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# Measuring Attitudinal Change in Mathematics and English Over the 1st Year of Junior High School: A Multidimensional Analysis

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**ABSTRACT. Changes in student self- and task evaluations, subjective valuation, and achievement behavior in mathematics and English over the 1st year of junior high form the basis of this study. The transition to junior high has been found to negatively affect students' self-concept and subjective valuation in mathematics and English, but previous research has not addressed changes in task evaluations and achievement behaviors. Gender and level of academic achievement effects are also relevant to the nature of changes in student attitudes. The participants ($N = 400$) were from 3 coeducational Australian government schools in metropolitan Sydney of comparable socioeconomic status. When changes in perceptions occurred, they were negative, and gender differences favored boys in mathematics and girls in English. However, the nature and extent of change was dependent on school and level of achievement.**

THERE IS A GROWING BODY OF RESEARCH on the effects on students of the transition from elementary to junior high school. These studies have addressed a range of student-level variables, including self-esteem (Seidman, Allen, Aber, Mitchell, & Feinman, 1994; Simmons, Blyth, Van Cleave, & Bush, 1979), self-concept of ability (Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991), perceptions of competence (Harter, Whitesell, & Kowalski, 1992), liking for school subjects (Wigfield et al., 1991), and school grades (Anderman & Midgley, 1997; Kavrell & Petersen, 1984). The majority of these researchers found the overall impact of the transition to junior high to be negative, leading to decreased self-esteem (Seidman et al., 1994), lower self-concept of ability in spe-

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cific school subject domains (Wigfield et al., 1991), declines in perceptions of competence (Anderman & Midgley, 1997), decreased liking in specific school subject domains (Wigfield et al., 1991), and lower school grades (Anderman & Midgley, 1997).

Some theorists have suggested that such negative changes are likely to occur because of physiological and psychological pubertal changes occurring at that time (Blyth, Simmons, & Carlton-Ford, 1983; Hill & Lynch, 1983; Rosenberg, 1986; Simmons et al., 1979). That view has been challenged by research showing that declines in students' expectancies and values in mathematics relate to differences in the classroom environment pre- and posttransition (Eccles & Midgley, 1989, 1990). Those analyses have been interpreted in the form of a model of person–environment fit (Eccles & Midgley, 1989, 1990), which suggests that lack of fit between the junior high school environment and the needs of young adolescents negatively affects student attitudes. The present study is located within this theoretical perspective, with contextual explanations sought for negative changes in student perceptions where they occur.

### *Domain Specificity*

The importance of assessing transitional impact on separate school subject domains has been recognized because not all domain-related perceptions are affected in the same way (e.g., Wigfield et al., 1991) and domain-specific findings differ from general student perceptions. For example, Harter (1982) found general perceptions of competence to be stable from Grades 3 to 9. Clearly, those general measures mask domain-specific changes over that time period.

In the present study, I examined the effects of the 1st year of junior high on student attitudes and performance in mathematics and English, because those are domains in which transition has been found to negatively affect self-concept (Wigfield et al., 1991). Mathematics is also a domain that is regarded as being of substantive importance, because students' mathematics-related attitudes strongly affect school mathematics course selections (Eccles & Jacobs, 1986; Watt & Bornholt, 1994) and mathematical career relatedness (Watt, 1995).

### *Important Subgroups*

One cannot assume that all students are affected similarly by the transition to junior high. Gender and ability have been identified as two salient dimensions along which to examine group differences (Anderman & Midgley, 1997). Researchers have found, for instance, that on average boys have more positive attitudes and self-perceptions than girls in mathematics (Eccles, Adler, & Meece, 1984; Marsh, 1989; Wigfield et al., 1991), and conversely for English (Wigfield et al., 1991). Researchers have suggested that such gender differences may be produced by a response bias (Wigfield et al., 1991)—wherein boys tend to be more self-congratulatory than girls on self-report measures of self-esteem (Bornholt, Goodnow, & Cooney, 1994; Maehr & Nicholls, 1980)—rather than by genuine differences in perceptions. In an earlier study (Watt, 1996), I suggested that such gender differences may not hold true for mathematics, however, because boys scored higher than girls on both their ipsative judgments of mathematical talent (i.e., relative to each of their other school subjects) and also on traditional rating measures of their talent at mathematics. Also, that notion is inconsistent with girls rating their English talent higher than boys (Wigfield et al., 1991).

There is some research to suggest that gender intensification occurs with age (Hill & Lynch, 1983), such that gender-role activities become more important to young adolescents over time as they try to conform more to behavioral gender-role stereotypes (Eccles, 1987; Hill & Lynch, 1983). Thus, girls become more negative about male-stereotyped domains, for example, mathematics, whereas boys become more positive, and conversely for female-stereotyped domains such as English. Not all research has found that to be the case (e.g., Wigfield et al., 1991). For mathematics, some researchers have explained discrepant findings by suggesting that mathematics is no longer perceived as a male domain.

Measured ability in the domain, or more accurately actual prior performance, has also been identified as a determinant of attitudinal adjustment to the junior high setting. One study found high-mathematics-performing students' self-concept to be the most affected by the transition, with low-mathematics-performing students' self-concept actually increasing posttransition (Wigfield et al., 1991). It seems likely that the streaming or ability grouping that often occurs in junior high leads to homogeneous reference comparison groups, such that high-ability students no longer outperform the majority of their classmates and conversely low-ability students no longer perform relatively poorly. Thus, ability grouping may result in students' self-perceptions becoming more homogeneous, as high-ability students' perceptions become less positive and low-ability students' perceptions become less negative (Wigfield et al., 1991). It is important to note that Wigfield et al. found no corresponding interaction effects for English, however.

### *Student Attitudes and Achievement Behavior*

Most studies of domain-specific student attitudes have examined perceptions of ability for different activities (Cauce, 1987; Harter, 1982), with some researchers including subject liking as a value indicator in addition to perceived ability (Eccles et al., 1989; Wigfield et al., 1991). Self-evaluations and subject valuation are key elements in the expectancy value framework of Eccles and colleagues, informing choice behaviors. In the present study, I included additional measures for self-evaluation (talent as well as expected success) and subjective valuation (interest as well as utility). I included task evaluations (difficulty and effort required) also highlighted in the expectancy value model, along with achievement behaviors (effort exerted and measured performance), in order to understand the relation of attitudinal to behavioral change.

The transition to junior high has been found to result in a decline in school grades. However, that decline has not been accompanied by decreased achievement on standardized achievement tests (Kavrell & Petersen, 1984; Schulenberg, Asp, & Petersen, 1984). Lowered school performance may be gender related, because Anderman & Midgley (1997) found a moderate correlation ($r$ = .44) between boys' pre- and posttransition school mathematics grades, but no significant relation for girls. It is noteworthy that those authors found strong correlations for both boys ($r$ = .77) and girls ($r$ = .81) on standardized mathematics basic skills tests. It is possible then that changes in school grades reflect new assessment procedures rather than a real drop in student performance.

### *The Present Study*

In the present study, I examined changes in students' English- and mathematics-related attitudes and achievement behaviors over the course of the 1st year of junior high. Although this study was not strictly a test of the impact of the transition to junior high—because students were assessed at the very beginning (i.e., posttransition) and at the very end of Grade 7—it did capture changes that occurred over that year. One advantage to this design is that the problem of confounding change in school setting with change in grade level is circumvented (Anderman & Midgley, 1997; Harter et al., 1992), because students within each school were in the same environment for the duration of the study. Also, because it has been suggested that motivational perceptions may stabilize soon after the beginning of the new school year (Deci, Schwartz, Sheinman, & Ryan, 1981), changes within the 1st year of junior high warrant investigation. Eccles, Wigfield, and colleagues (Eccles et al., 1989; Wigfield et al., 1991) did this, their study having two waves of data collection in each of Grades 6 and 7, but for the domains of mathematics and English, they investigated only perceived competence and liking.

In the present study, I built on the expectancy value model of Eccles and colleagues, which emphasizes the importance of self- and task perceptions and value judgments because of their impact on choice behavior. The inclusion of task evaluations—highlighted in the expectancy value framework yet not addressed in the transitional literature to date—gives a broader understanding of the nature and extent of changes occurring over this period. I also extended the expectancy value model by adding achievement behaviors in the form of effort exerted and academic performance. The additional achievement behaviors examined provide a behavioral component useful in understanding attitudinal changes.

I included frequently researched self-perceptions of competence in this study but assessed the more narrowly defined perceptions of perceived talent and expected success. More recently, researchers have addressed interest as a value indicator, and here I add an additional value indicator of perceived utility. Other constructs that have not been included in much of the transition research are task evaluations and achievement behaviors, which are an important contribution to understanding the nature and extent of change across the 1st year of junior high.

I expected that changes would be negative overall where they occurred, that boys would have more positive mathematics-related and girls would have more positive English-related perceptions, and that high-achieving students would have more positive perceptions than low-achieving students. Moreover, I anticipated that girls' perceptions would exhibit greater declines than boys' perceptions in relation to mathematics, and conversely for English. I also tested whether high achievers would be most negatively affected over the year, although the absence of ability tracking in most Australian schools in Grade 7 made it unlikely that U.S. findings would be replicated. The relative stability of attitudes in each subject domain for subgroups of students according to gender and achievement level was also of interest, along with changes in students' English and mathematics performance.

