DOCUMENT RESUME

ED 422 450 UD 032 510

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TITLE	The Impact of the First Year of High School on Student Self-, Task-, and Value-Perceptions and Judgements about Significant Others in Mathematics and English.
PUB DATE	1998-07-00
NOTE	22p.; Paper presented at the Biennial Meeting of the International Society for the Study of Behavioral Development (15th, Bern, Switzerland, July 1-4, 1998).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Academic Achievement; *English Instruction; Foreign Countries; *High School Freshmen; High Schools; *Mathematics Education; *Self Concept; Sex Differences; Significant Others; *Student Attitudes; Urban Schools; Urban Youth
IDENTIFIERS	*Australia (New South Wales)

ABSTRACT

Changes in student perceptions over the first year of high school and the interrelations of student and student-reported mother, father, and teacher perceptions form the basis of this study. Self- and task-perceptions as well as utility judgments are measured in two subject domains, mathematics and English, since the transition to high school has been found to impact negatively on students' self-concepts in both these domains. Participants (N=365) are from 3 coeducational schools in metropolitan Sydney (Australia) matched for socioeconomic status. Findings of declines in student perceptions across the seventh grade are discussed in terms of domain specificity, as well as within a developmental mismatch framework for contextual school factors and mediating parent and teacher influences as they relate to changes in student perceptions and beliefs over the course of the first year at high school. Major implications derived relate to the contextualization of student perceptions within each subject domain and explanations for the stability or instability of varying perceptions over time, according to student gender and level of achievement, and their relation to reported perceptions of significant others. (Contains 3 tables, 7 figures, and 42 references.) (Author/SLD)

Paper presented at the XVth Biennial Meeting of the ISSBD,
University of Berne, Switzerland, July 1-4 1998.

The Impact of the First Year of High School on Student Self-, Task- and Value- Perceptions and Judgements about Significant Others in Mathematics and English

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Changes in student perceptions over the first year of high school and the interrelations of student and student-reported mother, father and teacher perceptions form the basis of this study. Self- and task-perceptions as well as utility judgements are measured in two subject domains, mathematics and English, since the transition to high school has been found to impact negatively on students' self-concept in both these domains. Participants (N=365) are from three coeducational Government schools in metropolitan Sydney, matched for socioeconomic status. Findings of declines in student perceptions across the seventh grade are discussed in terms of domain specificity, as well as within a developmental mismatch framework for contextual school factors and mediating parent and teacher influences as they relate to changes in student perceptions and beliefs over the course of the first year at high school. Major implications derived relate to the contextualisation of student perceptions within each subject domain and explanations for the stability or instability of varying perceptions over time, according to student gender and level of achievement, and their relation to reported perceptions of significant others.

Acknowledgements.
I am grateful for the guidance of my PhD main supervisor, Dr Ray Debus from The University of Sydney, and also to Prof Jacquelynne Eccles from The University of Michigan in the preparation of this manuscript. My methodological supervisor, Dr Mike Bailey, formerly of The University of Sydney also contributed to decisions about analyses employed.

There is a growing body of research into the effects on students of the transition from primary to secondary school. These studies have addressed a range of student-level variables including self-esteem (e.g.: Seidman, Allen, Aber, Mitchell, & Feinman, 1994; Simmons, Blyth, Van Cleave, & Bush, 1979), self-concept of ability (e.g.: Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991), perceptions of competence (e.g.: Harter, Whitesell, & Kowalski, 1992), liking for school subjects (e.g.: Wigfield *et al.*, 1991), and school grades (e.g.: Anderman & Midgley, 1997; Kavrell & Petersen, 1984). The majority of these studies have found the overall impact of transition to secondary school to be negative in nature, leading to decreased self-esteem (Seidman *et al.*, 1994), lower self-concept of ability in specific 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 lowered school grades (Anderman & Midgley, 1997).

Some theorists have suggested that such negative changes are inevitable due to physiological and psychological pubertal changes occurring at this time (e.g.: Blyth, Simmons, & Carlton-Ford, 1983; Hill & Lynch, 1983; Rosenberg, 1986; Simmons *et al.*, 1979). This 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 post-transition (Eccles & Midgley, 1989; 1990). These analyses have been interpreted in the form of a model of person-environment fit (Eccles & Midgley, 1989; 1990), in which it is suggested that lack of fit between the secondary school environment and the needs of young adolescents impacts negatively on student attitudes. The present study is located within this theoretical perspective and seeks contextual explanations for negative changes in student perceptions where these occur.

Domain Specificity

The importance of assessing transitional impact on separate school subject domains has been recognised since 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 these general measures mask domain-specific changes over this time period.

The present study examines the effects of the first year at high school on students' perceptions in relation to English and mathematics, since these are domains in which transition has been found to impact negatively on students' self-concept (e.g.: Wigfield *et al.*, 1991). Mathematics is also a domain which is regarded as being of substantive importance, since students' mathematics-related attitudes impact strongly on school mathematics course selections (e.g.: Eccles & Jacobs, 1986; Watt & Bornholt, 1994) and mathematical career relatedness (Watt, 1995), participation in both of which is considered socially important. It is a focus of the present study also to identify patterns which are domain specific, in that they hold for English but not mathematics and vice versa.

Important Subgroups

It cannot be assumed that all students will be affected similarly by the transition to high school. Gender and ability have been identified as two salient dimensions along which to examine group differences (Anderman & Midgley, 1997). It has been found for instance, that boys on average 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). It has been suggested that such gender differences may be artifactual effects produced by a response bias (Wigfield *et al.*, 1991), wherein boys tend to be more self-congratulatory than girls on self-report measures (Maehr & Nicholls, 1980; Bornholt, Goodnow, & Cooney, 1994). An earlier study by the author (Watt, 1996) suggests this may not be the case in mathematics however, since boys scored higher than girls on both their ipsative judgements 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, this notion is inconsistent with girls rating their English talent higher than boys (e.g. Wigfield *et al.*, 1991). There is some research to suggest gender intensification occurs (Hill & Lynch, 1983), wherein gender-role activities become more important to young adolescents as they try to conform more to behavioural gender-role stereotypes (Eccles, 1987; Hill & Lynch, 1983). Thus, girls become more negative about male-stereotyped domains, for example mathematics, while boys become more positive, and conversely for female-stereotyped domains such as English. Not all research has found this to be the case (e.g.: Wigfield *et al.*, 1991). For mathematics, discrepant findings have been explained by suggesting 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 high-school setting. One study found high-mathematics-performing students' self-concept to be the most affected by the transition, with lower achieving students' self-concept actually increasing post-transition (Wigfield *et al.*, 1991). This study found no corresponding interaction effects for English, however (Wigfield *et al.*, 1991). It seems likely that the streaming or ability-grouping that occurs in high-school leads to homogeneous reference comparison groups, such that high-achieving students no longer outperform the majority of their classmates, and conversely low-performing students no longer perform relatively poorly. This may result in students' self-perceptions becoming more homogeneous, as high-ability students' perceptions become less positive, and low-ability students' less negative (Wigfield *et al.*, 1991). In Australian schools, where students are rarely streamed at the outset of secondary school, it is unlikely that these American findings will be replicated.

<u>Student Beliefs</u>

Most studies of domain-specific student beliefs have examined perceptions of ability for different activities (e.g.: Cauce, 1987; Harter, 1982), with few studies including subject liking or importance as value-indicators in addition to perceived ability (Wigfield *et al.*, 1991; Eccles *et al.*, 1989). The present study examines self-perceptions (perceived talent, expected success and effort exerted), task-perceptions (perceived difficulty and effort required), affect (liking or interest) and utility-value (perceived usefulness) in relation to English and mathematics, to see whether the first year of high school, gender, level of achievement and/or any interactions among these produce differential changes for various student perceptions, and whether these are context bound in terms of domain specificity.

