How Social Comparison Mediates the Relation Between Ability Grouping Practices and Students' Achievement Expectancies in Mathematics

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Running head: Mediating role of social comparison

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Abstract

The hypothesis that social comparison processes mediate the relation between ability grouping practices in mathematics and students' achievement expectancies is tested in a district-wide sample of sixth graders (N = 470). Compared to between-classroom ability grouping, within-classroom grouping raises high achievers' achievement expectancies, math grades, and tendency to make downward comparisons (i.e., with a classmate who is worse at math than themselves). Within-classroom grouping lowers low achievers' expectancies and math grades and increases their tendency to make upward comparisons. When controls for the direction of students' social comparison choices and for their mathematics grades are introduced, the independent effect of ability grouping on achievement expectancies is no longer significant. It is argued that ability grouping practices constrain the choices available to students and teachers for social comparison of abilities and thereby influence the frame of reference students use for self-assessment and teachers use for assigning grades.

In order to identify systematic effects of ability grouping practices, it is essential to differentiate types of ability grouping (DeLany & Garet, 1986; Slavin, 1986), to define specific outcomes of interest, and above all, to focus on the processes by which ability grouping practices are expected to influence students (Alexander & McDill, 1976; Eder, 1981; Marshall & Weinstein, 1984; Peterson, Wilkinson, & Hallinan, 1984; Richer, 1976; Rosenholtz & Rosenholtz, 1981; Rosenholtz & Simpson, 1984; Rowan & Miracle, 1983; Tesser & Campbell, 1982). The goal of this study is to show how between-classroom and within-classroom ability grouping practices in mathematics differentially influence students' achievement expectancies through social comparison processes occurring in the classroom. Although several theorists have hypothesized that social comparison processes are a critical mediator of the relation between ability grouping and students' achievement expectancies (e.g., Bachman & O'Malley, 1986; Marsh & Parker, 1984; O'Connor, Atkinson, & Horner, 1966; Richer, 1976; Rogers, Smith, & Coleman, 1978; Strang, Smith, & Rogers, 1978), as yet no research has directly assessed or demonstrated the mediating role of social comparison processes. This study begins to fill that gap.

The Nature and Purposes of Ability Grouping

It is useful to distinguish ability grouping practices in schools with respect to their type and level. Under <u>type</u> of ability grouping, each of two practices may be classified as present or absent: <u>between-classroom grouping</u>, whereby all students at a given grade level within a school are assigned to separate classrooms on the basis of their academic performance; and <u>within-classroom grouping</u>, whereby students within a given classroom are assigned to separate instructional groups on the basis of their past performance. Level of ability grouping refers to the segment of the ability distribution (e.g., high, average, or low) that characterizes entire classrooms under between-classroom ability grouping, or groups of students in a single classroom under within-classroom ability grouping. "Ability" measures that are used to make assignments to particular ability grouping levels may include past academic grades, scores on standardized aptitude or achievement tests, or teacher recommendations. The "ability" assessments may be assessments of a student's performance in a single academic subject or in a variety of subjects, depending on the type of ability grouping to be implemented.

The intent of between-classroom ability grouping is to produce a homogeneous level of academic preparation within each classroom, such that a single curriculum will be equally suitable for most students in the classroom. When between-classroom ability grouping is not practiced, the level of students' ability within each classroom is expected to be heterogeneous. Advocates of ability grouping argue that by reducing heterogeneity in the class or instructional group, it is possible to increase the pace and level of instruction for high achievers and provide more review and corrective feedback for low achievers, thereby optimizing achievement gains for most students. Ability grouping is supposed to make high achievers have to work harder in order to succeed and to make success more attainable for low achievers by taking them out of direct competition with their more able classmates. In this way, advocates argue, ability grouping will optimize academic challenge for most students.

The advantages claimed for ability grouping practices have often been called into question. Based on a best-evidence synthesis of research findings on ability grouping and student achievement in elementary schools, Slavin (1986) concludes that achievement gains are larger in ability-heterogeneous classrooms where within-classroom ability grouping is practiced than in heterogeneous classrooms where whole-class instruction is given; however, between-classroom ability grouping does not enhance students' achievement gains. Slavin's work underscores the importance of differentiating types of ability grouping practices when testing for effects of ability grouping. Not all types of ability grouping are equally effective in enhancing student achievement.

Many critics argue that ability grouping practices disadvantage students assigned to low groups or classrooms. For instance, Oakes (1985) has observed a lower quality of instruction in homogeneous, low achieving classrooms than in homogeneous, high achieving classrooms. Eder (1981; Eder & Felmlee, 1984) has observed higher student inattention, more frequent reading turn disruptions, and more teacher time spent managing students' behavior in low ability reading groups. She has argued that segregating low achievers deprives them of exposure to successful role models set by their high achieving classmates; homogeneous grouping increases their exposure to the "contagion" of misbehavior among other low achievers. Nachmias (1977) and Rist (1970) have argued that assignments to low ability classrooms or groups communicate low expectations for students that become self-fulfilling prophecies. Rosenbaum (1976) has argued that ability grouping practices magnify the stratification of students along racial and social class distinctions. Collectively, this work suggests the importance of differentiating the <u>level</u> of students' ability grouping assignments. The costs and benefits of a particular ability grouping practice may differ depending on the level at which students are placed.

Conceptions of Achievement Expectancies

An action-outcome expectancy is defined as a cognitive anticipation that the performance of an act will produce a certain outcome (Atkinson, 1957). In the case of achievement action, it has generally been assumed that there are two kinds of outcomes: success or failure. The strength of an individual's expectancy can be expressed as the subjective probability of an outcome, with values ranging from zero to one. Achievement motivation theorists have typically considered only those situations in which there is some element of risk, that is, situations where expectancies are not exactly equal to zero or one (but for an exception, see Kukla, 1975). Feather (1959) has eloquently reviewed the origins of the expectancy construct in the theoretical work of Lewin, Tolman, Rotter, Edwards, and Atkinson.

Atkinson (1957; Atkinson & Birch, 1978) has assumed that achievement expectancies depend on cues that are situation- or task-specific. His work typically treats subjective expectancy and perceived task difficulty as synonyms, that is, the easier the task, the higher one's expectancy for success at the task. In experimental research on persistence and choice (e.g., Feather, 1961) the expectancy construct is often manipulated by providing information about the proportion of others who have succeeded at a task. Expectancies are implicitly assumed to be determined by the task or situation in such research.

By contrast, attribution theorists (Kukla, 1972, 1978; Weiner, Freize, Kukla, Reed, Rest, & Rosenbaum, 1972) have expanded the concept of achievement expectancies, such that they are a function of both personal and situational factors. Attribution theorists assume that expectancies for success at an achievement task are determined by beliefs about personal skill at the activity, beliefs about the difficulty or demands of the task, intended effort at the task, and anticipated luck. The distinction to be emphasized here is that Atkinson's (1957) theory identifies subjective expectancies solely with situational factors (i.e., task difficulty), whereas attribution theorists include both situational factors (task difficulty and luck) and personal factors (perceived personal skill and intended effort) as determinants of achievement expectancies.