## Method

### *Design*

In the present study, I aimed to investigate the nature and extent of changes in student self-evaluations, task evaluations, subjective valuation, and achievement behaviors in relation to junior high mathematics and English. Whether student gender and level of achievement interacted with time effects or exerted independent effects on student perceptions and performance were also foci of the study.

### *Participants*

The participants were Grade 7 students ($N$ = 400) from three government coeducational schools in an upper middle class metropolitan area of Sydney of comparable upper middle socioeconomic status (Australian Bureau of Statistics, 1995). The distribution of students by school and gender is shown in Table 1. None of the schools tracked students according to demonstrated ability at the beginning of the year, although School 3 streamed their students halfway through the year (after the midyear examinations) into top, middle, and bottom classes for both English and mathematics.

Because I administered mathematics and English tasks on separate occasions to decrease respondent burden, some students had missing mathematics but not English data and vice versa. No correction was made for this because mathemat-

**TABLE 1**
**Distribution of Students by School and Gender**

| Variable | *n* | School 1 | School 2 | School 3 |
|---|---|---|---|---|
| Whole sample | | | | |
| Boys | 228 | 83 | 111 | 34 |
| Girls | 172 | 75 | 67 | 30 |
| Total | 400 | 158 | 178 | 64 |
| Mathematics sample | | | | |
| Boys | 153 | 57 | 75 | 21 |
| Girls | 127 | 57 | 50 | 20 |
| Total | 280 | 114 | 125 | 41 |
| English sample | | | | |
| Boys | 134 | 49 | 64 | 21 |
| Girls | 111 | 48 | 49 | 14 |
| Total | 245 | 97 | 113 | 35 |

ics and English analyses were conducted separately. It was also possible for students to be present at the Time 1 (T1) but not the Time 2 (T2) administration. All such cases were discarded from analyses. Effective sample sizes were 245 for English (61%) and 280 (70%) for math.

The three school environments were similar in that they were matched for socioeconomic status and were coeducational government schools. School 3 differed from the others in that it was smaller (about half the size) and consequently had a more personalized feel, both in terms of teacher knowledge of students and students' knowledge of each other. Although class size was comparable across schools, there were fewer classes in School 3. Unlike the other schools that were situated in metropolitan suburbia, School 3 was situated in a beach district and had a distinctive "surf" culture among the students. That is, School 3 students were recreationally focused on the beach and surfing, as was reflected in their conversation and appearance. Geographically, the schools were within 20 kilometers (12.4 miles) of each other.

### *Materials*

Questionnaires assessed student perceptions in relation to English and mathematics in junior high. I developed the measures on the basis of those designed by Eccles and colleagues at the University of Michigan for student self-evaluations (perceived talent, expected success), task evaluations (perceived difficulty, effort required), and subjective valuation (interest and utility) for both mathematics and English (see Table 2). A measure of achievement behavior (effort exerted) was also included, along with standardized mathematics and English tests at both time points. Survey items were measured on 7-point Likert-type scales anchored at both ends, and they formed part of a much larger study investigating a broad-

**TABLE 2**
**Self-Evaluative, Task-Evaluative, Subjective Valuation, and Achievement Behavior Scale Items**

| Scale/item | Stem | Anchors |
|---|---|---|
| | *Self-evaluation* | |
| Perceived Talent | | |
| TAL1 | Compared with other students in your class, how talented do you consider yourself to be at math/ English? | 1 *(not at all)*–7 *(very talented)* |
| TAL2 | Compared with other students in your year at school, how talented do you consider yourself to be at math/English? | 1 *(not at all)*–7 *(very talented)* |
| TAL3 | Compared with your friends, how talented do you consider yourself to be at math/English? | 1 *(not at all)*–7 *(very talented)* |
| Expected Success | | |
| SUCC1 | How well do you expect to do in your next math/ English test? | 1 *(not at all)*–7 *(very well)* |
| SUCC2 | How well do you expect to do on school math/ English tasks this term? | 1 *(not at all)*–7 *(very well)* |
| SUCC3 | How well do you think you will do on your school math/English exam this year? | 1 *(not at all)*–7 *(very well)* |
| | *Task evaluation* | |
| Effort Required | | |
| EFFREQ1 | How hard do you need to try to get good marks in math/English? | 1 *(a little)*–7 *(a lot)* |
| EFFREQ2 | How hard do you have to work at math/English? | 1 *(not at all)*–7 *(very hard)* |
| Difficulty | | |
| DIFF1 | To what extent do you consider math/English to be a tough subject? | 1 *(not at all)*–7 *(very tough)* |
| DIFF2 | How complicated is math/English for you? | 1 *(not at all)*–7 *(very complicated)* |
| DIFF3 | Compared with most other students in your class, how easy/difficult do you think math/English is? | 1 *(relatively easy)*–7 *(relatively difficult)* |
| | *Subjective valuation* | |
| Interest | | |
| INT1 | How much do you like math/English, compared with your other subjects at school? | 1 *(much less)*–7 *(much more)* |
| INT2 | How interesting do you find math/English? | 1 *(not at all)*–7 *(very interesting)* |
| INT3 | How enjoyable do you find math/English, compared with your other school subjects? | 1 *(not at all)*–7 *(very enjoyable)* |
| Utility | | |
| USE1 | How useful do you believe math/English is? | 1 *(not at all)*–7 *(very useful)* |
| USE2 | How useful do you think math/English is in the everyday world? | 1 *(not at all)*–7 *(very useful)* |
| USE3 | How useful do you think mathematical skills are in the workplace? | 1 *(not at all)*–7 *(very useful)* |

*(Continues)*

TABLE 2—*Continued*

| Scale/item | Stem | Anchors |
|---|---|---|
| | *Achievement behavior* | |
| Effort Exerted | | |
| EFFEXE1 | How hard do you work at math/English? | 1 *(not at all)*–7 *(very hard)* |
| EFFEXE2 | How much effort do you put into math/English? | 1 *(none)*–7 *(a lot)* |

**TABLE 3**
**Fit Indices From Confirmatory Factor Analyses Establishing Validity of Attitudinal Constructs**

| Fit index | Math T1 | Math T2 | English T1 | English T2 |
|---|---|---|---|---|
| *RMSEA* | .055 | .058 | .046 | .054 |
| GFI | .93 | .92 | .93 | .93 |
| AGFI | .89 | .88 | .90 | .89 |
| NFI | .95 | .94 | .94 | .94 |
| NNFI | .96 | .96 | .97 | .96 |
| $\chi^2$ | 271.40 | 277.59 | 215.99 | 260.44 |
| *df* | 130 | 130 | 130 | 130 |

*Note. RMSEA* = root mean square error of approximation; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; NFI = normed fit index; NNFI = nonnormed fit index.

er range of student perceptions and related influences in relation to both mathematics and English that are not the focus of the present study.

*Student perceptions.* Confirmatory factor analyses using LISREL confirmed the validity of each of the attitudinal constructs under investigation for English and mathematics and established the adequacy of data fit (see Table 3). Four separate confirmatory factor analyses were conducted for math T1, math T2, English T1, and English T2. Items designed for each of the seven attitudinal constructs were specified as construct indicators. The only items for which errors were permitted to covary were the first perceived talent and the last difficulty items as shown in Table 2, because both involved the class group as a frame of reference. Not surprisingly, that element only reached statistical significance for T2 models, by which time point students would have good knowledge of other class members, but was included in T1 models for consistency. Table 4 contains item factor loadings and uniqueness for each construct in the four analyses. Cronbach alpha reliabilities for each construct at both time points are shown in Table 5.

*Performance.* Students' academic performance in mathematics was measured on standardized Progressive Achievement Tests (PAT; Australian Council for Educational Research [ACER], 1984a). Alternate items were chosen so that each test could be administered along with the questionnaire in a 60-min lesson. Internal consistency for the February test (PAT 2A) was Cronbach's alpha .83, and for the December test (PAT 3B) was .75, indicating that both versions of the mathematics tests were reliable. I equated test performances via Rasch modeling statistics normed on a representative Australian sample (ACER, 1984b), enabling comparisons of student performance at the beginning and the end of Grade 7. (The Rasch-scaled PATMATH Scale scores express student attainment on any of the tests in the series on an achievement scale that relates attainment to the difficulties of the items, using the same units and the same scale for both measures [ACER, 1984b].)

Tests of Reading Comprehension (TORCH) also developed by ACER (Mossenson, Hill, & Masters, 1987) assessed students' English performance.