<u>Influences of Significant Others</u>

Past studies have found parents exert strong effects on their child's perceptions (e.g.: Eccles, Jacobs, & Harold, 1990; Jacobs & Eccles, 1992). Studies in the area of parental influence have typically focused on the mother. In studies including data concerning both mothers and fathers, there is little indication that children perceive their mothers as more influential than their fathers (Grolnick, Ryan, & Deci, 1991). Following recent calls for increased research on fathers' roles in adolescent development (Phares & Compas, 1992), and research suggesting the influence of fathers on motivational development may be complex and merits further study (Grolnick, Ryan, & Deci, 1991), this paper explores relations between both student-reported maternal and paternal perceptions and student perceptions.

The majority of studies have obtained parent reports of parent perceptions (e.g.: Eccles, Adler, & Kaczala, 1982). It has been suggested, however, that individuals filter their experience through a net of expectations and attributions such that similar phenomena are reported differently by different people (Sameroff & Feil, 1985). This seems to imply that a child's understanding of parent perceptions may differ from parent-reported perceptions, and it has indeed been found that especially before adolescence, children tend to project their own perceptions onto their parents (Goodnow, 1988).

The impact of child-reports of parent perceptions on the child's own perceptions has been largely unexplored (Grolnick, Ryan, & Deci, 1991), even though some theorists (e.g.: Blyth, 1982; Bronfenbrenner, 1977) have suggested children's phenomenal view of their socialising environment is of considerable importance. Goodnow (1988) goes so far as to say the critical feature may not even be the 'actual' parent variables, but rather the child's interpretation of them. Processes relevant to these effects are now presented, providing a basis for later interpretation of findings. In using child-reported parent data there are a number of interpretative processes that may occur. First, it is possible that the child 'accurately' interprets parents' views, reporting these as the parents themselves would. Alternatively, the child may filter parental behaviours and communications through a net of perceptions and experiences such that his/her interpretation differs from the parents' actual views. However perceived by the child, these parental perceptions may affect the child either through simple awareness, or they may form pressures and expectations influencing the child. It is also possible that the child may project his/her perceptions onto the parents, ascribing his/her own perceptions to the parents. Parental perceptions also depend in part on access that students provide to information. Some information such as school reports provide evaluative information on which parents base their views, but may not provide other information of which students act as gatekeepers. As a result, it is possible that there may be a time delay in changes in parents' perceptions, as they receive information from the child. Simultaneous collection of parent and child-reported parent data on successive occasions could tease out directionality of influence and processes of mediation.

Many studies have assumed the directionality of influence between parent and child perceptions to be unidirectional, from the parent to the child. It has been suggested, however, that bidirectional approaches are most appropriate (e.g.: Bell, 1968). Research testing the reciprocal nature of parent-child influences over time found strength of influence to be greater for parent to child than for child to parent relations over time, in a study investigating maternal influences on girls' perceptions of mathematical ability (Eccles, Jacobs, Harold, Yoon, Arbreton, & Friedman-Doan, 1993). There is good reason then to be concerned with parent perceptions, since these do impact on child perceptions. The present study, which is concerned with relations between parent and child perceptions, uses student-reported data only, since there is a sizable body of data demonstrating that children's views on several issues are better predicted by their perceptions of parent positions than by the positions parents report for themselves (Goodnow, 1988).

Teachers are of course another obvious group to include in a study examining students' high-school mathematics- and English-related perceptions. There have been a large number of studies examining the impact of teacher judgements on student perceptions and behaviour, some in the form of self-fulfilling prophecies (e.g.: Jussim & Eccles, 1992), or examining effects of teacher-student interactions (e.g.: Eccles, Kaczala, & Meece, 1982b), establishing that teacher attitudes exert strong influences on students. As for mothers and fathers, student-report data are obtained for teacher perceptions.

The Present Study

The present study examines changes in students' English- and mathematics-related perceptions over the course of the first year at high school. Although this is not strictly a test of the impact of the transition to high school, since students are assessed at the very beginning (i.e. post-transition) and the very end of Year 7, the study does capture changes that occur over this year. There is a major advantage to this design, in that the problem of confounding change in school setting with change in grade level is circumvented (Anderman & Midgley, 1997; Harter, Whitesell, & Kowalski, 1992). Also, since it has been suggested that motivational perceptions may stabilise soon after the beginning of the new school year (Deci, Schwartz, Sheinman, & Ryan, 1981), changes within the first year of high school warrant investigation. The studies by Eccles, Wigfield and colleagues (Eccles *et al.*, 1989; Wigfield *et al.*, 1991) do this, having two waves of data collection in each of grades 6 and 7, but investigate only perceived competence and liking in relation to mathematics and English.

Frequently researched perceptions of competence are included in this study, but assessed by more differentiated perceptions of perceived talent, expected success and perceived difficulty. More recently, research addressing liking as a value indicator is addressed in the form of affect, items of which include liking, enjoyment and interest. Other measures in this study are effort exerted, effort required and utility judgements. It was expected that changes would overall be negative where they occur, that boys would have more positive mathematics-related and girls more positive English-related perceptions, and that high-achieving students would have more positive perceptions than lower achieving students. An achievement x time interaction effect was not expected in the unstreamed Australian context, but a gender x time interaction effect was predicted, which would indicate that girls are more negatively affected than boys in relation to mathematics, and conversely for English. Relations between changes in student perceptions and perceived changes in the attitudes of significant others are also foci of the study, since strong relations may imply causal change-producing mechanisms. Caution in interpretation of these relations is necessary, since there may be a time lag between students and significant others having access to student information.

METHOD

Design

The study aimed to investigate the nature and extent of changes in student self-, task-, affect and utility-related perceptions in relation to high school English and mathematics. 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. Relations between changes in student perceptions and reported changes in the perceptions of mothers, fathers and teachers were also of interest.

Participants

Participants were Year 7 students (N=365) from three government coeducational schools in an upper-middle class metropolitan area of Sydney of comparable socioeconomic status (ABS Index for Education and Occupation, 1995). Distribution of students by school and gender is shown in Table 1. None of these schools streamed students at the beginning of the year, although School 3 streamed their Year 7 students halfway through the year (after the mid-year examinations) into each of a top, middle and bottom class for each subject setting.

Materials

Questionnaires assessed student perceptions in relation to English and mathematics at high school. Measures were adapted from those used by Eccles and colleagues for student perceptions of self-perceptions (perceived talent, expected success, effort exerted), task-perceptions (perceived difficulty, effort required), affect (interest) and utility judgements (perceived usefulness) for both mathematics and English. These items were measured on 7-point Likert-type scales anchored at both ends, and formed part of a much larger study investigating a broader range of student perceptions and related influences in relation to both mathematics and English, which are not the focus of the present study. Students also completed standardised mathematics and English tests at both time points, to obtain measures of student performance.