How Ability Grouping Practices Influence Students' Achievement Expectancies

Experiences of success and failure in day-to-day schoolwork are assumed to be determined, in some substantial part, by comparing one's own performance outcomes to those of other students in the same classroom (Levine, 1983; O'Connor, Atkinson, & Horner, 1966; Richer, 1976). If social comparison in the classroom does occur, then how favorable a student's self-evaluation will be ought to depend on the nature of the reference group made available to students by the classroom organization. In a heterogeneous class (irrespective of within-classroom grouping) highly able students are likely to outperform their classmates consistently and by substantial margins and therefore hold high expectancies for success; however, when placed in a homogeneous classroom with others who are also highly able, such students will neither outperform their classmates so consistently nor by such substantial margins and therefore should decrease their expectancies for success. Similarly, low ability students are likely to hold low expectancies for success in a heterogeneous classroom (irrespective of within-classroom grouping) but they are likely to raise their expectancies for success toward an intermediate level when placed in a homogeneous classroom where everyone is performing at a more nearly equal level.

The impact of ability grouping on students' expectancies ought to be mediated by individual differences in the tendency to engage in social comparison for self-evaluation of abilities (Festinger, 1954; Suls & Miller, 1977). Some students may only seek out social comparison information when they are fairly certain the information will reflect favorably on themselves (Tesser & Campbell, 1982) or when the obtained information will not embarrass others (Brickman & Bulman, 1977). Some students may be developmentally unprepared to process social comparison information (Veroff, 1969) or to make systematic comparison choices (Suls & Sanders, 1982).

The type and level of ability grouping are assumed to have different kinds of impacts on students' achievement expectancies. The level at which a student is placed ought to have a strong, direct influence on the students' achievement expectancies. Being placed in an "advanced" or "accelerated" math group or classroom ought to affirm the student's belief that she or he is good at math; being placed in a "remedial" or "special help" math group or classroom ought to affirm the student's belief that she or he is not good at math. By contrast, the type of ability grouping to which a student is exposed is unlikely to have any _direct_ impact on the student's expectancies. A student is unlikely to infer that she or he is good (or not good) at math because the teacher has instituted a policy of within-classroom ability grouping. Types of ability grouping are expected to influence expectancies _indirectly_ through social comparison processes.

In summary, the central hypothesis advanced here is that between-classroom ability grouping will move all students' expectancies for success in academics toward an intermediate level (i.e., near .50). Figure 1 illustrates this and several specific hypotheses: (a) High ability students will show higher expectancies for success in heterogeneous than in homogeneous ("high ability") classrooms; (b) average ability students will show equal expectancies for success under every type of ability grouping; (c) low ability students will show lower expectancies for success in heterogeneous than in homogeneous ("low ability") classrooms; (d) these effects of ability grouping on achievement expectancies will be mediated by within-classroom social comparison among students; (e) level of within-classroom and between-classroom ability grouping will be positively related to expectancies for success; and (f) the within-classroom variance in expectancies for success will be greater for students in heterogeneous than in homogeneous classrooms, in part because there will be more variance in performance outcomes within heterogeneous than within homogeneous classrooms.

Figure 1 about here

Previous research evidence is inconsistent with respect to these predicted effects of ability grouping on students' achievement expectancies. Investigators have reported that between-classroom ability grouping practices have both negative effects on the achievement expectancies of low achieving students (Nachmias, 1977; Oakes, 1985; Strang, Smith, & Rogers, 1978, Experiment 1) and positive effects (Borg & Prpich, 1966; Goldberg, Passow, & Justman, 1966; Schwarzer, 1982; Strang, Smith, & Rogers, 1978, Experiment 2). Similarly, between-classroom ability grouping practices have been shown both to lower the expectancies of high achieving students (Goldberg et al., 1966; Schwarzer, 1982) and to raise them (Alexander, Cook, & McDill, 1978). Passow (1966) has summarized a number of difficulties in drawing integrative conclusions from this research literature, including the variety of research designs used, samples investigated, types of ability grouping distinguished, and outcomes measured. Given diverse findings in the research literature, some reviewers (e.g., Kulik & Kulik, 1982) have concluded that between-classroom ability grouping practices do not systematically influence students' achievement expectancies. The premise of the present investigation is that systematic effects of ability grouping practices in mathematics can be identified by making comparisons among types and levels of ability grouping, by carefully defining outcomes of interest, and above all by directly assessing the processes by which ability grouping practices are hypothesized to affect students' achievement expectancies.

Other Antecedents of Achievement Expectancies

In order to estimate effects of ability grouping practices on students' achievement expectancies in natural school settings (that is, when students have not been randomly assigned to ability grouping conditions), it is essential to articulate a causal model that includes additional plausible antecedents of students' expectancies. To the extent that these other plausible antecedents are correlated with ability grouping practices but not included in the causal model, the estimated effects of ability grouping will be biased. Several antecedents of students' achievement expectancies, in addition to the level and type of ability grouping experienced by a student, are proposed here.

The strongest, direct determinants of a student's expectancies for success in an academic subject are likely to be the student's past and current performance outcomes in that subject. To the extent that the student receives high grades, academic praise, or high scores on standardized achievement tests, achievement expectancies ought to be high.

Past performance outcomes and current grades are likely to be differentially salient to the student over the course of the school year. Performance outcomes from a prior school year could be very salient at the beginning of a new academic year because they represent the best evidence the student has that would influence the dispositional, ability-relevant component of the student's expectancies (as opposed to the task-specific, difficulty component of expectancies). Performance outcomes from a prior school year may become less salient as the current school year progresses if the student comes to believe that conditions of evaluation have changed. Seasonal effects on the way past versus present performance outcomes are weighted would determine their relative impact on achievement expectancies.

There is a great deal of evidence to suggest that by junior high school, boys perceive themselves as more able in mathematics than do girls (Eccles (Parsons), Adler, Futterman, Goff, Kaczala, Meece, & Midgley, 1983; Meece, Eccles-Parsons, Kaczala, Goff, & Futterman, 1982). Sex differences in achievement expectancies occur despite the fact that throughout the elementary school years boys and girls typically perform equally well in their math classes and on standardized math achievement tests (Meece et al., 1982). Because it has been repeatedly identified as an independent predictor of achievement expectancies, gender will be included when analysing effects of ability grouping.

Method

Sample

The sample of students who participated in this study are sixth graders in a suburban, public school district located in southeastern Michigan. The school district is one of 12 that took part in the Transitions in Early Adolescence project, a panel study of effects of changing school environments on early adolescent development. Only analyses of data from the fall of 1983 (Wave 1) and the spring of 1984 (Wave 2) will be reported here.

This school district is selected for analysis in part because of a high participation rate by teachers and students. All teachers of sixth graders in the district agreed to participate, yielding a sample of teachers in 27 classrooms in eight elementary buildings. Within these classrooms, 580 sixth grade students (84 percent of the enrollment) agreed to participate. Due to a 2.4 percent attrition rate during the school year, the size of the analysis sample is slightly reduced.

