather than relying on volunteers.

These results suggest that girls' attitudes toward math are more positive in a class characterized by a high proportion of private teacher–student dyadic interaction relative to the time spent in public recitation, and by relatively high levels of teacher control over the public recitation when it occurs. This same pattern emerged in our second sample of junior high school classrooms. Using a similar procedure, we divided these 12 classrooms into two groups: the 6 with the least sex difference in the students' self-perceptions and the 6 with the most extreme sex difference in the students' self-perceptions. These two types of classrooms also differed primarily in terms of the proportion of time spent in private student–teacher interactions versus the time spent in public recitation and in terms of the

degree to which the teacher controlled who participated in public recitation rather than relying on volunteers. And, once again, the girls' self-perceptions were highest in the more private and teacher-controlled recitation classrooms.

There is some evidence that girls are less likely than boys to thrive, academically speaking, in an environment that is competitive and male-dominated (see Fennema & Peterson, Chapter 2, this volume; Petersen, & Fennema, 1983; Webb & Kenderski, Chapter 10 this volume; Wilkinson, Lindow, & Chiang, Chapter 9, this volume). It is quite possible that classrooms characterized by relatively high reliance on public recitation and on student volunteers seem relatively more competitive and threatening to students than classrooms characterized by relatively high reliance on private student—teacher interactions and on teacher-controlled recitation, provided that the teacher uses this control to encourage participation from everyone rather than a chosen few (Brush, 1980). If this is true, then we should expect that girls would find these more private classrooms more congenial and, consequently, would develop more positive attitudes toward math in such environments.

It is important to note that the logic underlying this proposal does not depend on sex-differentiated treatment by the teacher as a causal explanation of sex-differentiated beliefs and attitudes among the students. Instead, it suggests that sex differences in student learning and in students' attitudes could come about because similar environments affect boys and girls differently, primarily because boys and girls enter those environments with different views of the world and different learning histories. The extent to which this process is operative raises intriguing questions for those of us interested in fostering sex equity in education.

STUDENT LEVEL COMPARISONS

In the next set of comparisons we used the student level data to assess whether boys and girls were treated differently in either of these two types of classrooms and whether these sex differences varied across the two types of classrooms. Several interesting sex differences emerged in these analyses. In the low-difference classrooms, girls interacted more than boys (gave more responses, asked more questions, initiated more interactions); they also received more praise for work and criticism for form than boys. In high-difference classrooms, boys interacted more and received more praise for their work and criticism for their form.

We next divided the sample into the high and low teacher-expectancy

groups discussed earlier. In general, high teacher-expectancy boys and girls were treated quite differently in these two types of classroom. High teacher-expectancy girls interacted the most, answered the most questions, received the most work and form praise, and the least criticism in the low sex-differentiated classrooms. In contrast, high teacher-expectancy boys were accorded the most praise and interacted the most in the high sex-differentiated classrooms. High teacher-expectancy girls were accorded the least amount of praise of any of the eight sex by teacher expectancy by classroom-type groups in the high sex-differentiated classrooms.

The Sex × Teacher Expectancy interactions were particularly interesting in the high-difference classrooms. In these classrooms, the classic teacher expectancy effects emerged only among the boys; that is, high teacher-expectancy boys in these classrooms received more attention, more rewards, and less criticism than low teacher-expectancy boys. In contrast, the high teacher-expectancy girls in these classrooms were not treated in the manner predicted by the teacher-expectancy literature. In fact, if anything the low teacher-expectancy girls in these classrooms were accorded the classic high teacher-expectancy pattern, especially in terms of response opportunities and praise, while the high teacher-expectancy girls were basically ignored and given virtually no praise or encouragement.

What about the low-difference classrooms? The high teacher-expectancy girls fared very well in these classrooms; they dominated the interactions and received the most praise. But while the high teacher-expectancy boys got less praise in these classrooms than did the high teacher-expectancy girls, the pattern of its distribution across high and low teacher-expectancy children was equivalent for the two sexes. In this social climate, there was no overall sex difference in expectancies despite the fact that the girls both got more praise and interacted more than the boys.

These data suggest that being in a classroom in which praise is used differently for boys and girls has a detrimental effect on all girls but not on boys. Only the girls' expectations differed across these two types of classrooms. Furthermore, the relatively high levels of praise given to the low teacher-expectancy girls in the high sex-differentiated classrooms did not appear to have the facilitative effect on their attitudes one would expect; they had lower expectations for their own future success in mathematics than any of the other seven sex by teacher expectancy by classroom-type groups.