Table 1
Distribution of Students by School and Gender

	School 1	School 2	School 3
Boys (n=210)	74	103	33
Girls (n=155)	67	61	27
Totals (N=365)	141	164	60

Table 2
Construct Validity of Mathematics and English Variables[a]

		mathematics	English
Perceived Talent	T1 T2	R=.930,[b] $\chi^2_{(3)}$=.06[c] p=.997[d] R=.917, $\chi^2_{(3)}$=.01 p=1.000	R=.924, $\chi^2_{(3)}$=.07 p=.995 R=.909, $\chi^2_{(3)}$=.02 p=1.000
Expected Success	T1 T2	R=.913, $\chi^2_{(3)}$=.02 p=1.000 R=.921, $\chi^2_{(3)}$=.06 p=.996	R=.901, $\chi^2_{(3)}$=.03 p=.999 R=.900, $\chi^2_{(3)}$=.03 p=.998
Perceived Difficulty	T1 T2	R=.958, $\chi^2_{(3)}$=.02 p=1.000 R=.892, $\chi^2_{(3)}$=.04 p=.998	R=.918, $\chi^2_{(3)}$=.02 p=.999 R=.899, $\chi^2_{(3)}$=.03 p=.999
Interest	T1 T2	R=.959, $\chi^2_{(3)}$=.02 p=.999 R=.951, $\chi^2_{(3)}$=.28 p=.965	R=.940, $\chi^2_{(3)}$=.09 p=.994 R=.969, $\chi^2_{(3)}$=.11 p=.991
Perceived Usefulness	T1 T2	R=.932, $\chi^2_{(3)}$=.05 p=.997 R=.929, $\chi^2_{(3)}$=.07 p=.996	R=.890, $\chi^2_{(3)}$=.00 p=1.000 R=.936, $\chi^2_{(3)}$=.07 p=.996

<u>Student Perceptions</u>. Confirmatory factor analyses using LISREL established the discriminant validity of variables for English and mathematics, and eliminated items with high cross-loadings. One-factor congeneric models were then used to determine the relative contributions of items to each construct, and create composite variables for each.[1] The result is high construct validity for each variable in both administrations (T1 and T2) as shown in Table 2.

<u>Student-Reported Mother, Father and Teacher Perceptions</u>. For mothers, fathers and teachers, perceptions parallel to student perceptions were measured, excepting effort exerted and utility judgements, which were thought too complex to ask about. Measures were contemporaneous with student perception measures, in relation to both mathematics and English, and at both time points.

[a] <u>Note.</u> These statistics could not be computed for effort exerted and effort required, since one item had to be discarded from the former due to its large associated error of measurement resulting in a 2-item scale, and the latter consisted of only 2 items to begin with.

[b] <u>Note.</u> 'R' indicates the coefficient of determination for the x-variables, equivalent in this case to the true scale reliability.

[c] <u>Note.</u> The chi-square to degrees of freedom ratio provides a measure of the goodness of fit of the model. All ratios in this case are very small, indicating excellent fit.

[d] <u>Note.</u> The p-value denotes the probability of departure of data from the fitted model. All p-values here are well over .95, indicating excellent fit of the data to the model.

[1] The items for each of mathematics and English are exactly comparable, consisting of the same wording except the replacement of the word 'English' with 'mathematics'. A criterion in scale refinement was that latent constructs for both English and mathematics should comprise the same items to enable direct comparison of these constructs across academic domains.

Each perception was measured by a single item, chosen from the student scales as substantively representing the construct under investigation (see Table 3).

Table 3
Items Measuring Student Perceptions of Significant Others' Views [b]

Perception:	Item:	Scale Anchors:
talent	How talented does your *** think you are at maths?	1 (not at all) - 7 (very talented)
expected success	How well does your *** expect you to do at maths in high school?	1 (not at all well) - 7 (very well)
task difficulty	How difficult does your *** think you find maths?	1 (not at all) - 7 (very difficult)
effort required	How much effort does your *** think you need to put into maths in order to do well?	1 (none) - 7 (a lot)
interest	How interested does your *** think you are at maths?	1 (not at all) - 7 (very interested)

[b] Note. *** represents mother/father/teacher, since students were asked the same question in relation to each of these people.

Level of Achievement. Students' academic performance in mathematics was measured on standardised Progressive Achievement Tests (ACER, 1984a) at both the beginning and end of the school year. Performance on the February test was used as a measure of students' initial level of mathematical achievement. Alternate items were chosen so that the test could be administered along with the questionnaire in a 60-minute lesson. Internal consistency for the February test (PAT 2A) was Cronbach alpha .83, indicating that the mathematics test was reliable. Test performances were converted to Rasch scaled scores normed on a representative Australian sample[2] (ACER, 1984). Students were allocated to one of three achievement-level groups on the basis of these scores, being classified as either high-, mid- or low-achievers according to whether their scores fell in the top, middle or bottom third of achievement scores.

Students' English performance was also assessed at both the beginning and end of the year using the Tests of Reading Comprehension (TORCH) developed by ACER (Mossenson, Hill, & Masters, 1987). The February task 'A Horse of Her Own' was used as a measure of initial English achievement, with scores again converted to Rasch scaled scores normed on students in Years 3 to 10 in Government schools in Western Australia in 1984 (Mossenson, Hill, & Masters, 1995). Students were again divided into three groups based on whether their performance fell in the top, middle or bottom third of scores.

Procedure

Students completed questionnaires asking about their perceptions in relation to English and mathematics at high school, and also completed standardised English and mathematics tests. This procedure was carried out at the beginning of the school year (February 1996) and repeated at the end of the school year (December 1996). This circumvented the problem identified by Harter and colleagues of confounding change in school setting with change in grade level (Harter, Whitesell, & Kowalski, 1992).

[2] The Rasch-scaled PATMATHS Scale scores express student attainment on any of the tests in the series on an achievement scale which relates attainment to the difficulties of the items using the same units and the same scale for both measures (ACER, 1984b, p. 7).

The study was conducted with informed student and parent consent, and the approval of the School Principals and formal University and Departmental ethical bodies. Administration was in the regular classroom to maximise ecological validity. The researcher was present at each administration to clarify or answer questions where necessary. Administration at each time point was spread over two days, the first for mathematics tasks and second for English, in order not to overburden respondents.

Analyses

After forming valid and reliable composite variables for each of the student perceptions, repeated-measures ANOVAs with time as the within-subject and gender and performance level as between-subjects factors enabled detection of change in student perceptions and performance over time, as well as gender and achievement-level effects and interaction effects of time, gender and level of achievement. Relatedness of student perceptions and reported mother, father and teacher perceptions was established using Pearson correlation at both time points. The extent to which changes in student perceptions were related to changes in student-reported parent and teacher perceptions was measured by Pearson correlations of raw discrepancy scores formed by subtracting time 1 from time 2 data.

RESULTS

Results are presented in six main sections. The first four present data on changes across the year in students' self-, task-, affect and utility related perceptions for both mathematics and English, with respect to students of different achievement levels and gender. The fifth section reports domain differences between students' mathematics and English related perceptions, while the final section examines relations between student and student-reported parent and teacher perceptions.

Student Self-Perceptions

Mathematics. Students' perceptions of talent in relation to mathematics were higher for boys than girls ($F(1,286)=6.58$ $p=.011$, boys' T1 mean=4.75 s.d.=1.23, boys' T2 mean=4.63 s.d.=1.31, girls' T1 mean=4.45 s.d.=1.02, girls' T2 mean=4.43 s.d.=1.19). There was also an interaction effect of achievement-level and time ($F(2,286)=5.58$ $p=.004$), whereby perception of mathematical talent decreased significantly for students initially having the lowest mathematical performance ($F(1,76)=8.19$ $p=.005$, T1 mean=4.13 s.d.=1.20, T2 mean=3.82 s.d.=1.03), but remained similar for students having middle ($F(1,102)=2.17$ $p=.14$) and high ($F(1,108)=2.96$ $p=.09$) mathematical performance at the beginning of the year (see Figure 1).

Similarly, for students of low mathematical achievement, expectation of success in mathematics decreased significantly across the year ($F(1,77)=14.58$ $p<.001$, T1 mean=4.77 s.d.=1.20, T2 mean=4.34 s.d.=1.05). This was also the case for students of middling achievement ($F(1,102)=6.03$ $p=.016$, T1 mean=5.18 s.d.=0.91, T2 mean=4.90 s.d.=1.16), but expected success remained similar across the year for high-achieving students ($F(1,106)=0.05$ $p=.82$). There was a gender by achievement interaction effect on expected mathematical success ($F(2,285)=3.78$ $p=.024$), where among students of high achievement only, boys had consistently higher expectations for success ($F(1,106)=10.07$ $p=.002$, boys' T1 mean=5.70 s.d.=0.90, boys' T2 mean=5.81 s.d.=0.88, girls' T1 mean=5.38 s.d.=0.74, girls' T2 mean=5.31 s.d.=0.83; see Figure 2).