This school district is also selected for analysis because of the variation in ability grouping practices in mathematics represented within it (see Table 1). This variation is similar to that observed in a recent state-wide sample (Coldiron & McDill, 1987). Table 1 shows important organizational differences between the practices of within-classroom and between-classroom grouping in this district. First, the permeability of ability levels is much higher for within-classroom than between-classroom ability grouping. Of the 222 students who experienced between-classroom grouping throughout the school year, 10 students (4.5 percent) changed ability levels (i.e., classrooms); of the 214 students who experienced within-classroom grouping throughout the school year, 51 students (23.8 percent) changed ability levels (i.e., groups). Second, Table 1 indicates that the incidence of within-classroom grouping increased during the school year, whereas the incidence of between-classroom grouping remained constant. One hundred students (in four classrooms), who had not experienced within-classroom grouping in the fall, were assigned to within-classroom groups by the spring of the school year. These organizational differences are important because they could contribute to differential effects on the nature and stability of students' achievement expectancies.

Table 1 about here

The mean age of the sixth graders in this district (at Wave 1) is 11 years, 6.7 months; 50.2 percent are female; 94.7 percent are white. Among the parents who returned a parent questionnaire, 97 percent of the mothers and 98 percent of the fathers have completed high school. According to 1980 census figures (Southeast Michigan Council of Governments [SEMCOG], 1983), the median household income in this school district was $31,000.

Measures

Ability grouping. Ability grouping practices were assessed through teacher reports. In order to identify within-classroom grouping practices, teachers were first given a brief definition: "Some teachers assign students to separate groups within their classroom on the basis of students' ability in math. For example, students who are very good at math might be in a group together. Students who are having some trouble with math might be in a different group together. Students in different groups might get different assignments, use different materials, or study math at different times during the school day." Teachers then indicated whether each participating student was assigned to a high-, average-, or low math ability group, or whether students were not assigned to different math ability groups within the teacher's classroom. In order to determine between-classroom ability grouping practices, teachers were asked whether all students had been assigned to that class on the basis of their math ability and, if so, whether the class was best described as below average, average, or above average in math ability.

Math achievement. Percentile rank scores on the Mathematics Battery of the California Achievement Test (CAT), administered to all sixth graders during the first week of the fall semester, were used to assess students' skill in mathematics at the outset of the school year. In addition, their mathematics grades were collected from the report cards students had received at the end of November, January, March, and May.

Student self-report measures. Questionnaires were administered during students' mathematics period on two consecutive days in the fall

(Wave 1: mid-October to mid-November, 1983) and the spring (Wave 2: late March to early April, 1984). These questionnaires assessed students' mathematics-related beliefs, values, and behaviors, using multiple indicators of theoretical constructs (Sullivan & Feldman, 1979).

Components of achievement expectancies. The student questionnaire includes items intended to measure three distinct components of students' achievement expectancies in mathematics: their self-concept of mathematics ability, expectancies for success in mathematics activities, and perception of mathematics as a difficult subject. In order to represent self-concept of mathematics ability, three items were included in the student questionnaire: "How good at math are you?" [coded Not at all good (1) to Very good (7)]; "If you were to rank all the students in your math class from the worst to the best in math, where would you put yourself?" [coded The worst (1) to The best (7)]; and "Compared to most of your other school subjects, how good are you at math?" [coded Much worse (1) to Much better (7)]. Two items were included in the questionnaire as indicators of expectancies for success in mathematics: "How well do you think you will do in math this year?" [coded Not at all well (1) to Very well (7)]; and "How successful do you think you'd be in a career that required mathematical ability?" [coded Not very successful (1) to Very successful (7)]. Finally, three items focussed on perceptions of mathematics as a difficult subject: "In general, how hard is math for you?" [coded Very easy (1) to Very hard (7)]; "Compared to other students your age, how much time do you have to spend working on your math assignments?" [coded Much less time (1) to Much more time (7)]; and "Compared to most other school subjects you have taken or are taking, how hard is math for you?" [coded My easiest course (1) to My hardest course (7)]. Parsons (1980) developed these items.

Extensive confirmatory factor analyses support the discriminant validity of three latent variables representing students' self-concept of mathematics ability, expectancies for success in mathematics, and perceptions of math as a difficult subject (Reuman, 1986). These analyses favor acceptance of a 3-factor model which allows the three indicators of self-concept of math ability to load on just one factor, the two indicators of expectancies for success to load only on a second factor, and the three indicators of perceived difficulty to load only on a third factor. Normed fit indices for the 3-factor model (Bentler & Bonett, 1980) are very high (.97 and .98 for 6th grade girls and boys, respectively) and indicate that the model provides an excellent account of the item variance-covariance matrix. Furthermore, the 3-factor model provides highly significant improvements in fit over several alternative 2-factor models (Reuman, 1986). Internal consistency reliabilities are high for the indicators of self-concept of math ability (Cronbach's alphas are .81 and .79 for 6th grade girls and boys, respectively), high for indicators of success expectancies (.76 and .79 for 6th grade girls and boys, respectively), and moderately high for the indicators of perceived difficulty (.63 for both 6th grade girls and boys).

Social comparison. The frequency and importance of students' comparisons with their classmates in mathematics is measured by five items: "I compare my math ability to other students in my math class." [coded Never (1) to Very often (7)]; "I like to know how my math ability compares to other students in my math class." [coded Not at all true (1) to Very true (7)]; "Doing better in math than other students in my classroom is important to me." [coded Strongly disagree (1) to Strongly agree (7)]; "I compare how hard I try in math to how hard other students try in my classroom." [coded Never (1) to Very often (7)]; and "Trying harder in math than other students in my classroom is important to me." [coded Strongly disagree (1) to Strongly agree (7)]. Confirmatory factor analyses show that these items are unidimensional and factorially distinct from the three latent variables representing self-concept of math ability, expectancies for success in mathematics, and the perceived difficulty of mathematics (Reuman, 1986). The internal consistency reliability of the 5-item social comparison composite is high (Cronbach's alphas are .77 and .76 for 6th grade girls and boys, respectively).

The direction of a student's social comparison choices is measured by asking students to "Make believe you just got a math test back from your teacher. If you could look at someone else's test in your classroom, whose test would you want to look at?" Students could either nominate a classmate by name or write "Nobody" if they strongly felt there was nobody whose test they would want to see. Those students who did nominate a classmate next indicated why they picked this person out of everybody in their classroom, and finally whether "This person is Not as good at math as me (1), About the same at math as me (2), or Better at math than me (3)". For subsequent analyses, a nominal-level variable was created which differentiated students who preferred to compare with nobody else, with a student who was poorer in math, similar in math, or superior in math. This direction of social comparison variable was only included in the spring administration of the student questionnaire.