**TABLE 4**
**Factor Loadings (LX) and Uniqueness (TD) for Attitudinal Constructs for Math and English T1 and T2 From Confirmatory Factor Analysis (Completely Standardized Solutions)**

| | Math T1 | | Math T2 | | English T1 | | English T2 | |
|---|---|---|---|---|---|---|---|---|
| Scale/item | LX | TD | LX | TD | LX | TD | LX | TD |
| Perceived Talent | | | | | | | | |
| TAL1 | .93 | .13 | .83 | .31 | .88 | .22 | .89 | .20 |
| TAL2 | .87 | .24 | .87 | .24 | .85 | .28 | .81 | .35 |
| TAL3 | .83 | .30 | .82 | .32 | .82 | .33 | .85 | .28 |
| Expected Success | | | | | | | | |
| SUCC1 | .85 | .29 | .85 | .28 | .75 | .44 | .79 | .38 |
| SUCC2 | .87 | .24 | .88 | .22 | .85 | .27 | .89 | .22 |
| SUCC3 | .85 | .28 | .87 | .25 | .81 | .34 | .84 | .30 |
| Effort Required | | | | | | | | |
| EFFREQ1 | .83 | .30 | .90 | .19 | .83 | .31 | .85 | .28 |
| EFFREQ2 | .83 | .31 | .83 | .31 | .80 | .36 | .70 | .51 |
| Difficulty | | | | | | | | |
| DIFF1 | .81 | .34 | .67 | .55 | .71 | .50 | .87 | .25 |
| DIFF2 | .90 | .20 | .75 | .43 | .92 | .16 | .81 | .34 |
| DIFF3 | .81 | .34 | .74 | .45 | .80 | .37 | .76 | .42 |
| Interest | | | | | | | | |
| INT1 | .90 | .19 | .91 | .17 | .87 | .24 | .86 | .26 |
| INT2 | .91 | .18 | .91 | .17 | .91 | .17 | .87 | .24 |
| INT3 | .95 | .10 | .92 | .16 | .92 | .16 | .74 | .11 |
| Utility | | | | | | | | |
| USE1 | .83 | .31 | .85 | .28 | .81 | .34 | .88 | .22 |
| USE2 | .89 | .21 | .84 | .29 | .77 | .41 | .89 | .21 |
| USE3 | .83 | .32 | .86 | .26 | .76 | .42 | .85 | .28 |
| Effort Exerted | | | | | | | | |
| EFFEXE1 | .79 | .38 | .83 | .32 | .79 | .38 | .87 | .25 |
| EFFEXE2 | .87 | .25 | .94 | .12 | .82 | .32 | .88 | .22 |

*Note.* Correlated uniqueness between TAL1 and DIFF3: –.05 and –.18 for math, and .02 and –.09 for English, at T1 and T2, respectively.

**TABLE 5**
**Cronbach Alpha Reliabilities for Attitudinal Constructs**

| Variable | No. of items | Math T1 | Math T2 | English T1 | English T2 |
|---|---|---|---|---|---|
| Self-evaluations | | | | | |
| Perceived talent | 3 | .91 | .88 | .88 | .89 |
| Expected success | 3 | .90 | .91 | .84 | .87 |
| Task evaluations | | | | | |
| Effort required | 2 | .82 | .86 | .80 | .75 |
| Difficulty | 3 | .87 | .77 | .85 | .85 |
| Subjective valuation | | | | | |
| Interest | 3 | .94 | .94 | .93 | .92 |
| Utility | 3 | .88 | .88 | .82 | .90 |
| Achievement behavior | | | | | |
| Effort exerted | 2 | .81 | .87 | .79 | .87 |

Forms "Horse of Her Own" ($\alpha = .86$) and "Iceberg Towing" ($\alpha = .87$) were used in February and December, respectively. Again, equating was possible via Rasch modeling statistics normed on students in Grades 3 to 10 in government schools in Western Australia in 1984 (Mossenson, Hill, & Masters, 1995).

### *Procedure*

The students completed questionnaires asking about their attitudes in relation to English and mathematics at junior high and also completed standardized English and mathematics tests. This procedure was carried out at the beginning (February 1996) and repeated at the end (December 1996) of the Australian school year. This circumvented the problem identified by Harter and colleagues of confounding change in school setting with change in grade level (Harter et al., 1992), because the students were in the same classes throughout the year, except in the case of School 3, which tracked their students for the 2nd half of the school year.

The study was conducted with informed student and parental consent and with the approval of the school principals and formal university and departmental ethical bodies. To maximize ecological validity, I administered the questionnaires and tests in the regular classroom, and I was present at each administration to clarify or answer questions when necessary. To avoid overburdening the respondents, I spread the administration at each time point over 2 days—the 1st for mathematics tasks and the 2nd for English tasks.

### *Analyses*

Repeated-measures multivariate analyses of variance were conducted first on the full set of mathematics-related variables and second on the full set of English-related variables, with time as the within-subject factor and gender, achievement level, and school as the between-subjects factors, for both analyses. Following Eccles et al. (1989), I assessed the relative stability of student perceptions over Grade 7 via Pearson correlations for each Gender × Achievement Level subgroup. Level of achievement was determined according to initial performance on each of the standardized English and mathematics tests, with the lowest performing third of the students forming one group, the middle performing third forming a second group, and the highest performing third forming the last group in each case. Interrelations among variables were also measured with Pearson correlations.

*Results*

I present the results in six main sections. In the first four sections, I examine effects on students' self-evaluative, task-evaluative, and subjective-valuation perceptions, as well as achievement behaviors in mathematics and English. In the fifth section, I report the stability of perceptions and achievement behavior across the year overall and separately for students of high, middle, and low achievement levels. In the final section, I consider interrelations between the variables.

*Multivariate Tests*

*Mathematics perceptions.* Multivariate tests showed that overall, mathematics perceptions changed over the year (Pillais = .73, $p < .001$) and differed according to level of mathematical achievement (Pillais = .18, $p < .001$). These main effects were modified by the Achievement Level × Time interaction (Pillais = .21, $p < .001$) and the Gender × Time interaction (Pillais = .08, $p = .004$).

*English perceptions.* As for mathematics, English perceptions overall changed across Grade 7 (Pillais = .72, $p < .001$), again differing by level of English achievement (Pillais = .13, $p = .008$) and by gender (Pillais = .17, $p < .001$). These main effects were again modified by Achievement Level × Time (Pillais = .16, $p = .001$) and Gender × Time (Pillais = .17, $p < .001$) interactions. For English, there was also a School × Time interaction effect (Pillais = .12. $p = .01$).

*Self-Evaluative Attitudes*

*Mathematics talent.* Boys had higher perceptions of mathematics talent than girls, $F(1, 261) = 13.34$, $p < .001$ (boys' T1 $M = 4.94$, $SD = 1.20$, T2 $M = 4.85$, $SD = 1.25$; girls' T1 $M = 4.49$, $SD = 1.06$, T2 $M = 4.43$, $SD = 1.20$). There was a main effect of achievement level, with high achievers having the highest and low achievers the lowest talent perceptions at both time points, $F(2, 261) = 27.30$, $p < .001$, Bonferroni post hoc tests, modified by an Achievement Level × Time interaction effect, $F(2, 261) = 5.89$, $p = .003$ (high achievers' T1 $M = 5.17$, $SD = 1.06$, T2 $M = 5.35$, $SD = 1.07$; middle achievers' T1 $M = 4.72$, $SD = 1.09$, T2 $M = 4.48$, $SD = 1.20$; low achievers' T1 $M = 4.22$, $SD = 1.14$, T2 $M = 3.95$, $SD = 1.02$), whereby perception of mathematical talent decreased significantly for students initially having the lowest mathematical performance, $F(1, 86) = 5.74$, $p = .02$, but remained similar for students of middle and high mathematics achievement.

*Expected mathematics success.* Boys expected to be more successful in mathematics than did girls, $F(1, 261) = 4.54$, $p = .03$ (boys' T1 $M = 5.27$, $SD = 1.10$, T2 $M = 5.11$, $SD = 1.22$; girls' T1 $M = 5.11$, $SD = .92$, T2 $M = 4.80$, $SD = 1.13$). There was again a main effect of achievement level, in which high achievers had the highest and low achievers the lowest success expectations at both time points, $F(2, 261) = 23.53$, $p < .001$, Bonferroni post hoc tests, modified by an Achievement Level × Time interaction, $F(2, 261) = 3.92$, $p = .02$, accounted for by success expectations decreasing over the year for middle achievers, $F(1, 83) = 6.17$, $p = .02$ (T1 $M = 5.16$, $SD = .97$, T2 $M = 4.79$, $SD = 1.23$) and low achievers, $F(1, 86) = 11.53$, $p = .001$ (T1 $M = 4.75$, $SD = 1.12$, T2 $M = 4.39$, $SD = 1.03$), but remaining stable for high achievers (T1 $M = 5.59$, $SD = .84$; T2 $M = 5.58$, $SD = .94$).