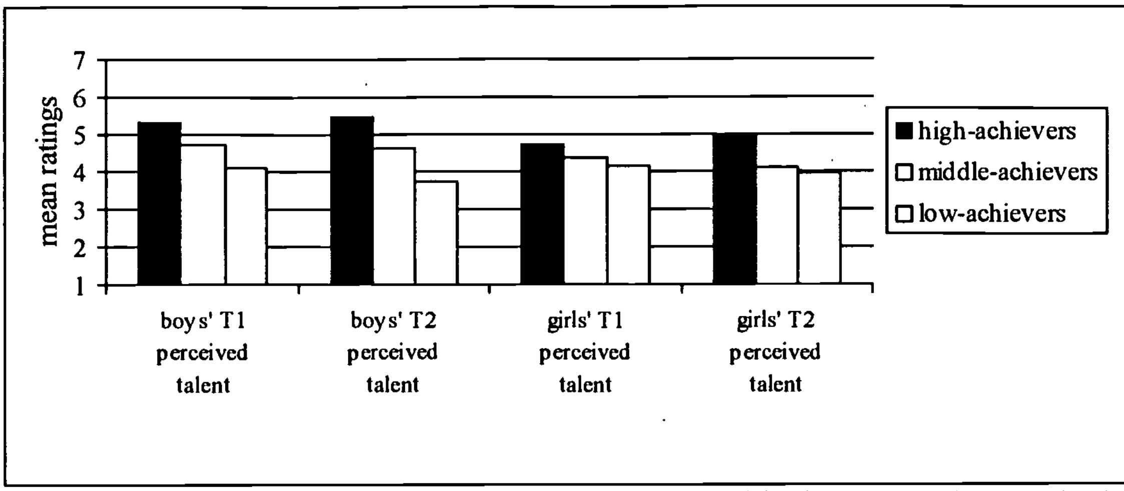

Figure 1. Perceived mathematical talent at T1 and T2 for boys and girls of different achievement levels.

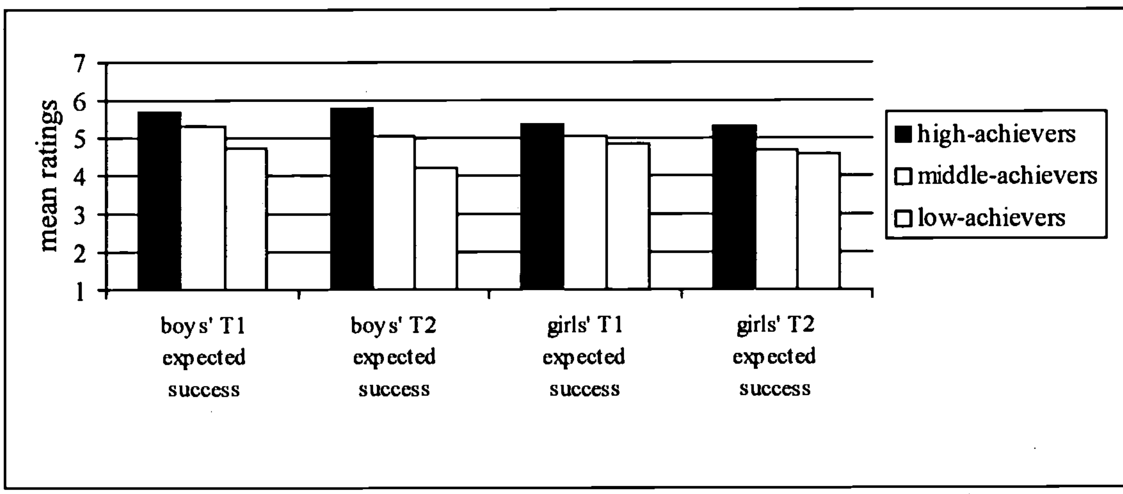

Figure 2. Expected mathematical success at T1 and T2 for boys and girls of different achievement levels.

Students' perceived effort exerted in mathematics decreased significantly over the year ($F(1,296)=54.98$ $p<.001$, T1 mean=5.40 s.d.=10.9, T2 mean=4.79 s.d.=1.40).

English. In relation to English, perception of talent was differentiated by achievement level ($F(2,275)=21.40$ $p<.001$), with initially high performers having consistently the highest (T1 mean=4.99, T2 mean=4.98) and low performers the lowest perceptions (T1 mean=4.20, T2 mean=4.11), with middle achievers falling in between (T1 mean=4.60, T2 mean=4.75).

For expectation of success in English, there was a main effect of initial level of achievement ($F(2,284)=16.32$ $p<.001$), with low performing students having the lowest (T1 mean=4.81, T2 mean=4.65) and high performing students the highest expectations (T1 mean=5.52, T2 mean=5.30) at the end of the year, with middle achievers falling in between (T1 mean=5.23, T2 mean=5.21). There was also an interaction effect of gender by time ($F(1,284)=4.78$ $p=.03$), explained by the fact that boys' expectations for success decreased significantly over the year ($F(1,159)=11.50$ $p=.001$, T1 mean=5.23 s.d.=0.92, T2 mean=4.89 s.d.=1.07), while girls' remained similar ($F(1,125)=0.02$ $p=.88$; see Figure 3). As in the case of mathematics, students' perceptions of effort expenditure in English decreased significantly across the year ($F(1,274)=25.11$ $p<.001$, T1 mean=5.46 s.d.=0.98, T2 mean=5.01 s.d.=1.15).

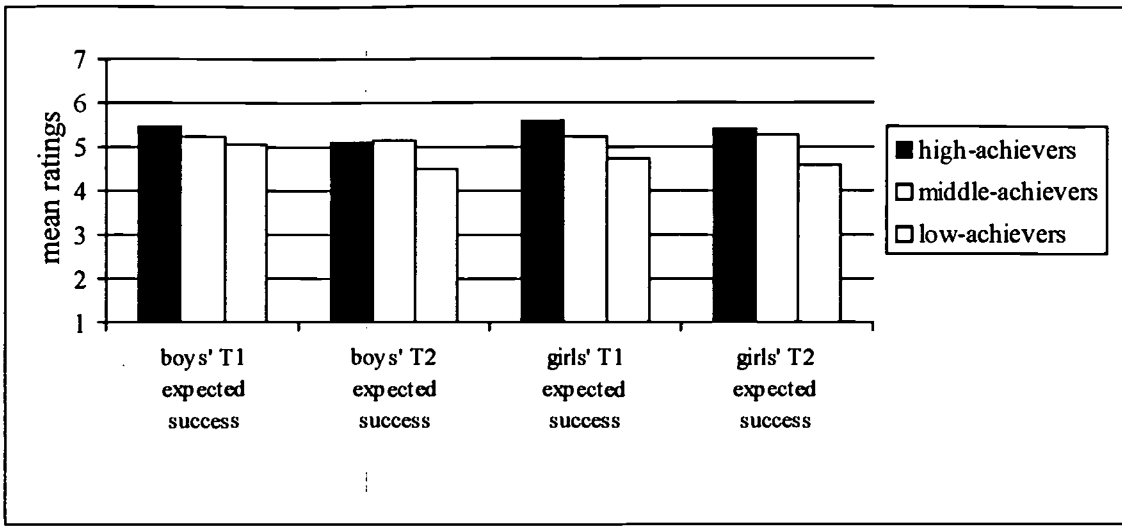

Figure 3. Expected English success at T1 and T2 for boys and girls of different achievement levels.