Results

Ability grouping assignments and past achievement in mathematics

Some investigators have argued that ability grouping assignments are often unrelated to objective academic performance (Kariger, 1963; Rosenbaum, 1976). That is not characteristic of ability grouping assignments in this district. Overall, there is a strong association between ability grouping assignments and percentile rank scores on the Mathematics Battery of the CAT (F (6, 535) = 55.79; $p < .0001$; R^2 = .385). Mean percentile rank scores as a function of ability grouping condition are displayed in Table 2. Students in high ability classrooms or groups show significantly higher mean scores on the Math Battery of the CAT than students experiencing neither type of grouping (F (1, 258) = 28.74; $p < .0001$), who in turn show significantly higher mean scores on the Math Battery than students in regular classrooms or groups (F (1, 302) = 11.51; $p = .0007$), who in turn show significantly higher mean scores than students in low ability classrooms or groups (F (1, 280) = 104.67; $p < .0001$). No contrast at a given level of ability grouping (e.g., high ability classrooms versus high ability groups) is significant at a criterion level of .05. Relative to the national standardization sample, students in this school district are performing at a high level, as indicated by the district mean near the 70th percentile on the Mathematics Battery of the CAT.

Table 2 about here

Do classrooms in fact vary in homogeneity?

The within-classroom variance in components of achievement expectancies ought to be greater for students in heterogeneous than in homogeneous classrooms, in part because there ought to be more variance in performance level within heterogeneous classrooms. Tests of this hypothesis are described here using the within-classroom variances of 6th graders' past math achievement (i.e., performance on the Math Battery of the CAT), self-concept of math ability, expectancies for success in mathematics, and perceptions of math difficulty. Table 3 displays mean within-classroom variances of each of these variables as a function of the type of ability grouping practiced in the classroom at Wave 1.

Table 3 about here

The within-classroom variance of past math achievement is significantly associated with type of ability grouping (overall F (2, 23) = 5.14; p = .014; R^2 = .309). Although a planned orthogonal contrast of the variances in homogeneous classrooms versus heterogeneous classrooms is significant (classrooms with between-classroom grouping have lower within-classroom variances than other classrooms; F (1, 24) = 4.75; p = .040), it is apparent that most of this effect is attributable to the contrast between the classrooms with between-classroom grouping versus those with within-classroom grouping (F (1, 19) = 10.01; p = .004). The pattern of within-classroom variances suggests that between-classroom grouping has been "successful" in its intent; namely, to create classrooms that are relatively homogeneous with respect to students' past math achievement. Whereas the presence of between-classroom grouping is associated with classroom homogeneity, the absence of between-classroom grouping does not always indicate classroom heterogeneity. Certain teachers in this district may have decided to implement within-classroom grouping in response to extreme heterogeneity they observed in the mathematical skills of their students.

The within-classroom variance in self-concept of math ability is significantly associated with type of ability grouping (overall F (2, 23) = 8.57; p = .002; R^2 = .427) in much the same way as is the within-classroom variance in past math achievement. A planned orthogonal contrast of the variances in homogeneous versus heterogeneous classrooms is marginally significant (classrooms with between-classroom grouping have marginally lower within-classroom variances than other classrooms; F (1, 24) = 4.05; p = .056); the effect is entirely attributable to the contrast between the classrooms with between-classroom grouping versus those with within-classroom grouping (F (1, 19) = 14.47; p = .0009).

The relations between type of ability grouping and within-classroom variances in math expectancies and difficulty perceptions are considerably weaker than is the case for variance in math self-concept. Within-classroom variance in math expectancies is not significantly associated with type of ability grouping (overall F (2, 23) = 2.07; p = .15). The planned orthogonal contrast between homogeneous and heterogeneous classrooms is not significant (F (1, 24) = 1.42; p = .24). Within-classroom variance in difficulty perceptions is not significantly associated with type of ability grouping (overall F (2, 23) = 0.76; p = .48). The planned orthogonal contrast between homogeneous and heterogeneous classrooms is not significant (F (1, 24) = 0.65; p = .43).

In summary, the hypothesis overriding these analyses is only partially confirmed. Within-classroom variance in past math performance and in one component of achievement expectancies (i.e., self-concept of math ability) is higher for heterogeneous classrooms than for homogeneous classrooms, as predicted, but the effect is attributable to the contrast between heterogeneous classrooms with within-classroom grouping versus homogeneous classrooms. The finding that not all heterogeneous classrooms show the predicted effect argues for distinguishing heterogeneous classrooms with versus without within-classroom ability grouping. Within-classroom variance in math expectancies and math difficulty perceptions are not higher for heterogeneous classrooms than for homogeneous classrooms, contrary to predictions; their differential relationship to the type of ability grouping present argues for distinguishing these components of achievement expectancies in mathematics from self-concept of math ability.

Effects of ability grouping on students' achievement expectancies

Between-classroom ability grouping is predicted to shift students' achievement expectancies toward an intermediate level: (a) high ability students will show higher expectancies for success in heterogeneous than in homogeneous (high ability) classrooms; (b) average ability students will show equal expectancies for success under the two grouping practices; (c) low ability students will show lower expectancies for success in heterogeneous than in homogeneous (low ability) classrooms; and (d) student ability level will be positively related to expectancies for success under all grouping conditions. Descriptive statistics relevant to these hypotheses are shown in Table 4. At each wave, sixth graders' self-concept of their mathematics ability, expectancies for success in mathematics, and perceptions of mathematics as an easy subject are described as a function of ability grouping conditions.[1]

Table 4 about here

The effect of ability grouping on students' self-concept of math ability is significant at Wave 1 (F (6, 499) = 11.90; $p < .0001$; R^2 = .125) and at Wave 2 (F (6, 463) = 11.22; $p < .0001$; R^2 = .127). In general, self-concept of math ability increases with the level of one's ability grouping assignment, particularly for students experiencing within-classroom ability grouping. As predicted, planned contrasts indicate lower self-concept of ability for students in low ability groups compared to students in low ability classrooms at Wave 1 (F (1, 71) = 14.65; p = .0001) and at Wave 2 (F (1, 71) = 10.42; p = .001). Partially consistent with predictions, planned contrasts indicate nominally higher self-concept of ability for students in high ability groups compared to students in high ability classrooms at Wave 1 (F (1, 148) = 2.83; p = .093) and a significant difference in the predicted direction at Wave 2 (F (1, 167) = 6.20; p = .013). Partially consistent with predictions, planned contrasts indicate higher self-concept of math ability for students in regular ability classrooms compared to students in regular ability groups at Wave 1 (F (1, 183) = 7.55; p = .006) but only a marginally significant difference at Wave 2 (F (1, 207) = 2.90; p = .089).

The effect of ability grouping on students' expectancies for success in mathematics is significant at Wave 1 (F (6, 499) = 5.06; $p < .0001$; R^2 = .057) and at Wave 2 (F (6, 463) = 9.39; $p < .0001$; R^2 = .108). In general, expectancies for success increase with the level of one's ability grouping assignment, particularly for students experiencing within-classroom grouping. Partially consistent with predictions, planned contrasts indicate nominally lower expectancies of students in low ability groups compared to students in low ability classrooms at Wave 1 (F (1, 71) = 3.37; p = .067) and a significant difference in the predicted direction at Wave 2 (F (1, 71) = 11.03; p = .001). Contrary to predictions, planned contrasts indicate no significant mean difference in expectancies of students in high ability groups compared to students in high ability classrooms at Wave 1 (F (1, 148) = .74; p = .39) or at Wave 2 (F (1, 167) = 1.81; p = .18). As predicted, planned contrasts indicate no significant mean differences in the achievement expectancies of students in regular ability groups compared to students in regular ability classrooms at Wave 1 (F (1, 183) = .04; p = .85) or at Wave 2 (F (1, 207) = 1.00; p = .32).