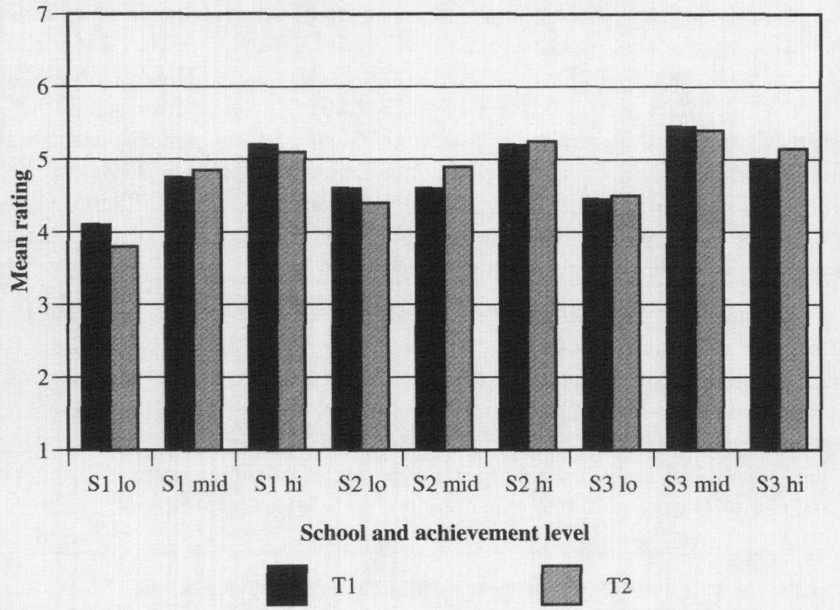
*English talent.* Perceived English talent did not change across Grade 7. School 3 students had the highest and School 1 the lowest English talent perceptions, $F(2, 227) = 3.47$, $p = .04$, modified by a School × Achievement Level interaction, $F(4, 227) = 2.71$, $p = .03$ (see Figure 1). This interaction resulted from low achievers having significantly the lowest reported talent in all but School 3, $F(2, 94) = 23.40$, $p < .001$; $F(2, 110) = 7.57$, $p = .001$, respectively for Schools 1 and 2, where talent perceptions did not differ by level of English achievement (School 1 low achievers' T1 $M = 4.03$, $SD = .93$, T2 $M = 3.78$, $SD = 1.11$; middle achievers' T1 $M = 4.76$, $SD = .89$, T2 $M = 4.86$, $SD = .84$; high achievers' T1 $M = 5.16$, $SD = .94$, T2 $M = 5.09$, $SD = .96$; School 2 low achievers' T1 $M = 4.65$, $SD = 1.02$, T2 $M = 4.36$, $SD = 1.05$; middle achievers' T1 $M = 4.68$, $SD = 1.06$, T2 $M = 4.91$, $SD = .99$; high achievers' T1 $M = 5.18$, $SD = .98$, T2 $M = 5.26$, $SD = .80$; School 3 low achievers' T1 $M = 4.41$, $SD = 1.62$, T2 $M = 4.48$, $SD = 1.45$; middle achievers' T1 $M = 5.44$, $SD = .80$, T2 $M = 5.36$, $SD = .89$; high achievers' T1 $M = 5.00$, $SD = .68$, T2 $M = 5.12$, $SD = .95$).

*Expected English success.* For expectation of success in English, there was a main effect of initial level of achievement, $F(2, 227) = 8.84$, $p < .001$, because low achievers had significantly lower success expectations than the other groups (Bonferroni post hoc tests; low achievers' T1 $M = 4.83$, $SD = .99$, T2 $M = 4.80$, $SD = 1.02$; middle achievers' T1 $M = 5.36$, $SD = .77$, T2 $M = 5.27$, $SD = .81$; high achievers' T1 $M = 5.44$, $SD = .78$, T2 $M = 5.33$, $SD = .98$).

### *Task-Evaluative Attitudes*

*Mathematics difficulty.* Students perceived mathematics as more difficult by the end of the year, $F(1, 261) = 23.9$, $p < .001$ (T1 $M = 3.14$, $SD = 3.14$, T2 $M = 3.46$,

**FIGURE 1. English talent perceptions, by achievement level and school.**



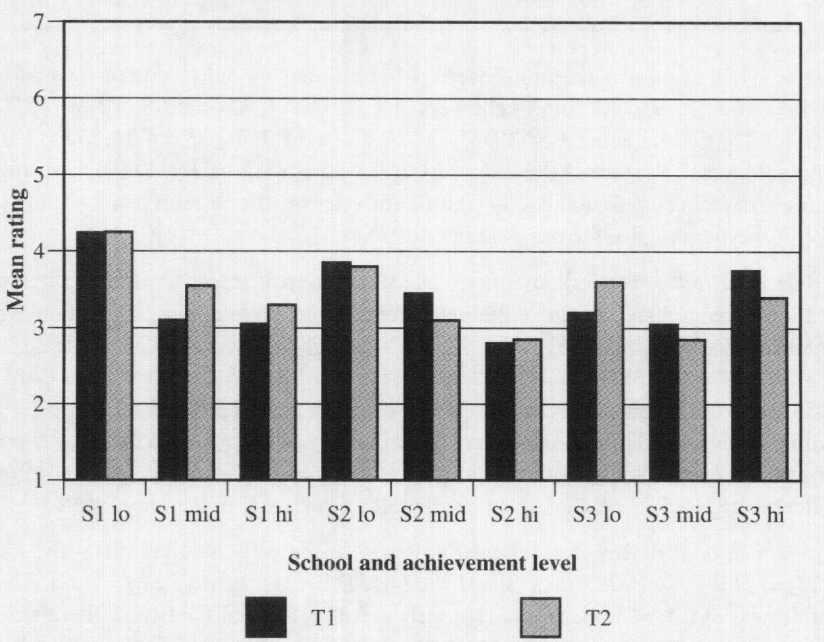

$SD$ = 1.10). Again, perceptions were differentiated by achievement level, $F(2, 261) = 16.55$, $p < .001$ (high achievers' T1 $M$ = 3.14, $SD$ = 1.08, T2 $M$ = 3.46, $SD$ = 1.10; middle achievers' T1 $M$ = 3.74, $SD$ = 1.08, T2 $M$ = 4.21, $SD$ = 1.07; low achievers' T1 $M$ = 4.06, $SD$ = 1.07, T2 $M$ = 4.43, $SD$ = 1.03), with high achievers rating mathematics as significantly less difficult than other groups at both time points (Bonferroni post hoc tests).

*Effort required in math.* Perceptions of the amount of effort required in mathematics remained stable across the year. Perceptions were again differentiated by achievement level, $F(2, 261) = 6.55$, $p = .002$ (high achievers' T1 $M$ = 4.86, $SD$ = 1.32, T2 $M$ = 4.57, $SD$ = 1.33; middle achievers' T1 $M$ = 5.25, $SD$ = 1.29, T2 $M$ = 5.35, $SD$ = 1.38; low achievers' T1 $M$ = 5.40, $SD$ = 1.30, T2 $M$ = 5.32, $SD$ = 1.19), with the lowest and highest achievers differing at both time points (Bonferroni post hoc tests). Low achievers perceived mathematics as requiring the greatest effort, whereas high achievers perceived mathematics as requiring the least effort.

*English difficulty.* Boys perceived English as more difficult than did girls, $F(1, 227) = 17.98$, $p < .001$ (boys' T1 $M$ = 3.64, $SD$ = 1.07; boys' T2 $M$ = 3.64, $SD$ = 1.04; girls' T1 $M$ = 3.05, $SD$ = 1.10; girls' T2 $M$ = 3.09, $SD$ = 1.02). There was a Time × School interaction effect over the year, $F(2, 227) = 3.24$, $p = .04$, whereby School 1 students perceived English as more difficult than other students by T2 (Bonferroni post hoc tests). This resulted from School 1 students exhibiting the greatest change over the year and in a positive direction, whereas changes for the other schools were negative (School 1 T1 $M = 3.46$, $SD = 1.21$, T2 $M = 3.65$, $SD = 1.01$; School 2 T1 $M = 3.33$, $SD = 1.05$, T2 $M = 3.23$, $SD = 1.07$; School 3 T1 $M = 3.29$, $SD = 1.10$, T2 $M = 3.17$, $SD = 1.09$). The change for School 1 did not reach statistical significance, however, $F(1, 96) = 3.08$, $p = .08$. There was also an Achievement Level × School interaction, $F(4, 227) = 3.08$, $p = .02$, whereby low achievers had the highest perceptions of English difficulty (Bonferroni post hoc tests), except in the case of School 3, where difficulty judgments did not differ by level of achievement (see Figure 2).

*Effort required in English.* Students overall perceived English as requiring less effort over the year, but boys rated effort required higher than girls did. School 1 students thought English required the most and School 3 students the least effort, and low achievers thought it required the most and high achievers the least effort. The main effects of time, $F(1, 227) = 3.88$, $p = .05$; gender, $F(1, 227) = 12.41$, $p = .001$; school, $F(2, 227) = 4.34$, $p = .01$; and level of achievement, $F(2, 227) = 9.03$, $p < .001$, were modified by a complex Time × Gender × School × Achieve-

**FIGURE 2. English difficulty perceptions, by achievement level and school.**



ment Level interaction effect, $F(4, 227) = 3.84$, $p = .005$. The small cell sizes after partitioning the sample for this interaction contributed to the only evident significant changes—namely, in School 2, for high-achieving boys, $F(1, 17) = 6.49$, $p = .02$, who reported English as requiring less effort by the end of the year (T1 $M = 4.83$, $SD = 1.11$; T2 $M = 4.11$, $SD = 1.09$), and for middle-achieving girls, $F(1, 14) = 4.92$, $p = .04$, for whom the effect was in the reverse direction (T1 $M = 4.47$, $SD = 1.20$, T2 $M = 4.83$, $SD = 1.11$). Figure 3 shows descriptively the change for each Gender × School × Achievement Level group at each time point. Decreases occurred for all groups over time, except for low-achieving boys and high-achieving girls from School 1, middle-achieving girls from School 2, and middle- and high-achieving boys and low- and high-achieving girls from School 3, all of whom perceived English as requiring greater effort by the end of the year.