Student Task-Perceptions

Mathematics. Both middle and high achieving girls' perceptions of the difficulty of mathematics were significantly higher than those of their male counterparts ($F(1,45)=12.10$ $p=.001$ for middle-achievers, mid-achieving girls' T1 mean=3.72 s.d.=1.19, T2 mean=4.30 s.d.=1.13, mid-achieving boys' T1 mean=3.78 s.d.=1.09, T2 mean=4.13 s.d.=1.36; $F(1,50)=11.34$ $p=.001$ for high-achievers, high-achieving girls' T1 mean=3.15 s.d.=0.90, T2 mean=3.68 s.d.=1.09, high-achieving boys' T1 mean=3.06 s.d.=1.15, T2 mean=3.24 s.d.=1.18), as indicated by a significant gender by achievement effect ($F(2,293)=3.13$ $p=.045$; see Figure 4).

The amount of effort required to succeed in mathematics differed by achievement level ($F(2,294)=9.47$ $p<.001$), with low achievers having consistently the highest (T1 mean=5.33 s.d.=1.29, T2 mean=5.33 s.d.=1.26) and high achievers the lowest perceptions of effort required (T1 mean=4.85 s.d.=1.35, T2 mean=4.58 s.d.=1.31), with middle achievers falling in between (T1 mean=5.22 s.d.=1.30, T2 mean=5.19 s.d.=1.34).

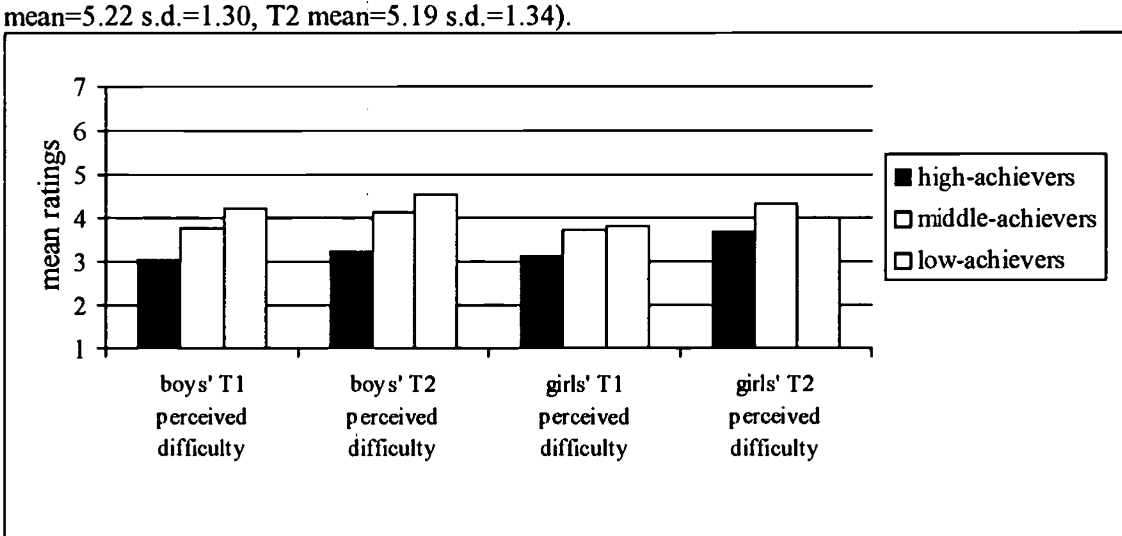

Figure 4. Perceived mathematical difficulty at T1 and T2 for boys and girls of different achievement levels.

English. Boys' perceived English as more difficult than did girls ($F(1,295)=11.50$ $p=.001$, boys' T1 mean=3.57 s.d.=1.10, boys' T2 mean=3.71 s.d.=1.13, girls' T1 mean=3.12 s.d.=1.19, girls' T2 mean=3.12 s.d. 1.01). Students' perceptions of the difficulty of English also differed according to level of achievement (F(2,295)=30.32 p<.001), with low achievers having the highest (T1 mean=3.95 s.d.=1.14, T2 mean=4.09 s.d.=0.95) and high achievers the lowest perceptions of difficulty (T1 mean=2.88 s.d.=1.02, T2 mean=3.06 s.d.=1.02), with middle achievers falling in between (T1 mean=3.41 s.d.=1.09, T2 mean=3.25 s.d.=1.11).

Boys of middle and high English achievement perceived the amount of effort needed to succeed as being greater than did their female counterparts (F(1,89)=4.45 p=.038 for middle achievers, F(1,104)=12.75 p=.001 for high achievers), as indicated by a gender by achievement interaction effect (F(2,269)=3.98 p=.02). High-achieving boys rated effort required in English substantially higher than high-achieving girls (boys' T1 mean=4.98 s.d.=1.11, boys T2 mean=4.78 s.d.=1.16, girls' T1 mean=4.20 s.d.=1.33, girls' T2 mean=4.18 s.d.=1.29), and similarly for middle achievers (boys' T1 mean=5.11 s.d.=1.28, boys T2 mean=4.89 s.d.=1.30, girls' T1 mean=4.65 s.d.=1.35, girls' T2 mean=4.37 s.d.=1.38; see Figure 5), while among low-achievers, boys' and girls' perceptions of English difficulty were similar.

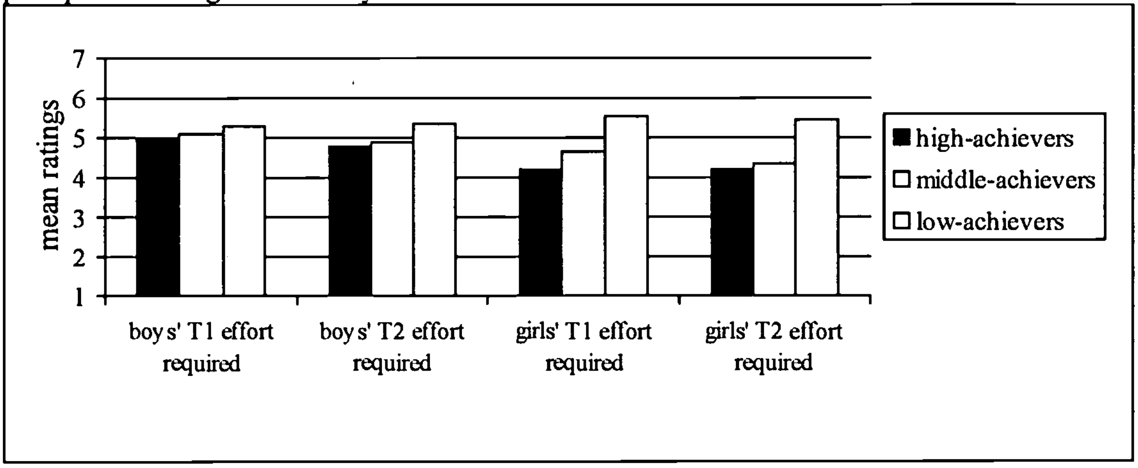

Figure 5. Perceived effort required in English at T1 and T2 for boys and girls of different achievement levels.

Student Affect

Mathematics. Students found mathematics less interesting by the end of Year 7 (F(1,310)=26.08 p<.001, T1 mean=4.05 s.d.=1.66, T2 mean=3.57 s.d.=1.71). In the case of high-achieving students, boys perceived mathematics as being more interesting than did girls (F(1,114)=7.88 p=.006, boys' T1 mean=4.97 s.d.=1.64, boys' T2 mean=4.54 s.d.=1.69, girls' T1 mean=4.40 s.d.=1.47, girls' T2 mean=3.59 s.d.=1.91), as evidenced by an interaction effect of gender and achievement (F(2,310)=3.77 p=.024; see Figure 6). Both gender groups had similar interest among low- and mid-achieving mathematics students.