The effect of ability grouping on students' perceptions of math as an easy subject is significant at Wave 1 (F (6, 499) = 3.91; p = .0008; R^2 = .045) and at Wave 2 (F (6, 463) = 7.49; $p < .0001$; R^2 = .088). In general, perceptions of math as an easy subject increase with the level of one's ability grouping assignment, particularly for students experiencing within-classroom ability grouping. As predicted, planned contrasts indicate lower perceptions of math ease for students assigned to low ability groups compared to students assigned to low ability classrooms at Wave 1 (F (1, 71) = 8.19; p = .004) and at Wave 2 (F (1, 71) = 8.16; p = .004). Partially consistent with predictions, planned contrasts indicate no difference in perceived math ease for students assigned to high ability groups compared to students assigned to high ability classrooms at Wave 1 (F (1, 148) = 1.04; p = .31) but a significant difference in the predicted direction is observed at Wave 2 (F (1, 167) = 6.18; p = .013). Contrary to predictions, planned contrasts indicate nominally higher perceptions of math ease for students in regular ability classrooms compared to students in regular ability groups at Wave 1 (F (1, 183) = 2.99; p = .085) and a significant difference in the same direction at Wave 2 (F (1, 207) = 6.82; p = .009).

The general pattern of means displayed in Table 4 lends support to the hypothesis that between-classroom ability grouping will shift students' achievement expectancies toward an intermediate level. The prediction that achievement expectancies will be higher for students in low ability classrooms than for students in low ability groups is supported consistently across Waves 1 and 2, and across distinct components of students' achievement expectancies. The prediction that achievement expectancies will be lower for students in high ability classrooms than for students in high ability groups is not supported at Wave 1, but it is supported by Wave 2 for two out of three components of achievement expectancies; namely, students' self-concept of math ability and perceptions of math as an easy subject. The prediction that achievement expectancies will not differ for students assigned to regular ability groups or classrooms is supported at Wave 2 for self-concept of math ability, at both waves for success expectancies, and at Wave 1 for perceptions of math ease.

Overall, the hypothesis that between-classroom grouping will shift students' achievement expectancies toward an intermediate level is more strongly supported for low ability students than for regular- or high ability students. In view of the generally high level of mathematics skill in this district, weaker support for predictions among high ability students may represent a ceiling effect specific to this sample.

The hypothesis that between-classroom grouping will shift expectancies toward an intermediate level is also more strongly supported in the spring than in the fall of the school year, suggesting a lag in the influence of grouping practices on expectancies.

Mediators of ability grouping effects

Because students were not randomly assigned to types or levels of ability grouping in this school district, it is important to regress students' achievement expectancies simultaneously on ability grouping conditions and other variables that may be correlated with ability grouping and that are plausible, independent antecedents of students' achievement expectancies. If, after controlling for these other variables, previously significant associations between ability grouping and students' expectancies are no longer statistically significant, it would be possible to infer that ability grouping effects on achievement expectancies are mediated by these other variables. When components of achievement expectancies measured in the fall of the school year are dependent variables, it is possible to include three predictors in addition to Wave 1 ability grouping assignments: Past achievement in mathematics; student gender; and the frequency and importance of social comparison within one's math classroom. When components of achievement expectancies measured in the spring of the school year are dependent variables, it is possible to include two more predictors: Math grades for the first and second marking periods (i.e., since Wave 1 and prior to Wave 2); and the direction of students' social comparison after having a hypothetical math test returned.

Multiple regression models predicting self-concept of math ability at each wave are displayed in Table 5. Nominal-level variables (i.e., ability grouping conditions, gender, and direction of social comparison) have been transformed to dummy variables with effect coding (Pedhazur, 1982); regression coefficients representing effects of these dummy variables may be interpreted as deviations from the grand mean of the sample. For example, the regression coefficients in Model 1 at Wave 1 show that students in high ability groups and classrooms have self-concepts of math ability that are significantly higher than the grand mean of the sample, whereas students in regular ability groups and low ability groups have self-concepts of math ability that are significantly lower than the sample grand mean.

Table 5 about here

In Model 2 at Wave 1, the effects of ability grouping on self-concept of ability are adjusted for percentile rank scores on the Mathematics Battery of the CAT, student gender, and the frequency and importance of within-classroom social comparison. As CAT scores increase, student self-concept of math ability increases significantly; girls show significantly lower self-concept of math ability than boys. The frequency and importance of within-classroom social comparison is unrelated to self-concept of math ability at Wave 1. Of most relevance to the analysis strategy pursued here, the net effect of ability grouping at Wave 1 remains highly significant (F (6, 496) = 5.28; p < .0001) after controlling for math achievement, gender, and the frequency of within-classroom social comparison.

Model 1 at Wave 2 shows that the main effect of ability grouping on students' self-concept of math ability is still significant. However, the net effect of ability grouping at Wave 2 is <u>not</u> significant (F (6,

456) = 1.42; p = .203) after controlling for the direction of students' social comparison and the average math grades students received for the first two marking periods. At Wave 2, students who say they would want to see someone's math test who is not as good at math as themselves ("Compare Down") show significantly higher self-concepts of math ability than the average sixth grader; students who say they would want to see someone's math test who is better at math than themselves ("Compare Up") tend to have significantly lower self-concepts of math ability. Not surprisingly, as students' math grades improve, their self-concepts of math ability increase. Because the net effect of ability grouping on Wave 2 math self-concept is no longer significant after controlling for these effects of social comparison direction and math grades, it is possible to infer that the direction of students' social comparison and the nature of math grades that students receive have mediated effects of ability grouping on students' self-concept of math ability.

Multiple regression models predicting students' expectancies for success in mathematics activities are displayed in Table 6. A similar main effect of ability grouping on expectancies is evident in Model 1 at both waves. Students in high ability groups and classrooms have higher expectancies for success, and students in low ability groups have lower expectancies for success than the grand mean of the sample. The main effect of ability grouping accounts for more variation in students' expectancies at Wave 2 (as indicated by the R^2 = .108) than at Wave 1 (R^2 = .057).

Table 6 about here

The net effect of ability grouping on expectancies is no longer significant at Wave 1 (F (6, 496) = 1.18; p = .314) or at Wave 2 (F (6, 456) = .87; p = .520) after controlling for other hypothesized antecedents of students' expectancies for success. At Wave 1, there is no independent effect of ability grouping after taking into account significant positive effects of past math achievement and the frequency of within-classroom social comparison. At Wave 2, there is no independent effect of ability grouping after taking into account positive effects of students' math grades and past math achievement, and negative effects of being female and of making upward comparisons. Because variation in math grades and the direction of students' social comparison originated after the onset of ability grouping assignments, these variables can be conceived as mediators of ability grouping effects on students' expectancies. Because variation in students' past math achievement and gender originated before the onset of ability grouping, these variables are not properly conceived as mediators of ability grouping effects, but as significant covariates.