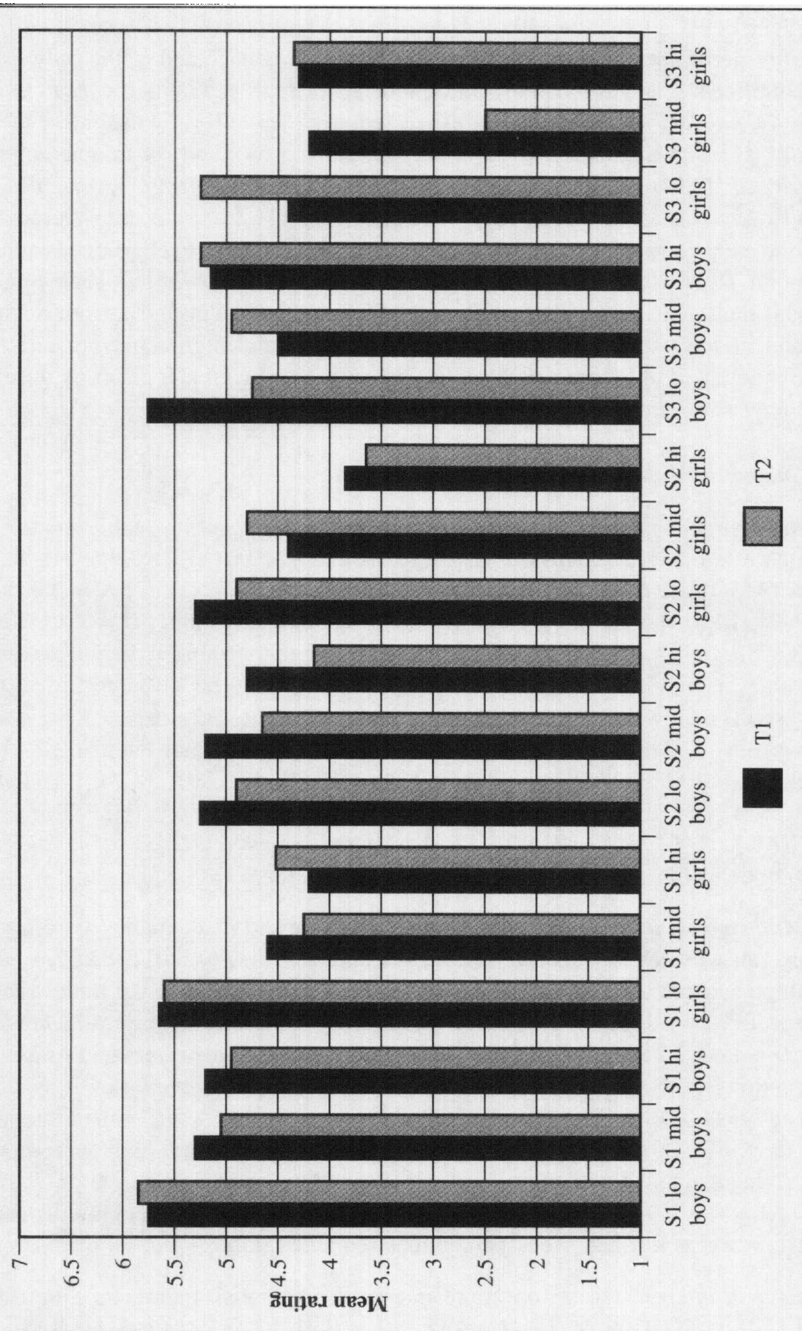
### *Subjective Valuation*

*Mathematics interest.* High achievers were the most and low achievers the least interested in mathematics, $F(2, 261) = 10.33$, $p < .001$ (high achievers T1 $M = 4.73$, $SD = 1.60$, T2 $M = 4.20$, $SD = 1.85$; middle achievers' T1 $M = 3.93$, $SD = 1.64$, T2 $M = 3.46$, $SD = 1.72$; low achievers' T1 $M = 3.63$, $SD = 1.55$, T2 $M = 3.33$, $SD = 1.43$). High achievers differed from other groups, with middle and low achievers having similar levels of mathematics interest (Bonferroni post hoc tests). There was a Time × School interaction effect, $F(2, 261) = 3.14$, $p = .05$, whereby students from Schools 2 and 3 became less interested in mathematics by the end of Grade 7 [School 2 $F(1, 124) = 13.29$, $p < .001$, T1 $M = 4.31$, $SD = 1.56$, T2 $M = 3.89$, $SD = 1.65$; School 3 $F(1, 40) = 10.85$, $p = .002$, T1 $M = 3.90$, $SD = 1.64$, T2 $M = 2.89$, $SD = 1.63$], whereas interest remained stable for School 1 students (T1 $M = 4.06$, $SD = 1.76$; T2 $M = 3.78$, $SD = 1.77$).

*Mathematics utility.* High-achieving students viewed mathematics as being most useful, whereas low achievers saw it as least useful, $F(2, 261) = 5.57$, $p = .004$ (high achievers' T1 $M = 6.29$, $SD = .77$, T2 $M = 6.06$, $SD = 1.02$; middle achievers' T1 $M = 6.12$, $SD = .99$, T2 $M = 5.75$, $SD = 1.23$; low achievers' T1 $M = 5.68$, $SD = 1.43$, T2 $M = 5.67$, $SD = 1.33$). Middle and high achievers had similar perceptions of the utility of mathematics, whereas low achievers saw it as significantly less useful (Bonferroni post hoc tests). A Time × Achievement interaction effect, $F(2, 261) = 4.81$, $p = .009$, resulted from middle and high achievers perceiving mathematics as significantly less useful by the end of the year, $F(1, 107) = 5.59$, $p = .02$; $F(1, 83) = 6.09$, $p = .02$, respectively for high and middle achievers, whereas low achievers' perceptions remained stable.

*English interest.* Girls were more interested in English than boys, $F(1, 227) = 27.84$, $p < .001$ (boys' T1 $M = 4.18$, $SD = 1.40$, T2 $M = 4.13$, $SD = 1.45$; girls'

FIGURE 3. English effort required, by school, achievement level, and gender.



T1 $M = 4.96$, $SD = 1.16$, T2 $M = 4.92$, $SD = 1.26$), and those perceptions were stable over time during Grade 7.

*English utility.* Girls rated the usefulness of English higher than boys, $F(1, 227) = 4.92$, $p = .03$ (boys' T1 $M = 5.94$, $SD = 1.04$; boys' T2 $M = 5.77$, $SD = 1.28$; girls' T1 $M = 6.07$, $SD = .91$; girls' T2 $M = 6.01$, $SD = 1.11$), and those judgments were stable over time during Grade 7.

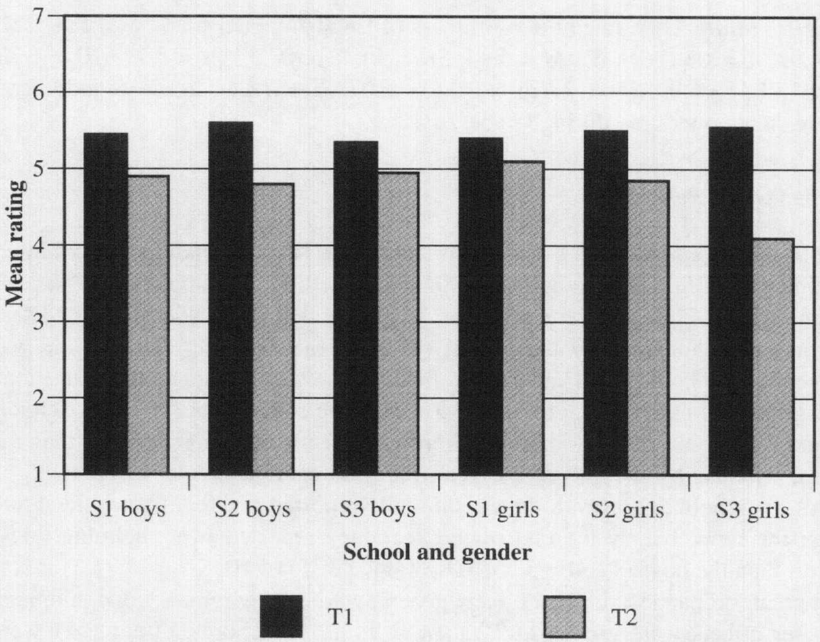
### *Achievement Behaviors*

*Mathematics effort exerted.* There was a complex Time × Gender × School interaction effect, $F(2, 261) = 3.16$, $p = .04$, explained by a combination of factors. Although all changes were negative, implying that the students exerted less effort in mathematics by the end of the year, the extent of that decline was dependent on both school and gender. First, the boys exhibited more change than the girls in all cases except in School 3, where the converse occurred. In Schools 1 and 2, the boys initially reported exerting more effort in mathematics than the girls, whereas by the end of the year, the girls exerted greater effort than the boys. In School 3, however, the girls initially reported greater effort expenditure than the boys, but by the end of the year they reported overwhelmingly less effort than the boys (T1 $M = 5.55$, $SD = 1.44$; T2 $M = 4.10$, $SD = 1.67$). This was the greatest change exhibited by any group by a large margin. Second, although gender effects were greater at T2 than at T1 in all schools, effect sizes were greatest for School 3 (.83), followed by School 2 (.16), and minimal for School 1 (.07). Finally, School 1 students showed the least decline in effort exertion, with the decline for School 2 students not much greater. The change for School 3 boys was between the two, and School 3 girls exhibited by far the greatest change (see Figure 4).