English. As in the case of mathematics, there was also a gender by achievement interaction effect on students' interest in English (F(2,312)=3.96 p=.020). This was due to girls of middle and high English achievement having greater interest in English than their male counterparts (F(1,97)=13.27 p<.001 for middle achievers, F(1,115)=25.65 p<.001 for high achievers; boys' T1 mean=4.18 s.d.=1.53, boys' T2 mean=4.04 s.d.=1.59, girls' T1 mean=4.81 s.d.=1.02, girls' T2 mean=5.23 s.d.=1.10 for middle achievers; boys' T1 mean=4.23 s.d.=1.33, boys' T2 mean=4.06 s.d.=1.63, girls' T1 mean=5.38 s.d.=1.05, girls' T2 mean=5.06 s.d.=1.30 for high achievers; see Figure 7). Among low-achievers however, boys' and girls' interest levels were similar.

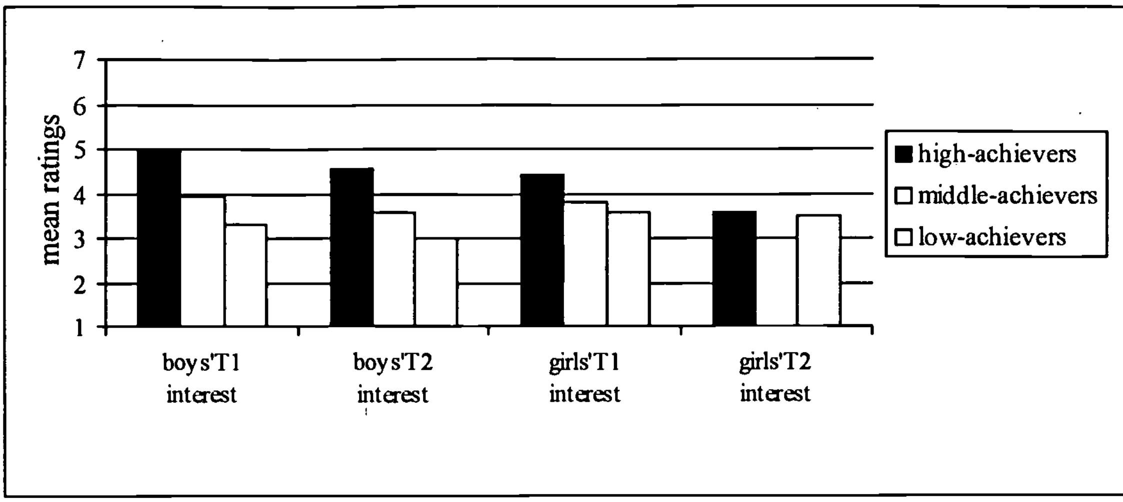

Figure 6. Interest in mathematics at T1 and T2 for boys and girls of different achievement levels.

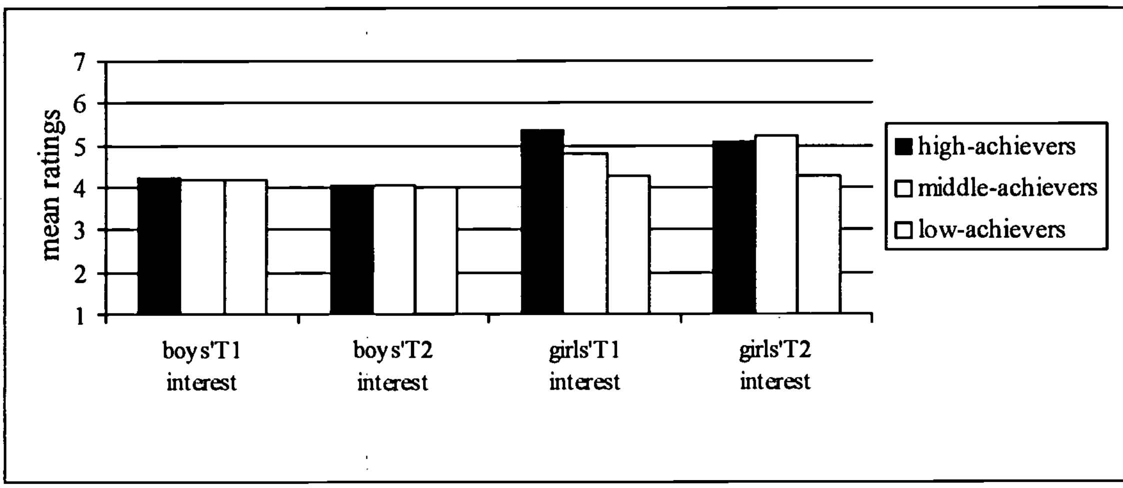

Figure 7. Interest in English at T1 and T2 for boys and girls of different achievement levels.

Student Utility Judgements

Mathematics. By the end of Year 7, students perceived mathematics as less useful than at the beginning of the year (F(1,289)=8.41 p=.004, T1 mean=6.02 s.d.=1.09, T2 mean=5.82 s.d.=1.25). Students' utility judgements were dependent on level of mathematical achievement (F(2,289)=4.52 p=.012), with high-achievers perceiving mathematics as most useful (T1 mean=6.30 s.d.=0.78, T2 mean=6.00 s.d.=1.110), followed by middle achievers (T1 mean=6.00 s.d.=1.1, T2 mean=5.75 s.d.=1.19), with low achievers perceiving mathematics as least useful (T1 mean=5.68 s.d.=1.32, T2 mean=5.65 s.d.=1.47).

English. Girls rated the usefulness of English higher than did boys (F(1,264)=5.23 p=.023; boys' T1 mean=5.95 s.d.=1.00, boys' T2 mean=5.58 s.d.=1.41, girls' T1 mean=6.15 s.d.=0.88, girls' T2 mean=6.08 s.d.=1.07).

Domain Effects in Student Perceptions

Self-Perceptions. Students perceived their effort exertion in mathematics to be lower than in English at the end of Year 7 (F(1,275)=10.97 p=.001; mathematics mean=4.79 s.d.=1.40, English mean=5.01 s.d.=1.15). This was the only perception and the only time point at which there were domain effects on student self-perceptions.

Task-Perceptions. For both perceived difficulty and effort required, students gave higher mathematics than English ratings (T1 $F(1,321)=12.23$ $p=.001$; T2 $F(1,276)=39.36$ $p<.001$). This indicates that despite students exerting less effort in mathematics than in English, they perceived mathematics as more difficult than English (T1 mathematics mean=3.61 s.d.=1.18, T1 English mean=3.37 s.d.=1.16; T2 mathematics mean=3.96 s.d.=1.25, T2 English mean=3.45 s.d.=1.12), and the amount of effort required to succeed in mathematics as greater than for English (T1 mathematics mean=5.11 s.d.=1.33, T1 English mean=4.92 s.d.=1.30; T2 mathematics mean=5.03 s.d.=1.35, T2 English mean=4.82 s.d.=1.28).

Affect and Utility Judgements. Students were more interested in English than in mathematics (T1 $F(1,339)=22.79$ $p<.001$; T2 $F(1,289)=46.31$ $p<.001$; T1 mathematics mean=4.05 s.d.=1.66, T1 English mean=4.52 s.d.=1.37; T2 mathematics mean=3.57 s.d.=1.71, T2 English mean=4.38 s.d.=1.52). Utility judgements however were similar for both mathematics and English (T1 $F(1,290)=.10$ $p=.754$; T2 $F(1,275)=.00$ $p=.970$).