Multiple regression models predicting students' perceptions of math as an easy subject are displayed in Table 7. A similar main effect of ability grouping on perceptions of math ease is evident in Model 1 at both waves, although the effect accounts for more variation in students' perceptions at Wave 2 (R^2 = .088) than at Wave 1 (R^2 = .045). Students in high ability groups (and at Wave 2, students in regular ability classrooms) rate math as easier, and students in low ability groups rate math as less easy than the grand mean of the sample.

Table 7 about here

The net effect of ability grouping on perceptions of math ease is still significant at Wave 1 (F (6, 496) = 3.04; p = .006) but it is only marginally significant at Wave 2 (F (6, 456) = 2.06; p = .057) after controlling for other hypothesized antecedents of students' perceptions of math ease. The logic of this analysis strategy suggests that the math grades students receive and the direction of their social comparison choices mediate effects of ability grouping on perceptions of math as an easy subject.

The relation between ability grouping and direction of social comparison

Closer examination of the relation between ability grouping assignments and the direction of students' social comparison choices helps provide insight into the means by which social comparison processes might mediate effects of ability grouping. Table 8 cross-classifies students according to their ability grouping status at Wave 2 and the nature of their comparison choices. The association between ability grouping and social comparison direction is highly significant (χ^2 (18) = 39.94; p = .002) and derives primarily from three cells in the cross-classification table: Students in high ability groups are disproportionately likely to compare with someone they believe is worse at math than themselves; students in low ability groups are disproportionately likely to compare with a superior other; and students in regular ability classrooms are disproportionately likely to say they do not want to compare with anybody. It is clear that within-classroom ability grouping increases the likelihood that students will compare with a dissimilar other and, in turn (as seen in Table 4), reach more extreme ability self-assessments, expectancies for success, and perceptions of math as an easy subject. Following the suggestions of Brickman and Bulman (1977), it is possible that assignment to regular ability classrooms increases the likelihood that students will reject social comparison altogether because they would be led to feel "average" by making comparisons within such classrooms.

Table 8 about here

The relation between ability grouping and math grades

It has been argued that ability grouping practices influence the reference groups available to students and thereby influence their social comparison behavior and eventually their achievement expectancies. Ability grouping practices might simultaneously influence the student reference groups available to teachers and thereby influence their grading practices. Through this mechanism, math grades might mediate the relation between ability grouping and components of students' achievement expectancies.

Table 9 displays descriptive statistics of math grades as a function of ability grouping assignments at Wave 2. Math grades have been averaged over the first two marking periods for each student. The relation between ability grouping and math grades is highly significant (F (6, 463) = 48.91; $p < .0001$; $R^2 = .388$). It is clear that grades increase as the level of ability grouping assignments increases. What is more remarkable is the finding that students in low ability groups receive significantly lower grades than students in low ability classrooms (F (1, 71) = 16.34; $p = .0001$), and students in high ability groups receive significantly higher grades than students in high ability classrooms ($\underline{F}$ (1, 166) = 4.33; $\underline{p}$ = .038). Teachers using within-classroom ability grouping assign more extreme grades to students in low and high groups. Perhaps the classroom organization heightens their perception of performance heterogeneity among students.

Table 9 about here

Discussion

Students' achievement expectancies in mathematics depend on both the type and level of their ability grouping assignments. Compared to between-classroom ability grouping, within-classroom ability grouping in mathematics lowers the achievement expectancies of low achievers and raises the achievement expectancies of high achievers. The pattern of this effect has important implications for students' persistence in mathematics through secondary school. To the extent that the incidence of within-classroom grouping in mathematics drops sharply after sixth grade, and the incidence of between-classroom grouping in mathematics increases (Coldiron & McDill, 1987), one might forecast a general grade-related decline in the mathematics achievement expectancies of high achieving students and a grade-related increase for low achievers. Grade-related changes in ability grouping practices represent a powerful organizational mechanism that could dampen the achievement expectancies of precisely those students who are most skilled in mathematics, and ultimately lead them not to enroll in optional, advanced mathematics courses.

This investigation has demonstrated how <u>within-classroom</u> social comparison processes mediate the relation between ability grouping practices in mathematics and students' achievement expectancies.

Students' expectancies depend in part on the ability level of classmates against whom they compare themselves. Within-classroom ability grouping increases the tendency of students in high ability groups to nominate a comparison other who is worse at math; it increases the tendency of students in low ability groups to nominate a comparison other who is better at math. The consequence of making comparisons with such dissimilar others is to raise the achievement expectancies of students in high ability groups and to lower expectancies in low ability groups. Between-classroom ability grouping does not lead to similar changes in the direction of students' comparison choices. Direct assessments of within-classroom social comparison among students suggest an important difference between student ratings of the frequency and importance of their social comparison behavior, on the one hand, and the direction of their social comparison choices, on the other hand. Only the direction of students' comparisons with their classmates mediates the relation between ability grouping practices and achievement expectancies. To the extent that teachers, counselors, or parents are concerned with students' achievement expectancies, they should focus on which students are chosen for comparison, rather than how often comparisons are made.

The pattern of the simple relation between ability grouping practices in mathematics and students' achievement expectancies is similar for three conceptually and empirically distinct components of expectancies; namely, students' self-concept of mathematics ability, expectancies for success in mathematics, and perceptions of mathematics as a difficult subject. However, the strength of this relation is stronger for students' self-concept of math ability than for success expectancies or perceptions of math difficulty. In addition, the mediating role of the direction of students' social comparison choices is more evident for students' self-concept of math ability than for success expectancies or perceptions of the difficulty of math. The net effect of ability grouping on students' self-concept of math ability becomes altogether nonsignificant when effects of the direction of students' social comparison are partialled. By contrast, the net effect of ability grouping on students' success expectancies is nonsignificant prior to partialling effects of the direction of social comparison, when only adjustments for past math achievement and the frequency of social comparison are introduced (direction of social comparison reduces the net effect of ability grouping even further). The net effect of ability grouping on students' perceptions of math as an easy subject is reduced, but still marginally significant, when effects of direction of social comparison are partialled. Overall, one may infer that the direction of students' comparisons with their classmates is more important in shaping their ability self-assessments than their expectancies for success in math activities or assessments of task difficulty. The fact that social comparison particularly influences a dispositional component of achievement expectancies suggests that effects of ability grouping in the sixth grade are apt to have long-term consequences.

Future research ought to consider the possible role of <u>between-classroom</u> social comparison as a mediator of the relation between ability grouping practices and students' achievement expectancies. Organizational characteristics of schools can be expected to influence the emergence of between-classroom comparison processes. For instance, students typically shift from having a primary teacher and a single set of classmates in their elementary school to a departmentalized curriculum with several teachers and several sets of classmates in junior high school. The transition to junior high school may precipitate a heightened role for between-classroom social comparison of abilities. In general, understanding the role of within-classroom social comparison processes may be insufficient for understanding how ability grouping practices influence achievement expectancies in junior high school and high school.