There was also a School × Level of Achievement interaction effect, $F(4, 261) = 3.14$, $p = .02$, accounted for by the differentiation of School 3 effort exertion by achievement level, $F(2, 38) = 4.75$, $p = .01$, whereas the high, middle, and low achievers in the other two schools reported expending similar amounts of effort. In School 3, the high achievers reported expending the most, and the low achievers significantly the least, amount of effort in mathematics (Bonferroni post hoc tests; see Figure 5).

*Mathematics performance.* Low achievers' mathematics performance improved significantly by the end of Grade 7, $F(1, 84) = 179.48$, $p < .001$ (T1 $M = 48.78$, $SD = 2.06$; T2 $M = 52.72$, $SD = 2.53$), whereas middle achievers' performance remained similar (T1 $M = 54.27$, $SD = 1.43$; T2 $M = 54.76$, $SD = 3.12$) and high achievers exhibited a minimal decline, $F(1, 104) = 13.79$, $p < .001$, as evidenced by a Time × Achievement Level interaction, $F(2, 257) =$

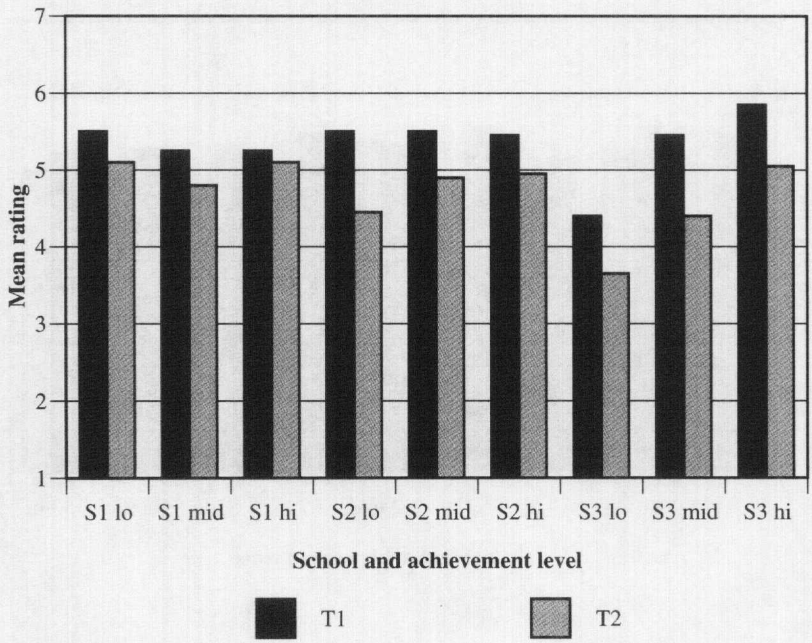
FIGURE 4. Math effort exerted, by gender and school.




41.66, $p < .001$. Performance was differentiated by achievement level, with high achievers scoring highest and low achievers lowest at both time points (Bonferroni post hoc tests), as determined by Rasch-scaled scores for the two standardized achievement tests (ACER, 1984a). There was also an initial mathematics Achievement Level × Gender interaction effect, $F(2, 257) = 3.46$, $p = .03$, explained by the fact that high-achieving girls had marginally lower performance than their male counterparts, $F(1, 104) = 6.66$, $p = .01$ (boys T1 $M = 59.93$, $SD = 3.06$, T2 $M = 59.30$, $SD = 3.69$; girls T1 $M = 59.22$, $SD = 2.47$, T2 $M = 57.52$, $SD = 2.59$).

*English effort exerted.* A main effect of time, $F(1, 227) = 29.10$, $p < .001$, whereby students overall reported exerting less effort, was complicated by a Time × School × Achievement Level interaction, $F(4, 227) = 2.72$, $p = .03$. This was explained by decreases in effort expenditure occurring for low and high achievers, $F(1, 80) = 8.00$, $p = .006$; $F(1, 85) = 4.59$, $p = .04$, respectively, whereas for middle achievers there was a Time × School interaction, whereby all except School 2 students reported a decrease in effort exertion, with School 2 students maintaining similar levels of effort in English (see Figure 6).

FIGURE 5. Math effort exerted, by achievement level and school.




*English performance.* There was a Time × Achievement Level interaction effect in students' English performance as measured by the Rasch-scaled TORCH test results, $F(2, 224) = 32.71$, $p < .001$. Although high achievers maintained the highest and low achievers the lowest performance across the year, low-achieving students exhibited the greatest gains in performance, $F(1, 82) = 140.63$, $p < .001$ (T1 $M = 33.13$, $SD = 10.91$; T2 $M = 47.58$, $SD = 9.67$), followed by middle achievers, $F(1, 71) = 60.81$, $p < .001$ (T1 $M = 48.66$, $SD = 3.27$; T2 $M = 55.19$, $SD = 7.71$). High achievers maintained a similar level of achievement over the year (T1 $M = 63.22$, $SD = 6.56$; T2 $M = 63.75$, $SD = 7.54$).

*Stability of Perceptions Across Grade 7*

Table 6 contains stability coefficients calculated across the whole sample. Because of the overall effects of gender and achievement level on student attitudes and behaviors, however, stability coefficients for boys and girls of high, middle, and low achievement must be examined. These revealed no consistent pattern, showing no greater stability for either gender or for any one achievement

FIGURE 6. English effort exerted, by achievement level and school.

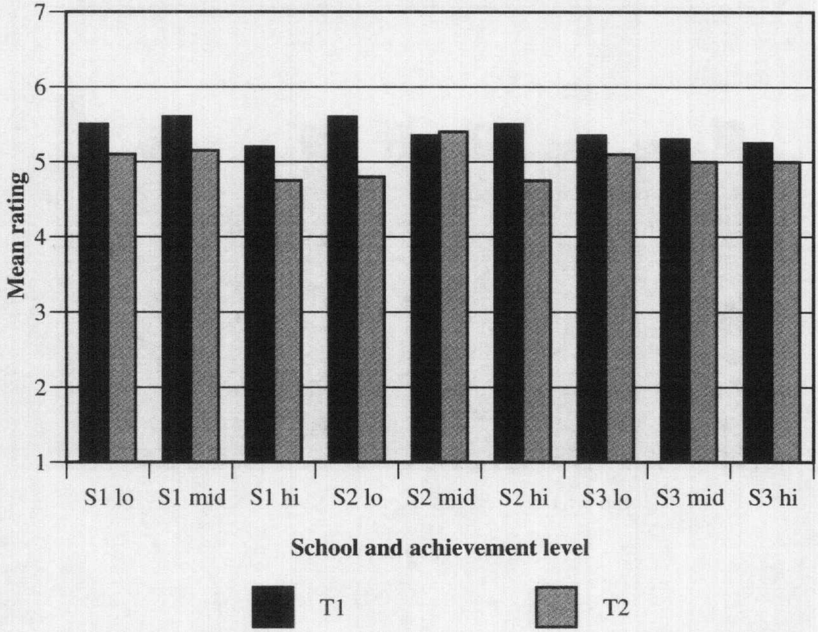



**TABLE 6**
**Overall Stability ($r$) of Attitudes and Achievement Across Grade 7**

| Variable | Mathematics stability | English stability |
|---|---|---|
| Self-evaluations | | |
| Talent | .56 | .50 |
| Expected success | .52 | .51 |
| Task evaluations | | |
| Difficulty | .54 | .54 |
| Effort required | .39 | .57 |
| Subjective valuation | | |
| Interest | .56 | .40 |
| Utility | .39 | .45 |
| Achievement behavior | | |
| Effort exerted | .39 | .41 |
| Performance | .68 | .68 |

*Note.* All correlations are significant at the .001 level.