One cannot infer from these data that praise itself is responsible for the expectancy differences in these two classrooms. In fact, the correlation between amount of praise and attitudes was nonsignificant for girls in either type of classrooms. Rather, it appears that the pattern of praise across the various subgroups is critical. Boys and girls had equivalent expectancies

when the relative distribution of praise and criticism was similar for both sexes.

Summary

The data from the junior high school study clearly indicate that the impact of classroom experiences on students' self-perceptions depends on their subjective meaning to the students. To advocate that teachers should avoid criticism or give praise more freely overlooks the power of the context in determining the meaning of the message. Praise was positively related to self-perceptions only in the group, in this case boys, in which it in fact conveyed information about the teachers' expectations. Among girls, a group for which the teachers' use of praise did not covary with their expectations, praise was not related to either the girls' self-perceptions or to their perceptions of their teachers' expectations.

What role do the teachers play in perpetuating sex differences in math attitudes? Our data suggest that differential treatment may be one factor, although not a very powerful or ubiquitous factor. Girls have lower expectancies for themselves in those classrooms in which they are treated in a qualitatively different manner than the boys. And while this differential treatment was not characteristic of most of our classrooms, these results suggest that the brightest girls are not being nurtured to the same extent as are boys in some classrooms. The causal implications of this difference need to be established.

Our data also suggest that general classroom climate may play an important role in reinforcing sex differences in achievement attitudes, beliefs, and performance. Certain kinds of educational environments may facilitate boys' achievement while either dampening or having little positive effect on girls' achievement. Relying on public recitation and student volunteers emerged as two such environmental characteristics in the junior high school study. Competitive goal structures and coeducation are two other characteristics that have been suggested as having similar effects (see Eccles, Midgley, & Adler, 1984, for discussion of impact of general classroom level variations on student motivation and self-perceptions). The remedy for such differential effects is not clear. Should we educate boys and girls differently so that each experiences the educational environment best suited for his or her needs? Probably not, especially since variations within sex make identification of such ideal environments for each sex impossible. Instead, educators at all levels need to be aware of the fact that children may respond to similar educational experiences in different ways. Then we can work toward a balance between providing both boys and girls with all types of educational

experiences and helping both boys and girls acquire the skills necessary to benefit maximally from various types of learning environments.

GENERAL CONCLUSIONS

In summary, we, like many others, have found small but fairly consistent evidence that boys and girls have different experiences in their classrooms. However, these differences seem as much a consequence of preexisting differences in the students' behaviors as of teacher bias. Nonetheless, when differences occur, they appear to be reinforcing sex-stereotyped expectations and behaviors. In addition, we found some evidence that boys and girls respond differently to similar experiences. These results indicate that similar treatment may not yield equitable outcomes for both boys and girls.

Studies relying more on case-study approaches have provided stronger evidence of the impact of teachers on students' career plans and decisions. For example, women working in male-dominated fields often report that a particular teacher played a very important role in shaping their career choice (Casserly, 1975; Boswell, 1979). Unfortunately, few students encounter a teacher who encourages them to consider a wide range of careers. Instead, most teachers reinforce traditional behavior and occupational plans for both boys and girls independent of where the student's interests or talents might lie (Eccles & Hoffman, 1984). For example, mathematically gifted girls are less likely to be identified as such by their teachers than are mathematically-gifted boys. Similarly, girls who drop out of the math curriculum or out of other nontraditional majors in college often attribute their decisions to a teacher who actively discouraged their interests (Fox, Brody, & Tobin, 1980).

Casserly's (1975) work indicates that teachers can favorably affect girls' preparation for math and science-related occupations if they provide active encouragement, exposure to role models, sincere praise for high ability and good performance, explicit advice regarding the value of math and science, and explicit encouragement to both boys and girls and their parents regarding the importance of developing their talents to the fullest and aspiring after the best jobs they can obtain (Casserly, 1975; Eccles & Hoffman, 1984). Most teachers rarely do any of these things. Certainly none of the teachers we observed did. In addition, we recorded less than a dozen instances of a teacher explaining the value of math and very few instances of a teacher explaining proactively the intrinsic value of engaging in any academic activity. We also rarely observed a teacher providing any form of career counseling. Thus, although teachers can help overcome sex stereo-

types and promote more sex-equitable educational outcomes, they rarely do. As a consequence, most students leave each classroom pretty much as they entered it, neither more or less sex stereotyped in their beliefs and future goals.

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