Ability grouping practices also constrain the nature of the student reference group available to teachers. In the school district investigated here, students in low ability groups received lower grades in mathematics than did students in low ability classrooms, despite equivalent achievement test scores in mathematics at the outset of the school year. Similarly, students in high ability groups received higher grades in mathematics than did students in high ability classrooms. In those classrooms where a teacher has implemented within-classroom ability grouping, the within-classroom heterogeneity of student performance may be especially salient and lead teachers to assign more extreme grades to students in low and high groups. As was the case with the direction of students' social comparison choices, the math grades assigned by teachers mediate the relation between ability grouping practices and students' achievement expectancies.

Based on Slavin's (1986) best-evidence synthesis of research findings on ability grouping and student achievement in elementary schools, one might speculate that the present sample of students experiencing within-classroom ability grouping in mathematics achieved more during the school year than did their counterparts experiencing no grouping at all, whereas no such enhanced achievement would be observed for the students experiencing between-classroom ability grouping. There is cause for concern that within-classroom ability grouping in mathematics might lead to heightened achievement gains for low ability students, but simultaneously to their receiving lower grades and forming lower achievement expectancies. This hypothesis cannot be tested currently because standardized tests of mathematics achievement were administered only once during the school year in this district. It is important that future research on effects of ability grouping on achievement expectancies include repeated achievement tests, in addition to the social comparison and grading variables identified as important mediators here. It may turn out that the costs and benefits of ability grouping depend not only on the type and level of a students' assignment, but that benefits of within-classroom grouping to low ability students' mathematics achievement are offset by costs to the same students' achievement expectancies.

To the extent that ability grouping practices, teachers' grading practices, and students' social comparison behavior can be changed, none of the effects observed here must necessarily be perpetuated in schools. Choosing to implement within-classroom versus between-classroom grouping policies involves complicated trade-offs. Other forms of grouping (e.g., cooperative, mixed-ability groups [Slavin, 1983]) may provide a more optimal mix of benefits and costs. In any event, it is important to identify reliable effects of different types and levels of ability grouping on motivational variables, such as students' achievement expectancies, in addition to their effects on standardized tests of achievement. Only then can ability grouping policies be implemented that meet a wide array of intended objectives for a broad spectrum of students.

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Footnote

[1]Composites representing self-concept of ability, expectancies for success, and perceptions of math difficulty were formed by summing the indicators of each construct. Scores on the composite representing perceptions of mathematics as a difficult subject were reversed for clarity of presentation.

Table 1

Variation in Ability Grouping Assignments over the Sixth Grade School Year

Wave 2 Ability Grouping Assignment	Wave 1 Ability Grouping Assignment								
	Between-Classroom			Within-Classroom			Neither	Both	
	High	Regular	Low	High	Regular	Low			
Between-Classroom:									
High	83	2							85
Regular		54	2						56
Low		6	53						59
Within-Classroom:									
High		1		48	13	1	32		95
Regular				23	95	9	37		164
Low					5	20	10		35
Neither							25		25
Both		21						26	47
	83	84	55	71	113	30	104	26	566

Table 2

Descriptive Statistics for Percentile Rank Scores on the Mathematics Battery of the California Achievement Test as a function of Ability Grouping Assignment

Ability Grouping Assignment	*M*	*SD*	*n*
Between-Classroom:			
High	88.0	13.3	84
Regular	65.5	20.4	85
Low	40.1	23.4	52
Within-Classroom:			
High	87.4	14.7	72
Regular	65.6	23.7	115
Low	35.1	20.5	30
Neither	73.9	22.1	104
	69.2	25.7	542

Note. Sixth graders in one classroom are excluded from this analysis because both between- and within-classroom ability grouping are practiced there.

Table 3

Within-Classroom Variance in Past Math Achievement and Components of Math Achievement Expectancies as a function of Type of Ability Grouping Assignment

Type of Ability Grouping Assignment	Classroom n	Mean Within-Classroom Variance			
		Past Math Achievement	Self-Concept	Expectancies for Success	Difficulty
No Grouping	5	425.00	9.86	4.22	10.68
Within-Classroom	10	645.77	16.72	5.69	12.25
Between-Classroom	11	337.17	9.96	3.99	10.18
	26	472.75	12.54	4.69	11.07

Note. One classroom in the district is excluded from these classroom-level analyses because both within- and between-classroom grouping are practiced there.

Table 4

Achievement Expectancies in Mathematics as a function of Ability Grouping Assignments in the Fall (Wave 1) and Spring (Wave 2)

Ability Grouping Assignment	n W1	n W2	Self-concept of ability W1	Self-concept of ability W2	Expectancies for success W1	Expectancies for success W2	Difficulty (Reversed) W1	Difficulty (Reversed) W2
Between-Classroom:								
High	79	79	16.02 *2.75*	15.13 *3.16*	11.72 *1.57*	11.32 *1.82*	13.77 *2.78*	13.68 *2.77*
Regular	77	49	15.18 *3.13*	15.16 *2.66*	10.86 *2.11*	10.98 *1.75*	13.61 *3.26*	14.47 *2.76*
Low	47	44	14.85 *3.51*	13.82 *3.51*	10.89 *2.42*	10.36 *2.42*	13.62 *3.43*	13.16 *2.90*
Within-Classroom:								
High	71	89	16.94 *3.08*	16.36 *3.09*	12.01 *1.80*	11.76 *2.08*	14.32 *3.31*	14.82 *3.37*
Regular	108	156	13.82 *3.77*	14.27 *3.14*	10.92 *2.18*	10.63 *2.26*	12.76 *3.44*	13.20 *2.83*
Low	26	29	11.73 *4.17*	11.34 *4.11*	9.96 *2.75*	8.66 *2.87*	11.31 *3.54*	11.14 *2.77*
Neither	98	24	15.39 *3.25*	15.88 *3.34*	11.26 *2.10*	11.54 *1.86*	12.89 *3.44*	14.42 *3.44*
	506	470	15.10 *3.54*	14.76 *3.41*	11.20 *2.13*	10.90 *2.26*	13.30 *3.36*	13.65 *3.08*

Note. Cells display means and standard deviations (in italics). Students (in one classroom at Wave 1 and two classrooms at Wave 2) who experience both between- and within-classroom grouping are excluded. W1 = Wave 1; W2 = Wave 2.

Table 5

Regression Models Predicting Self-Concept of Math Ability

Regressor	Wave 1 Models		Wave 2 Models	
	1	2	1	2
Ability Grouping:				
High Within	.34***	.20**	.25***	.06
Regular Within	-.19***	-.17**	-.05	-.02
Low Within	-.42***	-.26**	-.32***	-.12*
High Between	.20***	.04	.07	-.04
Regular Between	.06	.06	.07	.03
Low Between	.00	.13*	-.08	.03
CAT Math PR		.30***		.11
Female		-.14***		-.17***
Compare: Frequency		.07		.04
Compare: Direction				
Down				.16*
Same				.00
Up				-.29***
Math Grades				.30***
Overall *F*	11.90***	13.97***	11.22***	14.24***
R^2	.125	.202	.127	.289
p-value (Grouping)	<.0001	<.0001	<.0001	.203
p-value (Direction)				<.0001

Note. Coefficients are standardized regression coefficients (betas). Wave 1 *n* = 506; Wave 2 *n* = 470. CAT Math PR = percentile rank scores on the Mathematics Battery of the California Achievement Test.