**TABLE 7**
**Stability of Attitudes and Achievement Across Grade 7, by Gender, Achievement Level, and Academic Domain**

| Variable | Mathematics stability (*r*) | | English stability (*r*) | |
|---|---|---|---|---|
| | Boys | Girls | Boys | Girls |
| *Self-evaluations* | | | | |
| Perceived talent | | | | |
| High achievement | .38** | .49*** | .57*** | .38 |
| Middle achievement | .37* | .35* | .37* | .53** |
| Low achievement | .58*** | .53*** | .34* | .53** |
| Expected success | | | | |
| High achievement | .34** | .41** | .67*** | .55** |
| Middle achievement | .34* | .38* | *ns* | .35* |
| Low achievement | .69*** | .39* | .38** | .55*** |
| *Task evaluations* | | | | |
| Effort required | | | | |
| High achievement | .33* | *ns* | .52*** | .60*** |
| Middle achievement | *ns* | .46** | .38* | .57*** |
| Low achievement | .57*** | .49** | .35* | .62*** |
| Difficulty | | | | |
| High achievement | .60*** | .46*** | .60*** | .43** |
| Middle achievement | .37* | .54*** | .50*** | *ns* |
| Low achievement | .33* | .51*** | .46*** | .38* |
| *Subjective valuation* | | | | |
| Interest | | | | |
| High achievement | .61*** | .54*** | *ns* | .58*** |
| Middle achievement | .37* | .63*** | .43** | *ns* |
| Low achievement | .49*** | .52*** | *ns* | .40* |
| Utility | | | | |
| High achievement | .29* | .52*** | *ns* | .38** |
| Middle achievement | *ns* | .35* | .56*** | .78*** |
| Low achievement | .41** | .45** | .33* | .43* |
| *Achievement behavior* | | | | |
| Effort exerted | | | | |
| High achievement | .30* | .39** | .39* | *ns* |
| Middle achievement | .63*** | .40* | .60*** | *ns* |
| Low achievement | .44** | *ns* | .40** | .49** |
| Performance | | | | |
| High achievement | .53*** | *ns* | *ns* | *ns* |
| Middle achievement | *ns* | *ns* | .56*** | *ns* |
| Low achievement | *ns* | .47** | .48*** | *ns* |

*Denotes significance at the .05 level. **Denotes significance at the .01 level. ***Denotes significance at the .001 level.

group (see Table 7), although two thirds (65/96) of the correlations were less than .50, indicating strong evidence of disruption in perceptions across the year.

### *Interrelations Among Student Self- and Task Evaluations, Subjective Valuation, and Achievement Behaviors*

*Mathematics attitudes and achievement.* Relationships among mathematics attitudes that were strong at T1 were also strong at T2. With the somewhat arbitrary criterion for strength set at $r = .50$, in all but two instances correlations greater than .50 at T1 were still greater than .50 at T2. The consistently high relationships were for perceived talent and expected success ($r = .69$ at T1, $r = .78$ at T2), perceived talent and mathematics difficulty ($r = -.57$ at T1, $r = -.64$ at T2), expected success and mathematics difficulty ($r = -.64$ at T1, $r = -.57$ at T2), and expected success and interest ($r = .59$ at T1, $r = .55$ at T2). The exceptions were for the relationship between mathematics difficulty and interest ($r = -.55$ at T1, $r = -.41$ at T2) and the relationship between perceived talent and mathematics performance ($r = .39$ at T1, $r = .51$ at T2).

**TABLE 8**
**Correlations > .5 Among Math and English Self-Evaluations, Task Evaluations, Subjective Valuation, and Achievement Behaviors During Grade 7**

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| | | | *Math constructs* | | | | | |
| 1. Perceived talent | | | | | | | | |
| 2. Expected success | T1, T2 | | | | | | | |
| 3. Effort required | | | | | | | | |
| 4. Difficulty | T1, T2 | T1, T2 | | | | | | |
| 5. Interest | | T1, T2 | | T1 | | | | |
| 6. Utility | | | | | | | | |
| 7. Effort exerted | | | | | | | | |
| 8. Performance | T2 | | | | | | | |
| | | | *English constructs* | | | | | |
| 1. Perceived talent | | | | | | | | |
| 2. Expected success | T1, T2 | | | | | | | |
| 3. Effort required | | | | | | | | |
| 4. Difficulty | T1, T2 | T1, T2 | T2 | | | | | |
| 5. Interest | | | | T1 | | | | |
| 6. Utility | | | | | | | | |
| 7. Effort exerted | | | | | | | | |
| 8. Performance | | | | | | | | |

*Note.* T1 denotes relationships where $r > .50$ at Time 1; T2 denotes relationships where $r > .50$ at Time 2.

*English attitudes and achievement.* As for mathematics, relationships among English attitudes that were strong at T1 were also strong at T2 ($r > .50$), again in all but two instances. Consistently strong relationships were for perceived talent and expected success ($r = .72$ at T1, $r = .70$ at T2), perceived talent and English difficulty ($r = -.62$ at T1, $r = -.67$ at T2), and expected success and English difficulty ($r = -.58$ at T1, $r = -.60$ at T2). The exceptions were for the relationship of English difficulty and interest ($r = -.57$ at T1, $r = -.39$ at T2) and for the relationship of English difficulty and effort required ($r = .46$ at T1, $r = .59$ at T2). It is interesting to note the similarities of strong relationships across mathematics and English attitudes. Consistently strong relationships were among the same attitudes for both mathematics and English, with the exception of the failure of English difficulty and effort required T2 relationship to meet the strength criterion in mathematics ($r = .41$ at T1, $r = .43$ at T2), the mathematics perceived talent and performance T2 relationship, and the failure of the mathematics expected success and interest T1 and T2 relationship to meet the strength criterion in English ($r = .30$ at T1, $r = .39$ at T2; $r = .47$ at T1, $r = .48$ at T2, respectively, for English talent and performance and English success and interest). Similarities are represented in Table 8, showing strong relationships between mathematics and English attitudes and performance.

## Discussion

As hypothesized, changes in student attitudes over the 1st year of junior high were negative where they occurred and varied in stability across the year. Also as hypothesized, boys had more positive mathematics-related perceptions than girls did and girls had more positive English-related perceptions than boys did. The gender intensification hypothesis had limited support, because despite multivariate tests revealing significant interactions of gender and time in both mathematics and English, univariate tests showed only one specific interaction. Other overall effects identified were for level of achievement, where as one would intuit, high achievers had the most positive and low achievers the least positive attitudes and performance. Finally, there was an overall Achievement Level × Time interaction, whereby changes over Grade 7 were dependent on level of achievement in both mathematics and English.

### *Declining Student Attitudes Across the 1st Year of Junior High*

Overall, student attitudes became less positive over Grade 7 for both mathematics and English. In all cases (except for English difficulty where there was a main effect of time unqualified by any interaction), the extent of change was dependent on student characteristics such as level of achievement, gender, and occasionally school. It is important then to consider changes separately for various subgroups of students.

Self-evaluations for mathematics talent and expected success declined over the year for low achievers' talent perceptions and middle and low achievers' success expectations. This result was at odds with the greater performance gains exhibited by low versus higher achievers. There were no changes for English self-evaluations. In the United States, researchers have found that high-ability students experience the biggest drop in their ability self-perceptions over the transition to junior high (Wigfield et al., 1991), with ability-tracking practices leading to homogeneous reference groups being suggested as a probable explanation. This was not the case with this Australian sample. Despite the fact that the students in the present study were by and large not ability tracked, Achievement Level × Time interactions occurred for ability self-perceptions. Those interaction effects did not result from high-achieving students being most negatively affected over the year but from low-achieving students exhibiting negative changes in their self-evaluations. Because Australian students (unlike their U.S. counterparts) are largely unstreamed and were in a much larger setting than was the case in elementary school, it is not surprising that low achievers would be the most negatively affected in the 1st year of junior high. These students are now comparing themselves with a much larger group of peers, and the number if not the proportion of students outperforming them has increased. This explanation is consistent with Marsh's (1987) *big-fish-little-pond effect*, wherein high-ability students are negatively affected by the transition to academically selective schools because of the greater number of high achievers and consequently more elevated frame of reference for students to evaluate their own achievement by. Here it was low achievers making the transition to a nonselective school, where relative to their level of achievement, there were more students outperforming them than previously. This finding highlights the salience of frame of reference in the development of students' perceptions.

This differential change in mathematics and not in English may be explained by differences in reporting practices in the two subject areas. In mathematics, achievement is typically summarized by a single norm-referenced score twice a year. In English, criterion- rather than norm-referenced marking is typical, and grades are accompanied by interpretative feedback related to assessment criteria. The absence of such interpretative information for mathematics assessment may well lead students to evaluate their mathematics ability on the basis of the performance of others, while basing their English ability perceptions on additional informative feedback. This would explain the wider social reference group leading to decreased mathematics and not English self-evaluations for low achievers. It is deserving of further study to determine reasons that Australian students might display attitudinal adjustment discrepant from that of U.S. students. The lack of tracking is one clear difference, and in the longitudinal study of which these students are a part, I seek to determine if tracking practices introduced in the following year produce such change.

There were no changes in task evaluations over the year, except for students from Schools 2 and 3, who perceived English as less difficult by the end of the year. The stability of School 1 students' perceptions of English difficulty relative to those of other students may be explained by School 1's strong focus on academic achievement and rigor. The School 1 students would be unlikely to have had English presented to them in such a way that they would perceive it as becoming easier. Overall, it is plausible that task evaluations would be more stable than self-evaluations on commencing junior high, because the new environment might be expected to promote increased self- rather than task reflection. In addition, English task evaluations may be more susceptible to change than mathematics task evaluations, in view of the nature of the consolidatory Grade 7 mathematics curriculum.

Mathematics utility judgments declined for middle and high achievers over the year, whereas there were no changes for English subjective valuation. The declines in high achievers' subjective valuation of mathematics may relate in part to the nature of the Grade 7 curriculum. The repetition of previously learned material—to increase consolidation before proceeding to new material in subsequent years—may be demotivating for students who are good at math. That there were no corresponding declines in English valuation lends support to this explanation, because the English curriculum does not have this built-in repetition through Grade 7. The stability of School 1 students' interest in mathematics relative to declines for other students is likely again to relate to the emphasis on academic achievement at that school. The teachers' focus on excellence and student learning is doubtless a motivating factor for these students.