Relations Between Student Perceptions and Student-Reported Perceptions of Significant Others

The strength and nature of relationship between student and corresponding student-reported perceptions of significant others was measured for both time points. Correlations were significant ($p<.01$) in each instance, and generally appear stronger for mathematics than English. For mathematics, correlations generally appear strongest for mothers at both time points, and stronger at T1 than T2, while no clear pattern is evident for English. Table 4 shows Pearson correlations between student and student-reported mother, father and teacher perceptions at T1 and T2 in corresponding areas.

Relation Between Changes in Student Perceptions and Changes in Student-Reported Perceptions of Significant Others

The relationship between change in student and student-reported mother, father and teacher perceptions was established by Pearson correlations of discrepancy scores calculated by subtracting time 1 from time 2 data. Table 5 shows the strength of relation for amount of change in student perceptions and amount of change in teacher, mother and father perceptions in corresponding areas, which were significant ($p<.05$) in each case. Changes in student mathematical talent perceptions appear to be most related to changes in student-reported father mathematical talent judgements ($r=.46$), similarly for mathematical difficulty ($r=.30$) and effort required in mathematics ($r=.37$). Changes in student expected mathematical success and interest appear most closely allied to changing student-reported mother perceptions, however ($r=.38$, $.39$ respectively).

For English, changes in student perceived talent and interest appear equally related to changes in student-reported mother, father and teacher perceptions ($r=.24$, $.26$, $.27$ respectively for talent, $r=.36$, $.35$, $.32$ respectively for interest). Changes in students' expected success seem most closely related to changes in student-reported father perceptions ($r=.18$), while changes in students' perceptions of English difficulty appear most allied with changes in student-reported teacher perceptions of difficulty ($r=.47$), and changes in students' judgements about the amount of effort required in English seem most related to reported changes in mother perceptions in this respect ($r=.43$).

Table 4

Correlations Between Student and Student-Reported Mother, Father and Teacher Perceptions T1 and T2 in Corresponding Areas (all correlations significant at $p<.01$)[c]

		student-reported mother perceptions		student-reported father perceptions		student-reported teacher perceptions	
		maths	*English*	*maths*	*English*	*maths*	*English*
perceived talent	T1	.64	.47	.62	.43	.53	.52
	T2	.66	.52	.61	.58	.60	.53
expected success	T1	.59	.43	.48	.38	.48	.29
	T2	.59	.42	.53	.40	.61	.37
perceived difficulty	T1	.68	.60	.58	.63	.57	.48
	T2	.48	.63	.46	.56	.41	.63
effort needed	T1	.61	.54	.58	.52	.56	.43
	T2	.49	.52	.49	.50	.56	.45
interest	T1	.69	.62	.69	.63	.60	.57
	T2	.60	.60	.51	.55	.49	.57

[c] Note. Listwise deletion of missing data resulted in effective sample sizes of 284 for T1 mathematics, 264 for T2 mathematics, 250 for T1 English and 258 for T2 English.

Table 5

Correlations Between Changes in Student and Student-Reported Teacher, Mother and Father Perceptions in Corresponding Areas (all correlations significant at $p<.05$)[d]

	change in student-reported mother perceptions		change in student-reported father perceptions		change in student-reported teacher perceptions	
	maths	*English*	*maths*	*English*	*maths*	*English*
change in perceived talent	.37	.24	.46	.26	.29	.27
change in expected success	.38	.15	.27	.18	.32	*ns*
change in perceived difficulty	.23	.37	.30	.33	.18	.47
change in effort needed	.34	.43	.37	.38	.31	.32
change in interest	.39	.36	.34	.35	.37	.32

[d] Note. Listwise deletion of missing data resulted in effective sample sizes of 228 for mathematics and 193 for English.

Differences Between Student-Reported Mother and Father Perceptions

Some evidence of discriminant validity in student-reported parent data was shown in that student perceptions of parent attitudes differed for mothers and fathers at both time points for interest in mathematics ($t_{(332)}=2.33$ $p=.02$ T1; $t_{(301)}=2.88$ $p=.004$ T2), with students perceiving their fathers in both instances as considering them more interested in mathematics (mother T1 mean=4.55 s.d.=1.52; father T1 mean=4.67 s.d.=1.54; mother T2 mean=4.26 s.d.=1.71; father T2 mean=4.45 s.d.=1.73). There were no other perceptions, either mathematics or English-related, on which student reports of mother and father perceptions differed.

DISCUSSION

As hypothesised, changes in student perceptions over the first year of high school were negative where they occurred. Also as hypothesised, boys had more positive mathematics-related perceptions than girls, and conversely for English, where gender effects were evident. The gender intensification hypothesis had limited support, with only one gender by time interaction occurring in relation to English. An unpredicted interaction of gender and achievement was identified, indicating that high-achieving girls' mathematics-related perceptions were more negative than boys', and that mid- and high-achieving boys' English-related perceptions were more negative than girls'.

Declining Student Perceptions Across the first Year of High School

One English-related and three mathematics-related perceptions declined over the first year of high school, indicating that English perceptions are more stable than in the case of mathematics over this period. By the end of Year 7, students reported exerting less effort in both English and mathematics, being less interested in mathematics, and perceiving mathematics as less useful than at the beginning of the year.

Other negative changes occurred on both English and mathematics-related perceptions, but only for specific subgroups of students. For boys only, expected success in English decreased over the year, while girls' success expectations remained stable. Expected mathematics success declined for students of middle and low mathematics achievement only, remaining stable for high-achievers. Also, for students having the lowest level of mathematical performance, perception of talent decreased from the beginning to the end of the year, but did not change for mid- and high-mathematics achievers. Clearly, high school experiences impact negatively upon certain student perceptions, and differentially for different subgroups of students. It seems that boys overall are more susceptible to negative changes in English perceptions than is the case for girls in mathematics.

Evidence of Sex-Typed Patterns of Perceptions

It was anticipated that boys would have more positive mathematics-related perceptions than girls, and that the converse would apply to English. This hypothesis had partial support, in that boys had higher perceptions of mathematical talent than girls, consistent with recent Australian research focusing on perception of talent (Bornholt, Goodnow, & Cooney, 1994; Watt, 1995). Conversely, girls had more positive English-related perceptions than boys, in that they found English less difficult, and perceived it as having greater utility value.

Achievement-Level as a Determinant of Attitudinal Adjustment

It has been reported that high-ability students are most negatively affected by the transition to high-school (Wigfield *et al.*, 1991), with streaming practices leading to homogeneous reference groups being suggested as a probable explanation. Despite the fact that students in the present study were largely unstreamed, however, two achievement by time interactions were identified for expected success and perceived talent in relation to mathematics. These interaction effects were not due to high-achievers being most negatively affected over the year, but were in fact due to lower achieving students exhibiting negative changes. The Australian context, in which students in the first year of high school are rarely streamed, makes it unlikely that American findings will be replicated. It is certainly deserving of further study to determine reasons for why Australian students might display discrepant attitudinal adjustment from American students. Certainly the lack of streaming is one clear difference, which plausibly accounts for why high-achieving students are not most negatively affected over Year 7. The longitudinal study, of which these students are a part, will seek to identify whether streaming practices introduced in the following year (Year 8) produce such change.

Gender Intensification

There was limited evidence of gender intensification, occurring only for expectation of success in English, whereby boys became more negative in their perceptions, while girls' perceptions remained stable. It was not the case that girls became more negative than boys in their attitudes to mathematics, supporting the findings of Eccles, Wigfield and colleagues (Eccles *et al.*, 1989; Wigfield *et al.*, 1991). It may be, as these researchers suggest, that mathematics is no longer perceived as a male domain (1991), and this could explain why there is evidence of gender intensification for English and not mathematics, assuming English is still perceived as a female domain. Other data from the study investigating the extent to which students perceive mathematics and English as sex-typed subject domains, not presented here, do indicate evidence of sex-typing in both mathematics and English, with effect sizes being slightly stronger for English than for mathematics. These data are consistent with Wigfield's suggestion above. Alternatively, it is possible that the gender intensification process occurs earlier than the 7th grade, accounting for stable gender differences by the time students reach this age. Replication of this study with primary-school children (grades 3 to 6) could test whether this is the case.