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 6

Regression Models Predicting Expectancies for Success in Mathematics

Regressor	Wave 1 Models		Wave 2 Models	
	1	2	1	2
Ability Grouping:				
High Within	.25***	.12	.21***	.01
Regular Within	-.05	-.04	-.03	-.01
Low Within	-.25**	-.11	-.31***	-.10
High Between	.18**	.03	.11*	-.01
Regular Between	-.06	-.06	.04	.00
Low Between	-.05	.08	-.06	.06
CAT Math PR		.27***		.13*
Female		-.07		-.11**
Compare: Frequency		.08*		.04
Compare: Direction				
Down				.12
Same				-.01
Up				-.26***
Math Grades				.31***
Overall F	5.06***	7.01***	9.39***	11.76***
R^2	.057	.113	.108	.251
p-value (Grouping)	<.0001	.314	<.0001	.520
p-value (Direction)				.0001

Note. Coefficients are standardized regression coefficients (betas). Wave 1 n = 506; Wave 2 n = 470. CAT Math PR = percentile rank scores on the Mathematics Battery of the California Achievement Test.

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

Table 7

Regression Models Predicting Perceptions of Math as an Easy Subject

Regressor	Wave 1 Models		Wave 2 Models	
	1	2	1	2
Ability Grouping:				
High Within	.20**	.03	.19***	.00
Regular Within	-.08	-.08	-.06	-.05
Low Within	-.26***	-.07	-.26***	-.07
High Between	.10	-.08	.02	-.10*
Regular Between	.07	.07	.12*	.08
Low Between	.07	.23**	-.05	.08
CAT Math PR		.34***		.18**
Female		-.08*		-.15***
Compare: Frequency		-.02		-.07
Compare: Direction				
Down				.23**
Same				-.02
Up				-.24***
Math Grades				.22***
Overall F	3.91***	7.63***	7.49***	10.12***
R^2	.045	.122	.088	.224
p-value (Grouping)	.0008	.006	<.0001	.057
p-value (Direction)				.0003

Note. Coefficients are standardized regression coefficients (betas). Wave 1 n = 506; Wave 2 n = 470. CAT Math PR = percentile rank scores on the Mathematics Battery of the California Achievement Test.

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

Table 8

Direction of Social Comparison as a function of Ability Grouping Assignment at Wave 2

Ability Grouping Assignment	Direction of Social Comparison				
	Worse Other	Same Other	Better Other	Nobody	
Between-Classroom:					
High	1	35	29	14	79
Regular	4	17	9	19	49
Low		19	13	12	44
Within-Classroom:					
High	10	44	19	16	89
Regular	6	67	51	32	156
Low		8	15	6	29
Neither		10	10	4	24
	21	200	146	103	470

Table 9

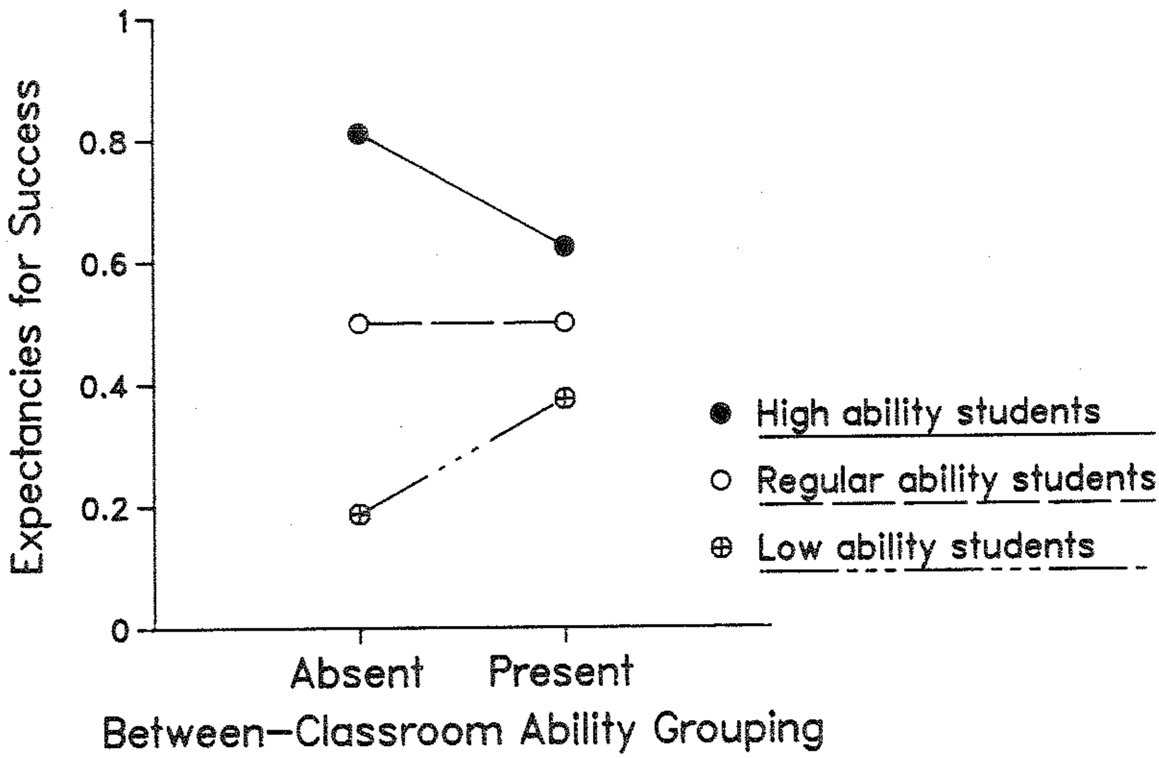
Descriptive Statistics for Math Grades as a function of Ability Grouping Assignments at Wave 2

Ability Grouping Assignment	*M*	*SD*	*n*
Between-Classroom:			
High	10.97	1.56	79
Regular	9.85	1.51	49
Low	8.11	2.22	44
Within-Classroom:			
High	11.52	1.41	89
Regular	9.48	1.90	156
Low	6.45	1.75	29
Neither	11.06	1.38	24
	9.92	4.78	470

Note. Math grades are averaged over the first two marking periods and coded <14>A+, <13>A, <12>A-, <11>B+, <10>B, <9>B-, etc.

Figure Caption

Figure 1. Predicted effects of between-classroom ability grouping and student ability level on expectancies for success.



Expectancies for Success
1
0.8
0.6
0.4
0.2
0
Absent
Present
Between-Classroom Ability Grouping
High ability students
Regular ability students
Low ability students