Changes occurred in both mathematics and English achievement behaviors for effort exertion. For mathematics, although all changes were negative, the extent of change was greater for boys (except in School 3, where the reverse occurred) and was strongly contextualized within schools. For effort exerted in English, nearly all students (except middle achievers in School 2) reported exerting less effort by the end of the year. School 1 students exhibited the least negative change for effort exerted in mathematics, consistent with that school's focus on academic excellence, and also had the smallest gender effects. This result likely resulted from School 1's awareness and concern with gender equity, as demonstrated, for example, by their *Gender Equity* professional development day for staff, which I attended during the time these data were collected. School 3 students were at the other extreme, exhibiting the greatest gender effects, with girls suffering an enormous decline over the year. Perhaps School 3's concern with academic disadvantages for boys has produced this unintended negative spin-off for girls.

Student performance as measured by standardized mathematics and English achievement tests increased slightly from the beginning to the end of Grade 7. Although this result seems logical, given that learning should have increased over a year's schooling, it is at odds with research reporting declines in student performance as assessed by school grades posttransition to junior high. The achievement tests used may have been dissimilar in content or structure to school assessments, resulting in an apparent discrepancy with performance on school-based measures. Other studies have in fact found that decreases in school grades are not reflected in lower performance on standardized tests (Kavrell & Petersen, 1984; Schulenberg et al., 1984). Assessment procedures in junior high may be sufficiently different from those in elementary school to produce such discrepancies.

High achievers suffered a slight decline in mathematical performance and showed no change in English performance, whereas both middle- and low-achieving students' performance improved in both academic domains, with the low-achieving group showing the greatest improvement. Regression effects may largely explain these patterns, because the performance measures were not perfectly reliable. Also, in view of the nature of the Grade 7 curriculum, which is largely a consolidation of material learned in elementary school, it seems plausible that low achievers' performance should show the largest gains, as the opportunities to further practice and consolidate their existing knowledge continue across the year.

*Evidence of Gender-Typed Patterns of Perceptions*

I had anticipated that boys would have more positive mathematics-related perceptions than girls, and that the converse would apply to English. There was an overall main effect of gender for English, but not for mathematics. This result is consistent with suggestions that mathematics is no longer perceived as a strongly male domain (Wigfield et al., 1991).

For self-evaluations, boys both had higher perceptions of mathematical talent and expected to be more successful in mathematics than girls. This result is consistent with recent Australian research focusing on perceptions of talent (Bornholt et al., 1994; Watt, 1995) and with previous research on self-concept of mathematics ability (e.g., Eccles, Wigfield, Harold, & Blumenfeld, 1993; Marsh, Byrne, & Shavelson, 1988). Explanations commonly focus on gender-differentiated socialization patterns, reinforcing boys' and challenging girls' abilities in domains perceived as male. There were no gender effects for self-evaluations related to English, consistent with suggestions that boys may generally have greater confidence in their abilities than girls and hence not necessarily lower self-perceptions than girls in domains perceived as female (Eccles et al., 1984). Eccles et al. (1993) found no gender differences in reading self-concept, supporting the finding of no gender differences in overall English self-evaluations in the present study.

Task evaluations for English difficulty favored girls, with boys finding English more difficult. Although there was a main effect of gender favoring girls for effort required in English, this was qualified by a complex interaction. There were no gender effects for mathematics task evaluations. It is interesting to compare the students' nongendered self-evaluations with their gendered task evaluations in English and their gendered self-evaluations with their nongendered task evaluations in math. Could it be that the recent emphasis on mathematics as not being a male domain has led to similar perceptions about mathematics tasks for boys and girls, but because boys generally have more confidence in their abilities, their self-evaluations in relation to mathematics still outranks girls' self-evaluations? Conversely, if English is perceived as a female domain, girls may have more positive perceptions about English tasks, but again because of boys' generally greater confidence in their abilities, those positive perceptions may not have translated to girls having more positive self-evaluations than boys. Similarly, the result that girls had more positive subjective valuation in English than boys—they found it more interesting and judged it to have greater utility—may well be explained by English being seen as a female domain. The finding of no gender differences for mathematics subjective valuation supports the view of mathematics as no longer being perceived as a male domain.

The only gendered achievement behavior occurred among the high achievers in mathematics, with high-achieving girls negligibly outperformed by their male counterparts. This result is consistent with the body of research documenting gendered performance differences among high-achieving mathematics students (e.g., Benbow & Stanley, 1980; Feingold, 1993). There were no gender differences in English achievement as measured by reading comprehension tests, in contrast to research showing superior verbal ability for girls (e.g., Halpern, 1986; Skaalvik & Rankin, 1994). The difference in measures for English achievement in the present study may well be the reason for this, because superior female verbal ability may not translate into superior comprehension skills. Alternatively (as Hyde and Linn argued in their 1988 meta-analysis of verbal ability), gendered effect sizes in verbal ability may be so small as to be considered nonexistent. Hyde and Linn divided verbal ability into seven components, one of which was reading comprehension and therefore relevant here, and the effect size favoring girls was $d = .09$. That small effect size is consistent with the nonsignificant gender difference found here.

There was some limited evidence of gender intensification in both mathematics and English overall, with multivariate Gender × Time effects. Specifically, gender intensification occurred for mathematics effort exertion whereby boys' effort exertion changed from being higher than that of girls to being significantly lower. Conversely, girls' effort exertion increased from being lower than that of boys to being significantly higher (except in School 3 where the reverse occurred as discussed earlier). Otherwise, girls did not become more negative than boys in their attitudes toward mathematics, supporting the findings of Eccles, Wigfield, and colleagues (Eccles et al., 1989; Wigfield et al., 1991). As suggested by Eccles, Wigfield, and colleagues, mathematics may no longer be perceived as a male domain, accounting for the scant evidence of gender intensification for mathematics.

### *Attitude Differentiation by Level of Achievement*

For both mathematics and English overall, attitudes were differentiated by level of achievement. Not surprisingly, for all mathematics constructs except effort exerted, student attitudes and performance differed according to achievement level, with high achievers having the most favorable and low achievers having the least favorable attitudes toward math. The equal effort expenditure regardless of achievement level may be attributable to the perceived social importance of mathematics, such that all students strive for success in this domain. Surprisingly, however, that was not the case for English. The only English constructs differentiated by achievement were expectation of success, difficulty, and performance. For all other English attitudes, the students did not differ by achievement level. This may tie in with the earlier argument about differences between mathematics and English assessment and reporting practices. The normative reporting used for mathematics explicitly encourages students to evaluate their achievement in comparison with the achievement of their peers. In contrast, the criterion-referenced interpretative feedback given for English focuses students on their own strengths and weaknesses, rather than on their measured performance as compared with others. This difference in focus may be expected to lead to differentiated evaluations on the basis of demonstrated achievement in mathematics, but not in English.

### *Conclusion*

The major contribution of this study lies in its examination of the impact of time in Grade 7 and student characteristics on a range of mathematics and English-related attitudes and performance. In particular, task-evaluative perceptions highlighted in the expectancy value model of Eccles, Wigfield, and colleagues are addressed, along with more frequently researched self-evaluative and value judgments. I also extended the model by including achievement behaviors, providing a behavioral component from which to more fully understand attitudinal change on commencement of junior high. Changes were negative in all instances except performance, reflecting previous research examining the impact of beginning junior high. Most previous research has been conducted in the United States, so it is interesting that the negative changes in that context are reflected with Australian students. It would be worthwhile to conduct a similar study in a quite different educational context to investigate just how robust those findings are across different contexts.

Previous studies have not addressed the range of variables that this study has, involving task evaluations and achievement behaviors in addition to the previously researched self-evaluations and subjective valuation. By including those additional dimensions of students' mathematics-related perceptions in the present study, I was able to more fully understand the impact of beginning junior high on student attitudes. Moreover, differential changes in perceptions for students of varying levels of achievement could be identified across that range of perceptions, giving strong support to the social comparison processes suggested by Wigfield, Eccles, and colleagues (1991). Finally, the effects of Grade 7 experiences are captured through the design. The students within each school were in similar school settings and in the same grade level for the duration of the study. Hence, there was no confounding of changes in grade level with changes experienced through commencing junior high. That has been an acknowledged weakness of research on the impact of transition to junior high school (e.g., Anderman & Midgley, 1997; Harter et al., 1992). In some studies, researchers have circumvented this problem by obtaining beginning- and end-of-year measures in both the final elementary and initial junior high years (e.g., Eccles et al., 1989; Wigfield et al., 1991), but those studies typically have addressed a limited number of perceptions.

The remarkably robust interrelations between self-evaluations, task evaluations, and subjective valuation, in both mathematics and English, have several important implications. That despite substantial instability within student attitudes, relations between certain attitudes were consistently strong prompts us to ask about the organizational structure of student beliefs and the potential causal ordering among them. The possibility of transference between attitudes has strong implications for interventions targeting specific attitudes.

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