Gender and Achievement Interaction Effects

Unpredicted interaction effects between gender and achievement occurred for both mathematics and English-related perceptions. For mathematics, high-achieving girls had lower interest and success expectations than their male counterparts, while middle and high-achieving girls regarded mathematics as more difficult than their male counterparts. It is possible these girls may be more susceptible than other girls to negative effects, since they are high-achievers in what may be stereotyped as a male domain. For English, girls of middle and high achievement had more positive perceptions than their male counterparts on both their level of interest and on effort required to succeed in English. Again, it may be that these boys are more susceptible than other boys to effects of gendered stereotypes, since they are achieving in what is often stereotyped as a female domain. The fact that only high-achieving girls as opposed to both mid- and high-achieving boys are affected in this way may reflect greater sex-typing of English as opposed to mathematics, consistent with the argument above.

Domain Effects

There is ample evidence of domain-specific patterns of effects. Apart from different effects on students' mathematics and English-related perceptions reported above, direct comparisons of students' mathematics and English-related perceptions reveal significant differences. Overall, students reported more positive perceptions for English than for mathematics, with students exerting more effort in English, and perceiving English as less difficult, requiring less effort to succeed, and as being more interesting. Clearly it is important to study different academic domains separately, since patterns of effects are largely domain-specific, while reported perceptions differ according to academic domain.

Relatedness of Student and Reported Mother, Father and Teacher Perceptions

Student-reported mother, father and teacher perceptions in areas corresponding to students' own mathematics- and English-related perceptions were measured for perceived talent, expected success, perceived difficulty, effort required and interest. At both time points, there was a statistically significant relationship between each student perception and the corresponding student-reported mother, father and teacher perception, except in one instance where student-reported teacher perceptions regarding expected English success at the end of the year was unrelated to students' own perceptions. Validity for the student-reported perceptions of significant others in terms of these not being simply projections of the child's own attitudes is supported by the differing levels of relation for different perceptions, and the difference between reported mother and father data regarding interest in both mathematics and English.

For mathematics, at the beginning of the year, reported mother perceptions seem closely allied with students' own perceptions overall, which the common view would seem to predict, but the relations of reported father perceptions are relatively similar in strength to those for mothers, lending support to recent calls for increased research including fathers, suggesting their role in child development is also influential. Reported teacher perceptions were overall the least related to student perceptions. The perceptions of teachers, although initially least strongly related to student perceptions, were still surprisingly strongly related considering the initial data were gathered right at the beginning of the school year. Anecdotal data frequently heard during the data collection process for the study help explain this finding, since students in the sample largely regarded their teachers as authorities regarding the students' own progress in mathematics.

At the end of the year, relations for mathematics appear overall less strong than at outset. Perhaps this reflects students becoming increasingly independent, and consequently less dependent on the views of others for their own self-perceptions. Alternatively, students may be less likely to project their own beliefs onto significant others as they mature at puberty (Goodnow, 1988), although the difference in student report of mothers' and fathers' interest ratings for mathematics at both time points provides some evidence of discriminant validity, and hence some evidence against the projection hypothesis.

Relations were generally less strong for English than for mathematics, and patterns of relations were less clear. With regard to the significant other with whom student-reported perceptions were most closely allied, patterns were again not consistent, with equivalent numbers of relations being strongest for each group.

The relation between extent of change in student perceptions and reported perceptions of significant others was significant in each case. For mathematics, relations were again strongest for mothers and fathers in each case. For English, relations were weaker than for mathematics, and were distributed in no consistent way across all three groups of significant others.

The strength of all correlations was modest, implying other operative factors responsible for changes in student perceptions across Year 7. This provides further evidence of validity for student-reported perceptions of significant others, as the projection interpretation would imply close relations between self- and other perceptions. Contextual school variables are a likely explanation for changing student perceptions, which the work of Midgley and colleagues using indices of perceived school environment, would seem to support. Other possibilities relate to changing social behaviours and values as students reach adolescence.

Conclusion

The major contribution of this study lies in its examination of the impact of time in Year 7 and student characteristics on a range of mathematics and English-related perceptions. Previous studies have not addressed the range of variables that this study has, involving self-perceptions, task-perceptions, affect and utility judgements. By including these additional dimensions of students' mathematics-related perceptions, the present study has been able to identify which are negatively affected over the first year of high school and which remain stable. Moreover, differential changes in perceptions for students of each gender and of varying levels of achievement were able to be identified across this range of perceptions, showing that such change does not occur on many areas of student-related perceptions.

Academic domain emerged as a defining feature of susceptibility to change or stability of student perceptions. There was stability for a greater number of English- than mathematics-related perceptions (English perceived talent, difficulty, effort required, affect and utility-value, as opposed to only effort required in mathematics remaining stable). Conversely, mathematics-related perceptions were more susceptible to change, with perceived effort exerted, affect and utility judgements exhibiting change over the year for all students, as opposed to there being change only in perceived effort exerted for English. Changes were negative in nature in all instances, reflecting previous research which has examined the impact of beginning high-school. Students' level of achievement was also related to the stability of their perceptions, with high-achieving students having the greatest stability in their perceptions, and low-achieving students the least.

Secondarily, the information gathered on student-reported perceptions of significant others enabled identification of strength of relation between student and reported significant others' perceptions. Academic domain was again a defining feature, with parents - particularly mothers - having generally stronger relations for mathematics-related perceptions, but no consistent patterns emerging for English. Relatedness of perceptions was also stronger for mathematics than for English, perhaps implying that students are more affected by the views of others in mathematics than in English. Alternatively, clearer feedback for mathematics performance may mean that student and other perceptions may all be strongly related to performance indicators, while the less normative English feedback may result in perceptions less aligned to academic performance and hence weaker relations among student, mother, father and teacher English-related perceptions. Another explanation is that directionality of influence may be in the reverse direction. It may be that students provide (or the school may provide) more explicit evaluative information regarding mathematics than English to significant others, such that the perceptions of these others are more closely aligned to student perceptions in this domain. This is also a feasible explanation, since it is certainly the case for example, that mathematics is more rigorously streamed than English at school (although not at the outset), and that assessment procedures generally provide greater comparative information. Data from both significant others as well as student-report on successive occasions would be needed to tease out the directionality of influence.

Finally, the effects of Year 7 experience are captured through the design. All students are in similar school settings and in the same grade level for the duration of the study. Hence, there is no confounding of changes in grade level with changes experienced through commencing high school, which has been an acknowledged problem with research into the impact of transition to high school (e.g.: Anderman & Midgley, 1997; Harter, Whitesell, & Kowalski, 1992). Some studies have circumvented this problem by obtaining beginning and end of year measures in both the final primary and initial high school years (e.g.: Wigfield *et al.*, 1991), but these typically have addressed a limited number of perceptions.

In summary, the study has identified changes on a range of student perceptions across Year 7, as well as the variations by gender and level of achievement on these. The idea of gender intensification (Hill & Lynch, 1983) was tested across a range of perceptions, but was generally not supported. The notion of the most able students being most negatively affected over time could similarly be tested across these perceptions, but as expected was not supported. In fact, the present study identified lower achieving students as being most negatively affected over Year 7, which is probably related to Australian practices of not streaming students in their first year of high-school. The longitudinal study from which these data are drawn will allow the effects of streaming from other factors to be teased out as these students proceed through high-school.

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5th Biennial Mtgs. of the International Society for the Study of Behavioural Development (ISSBD)
(Berne, Switzerland, July 1-4, 1998)