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Development of Adolescents' Self-Perceptions, Values, and Task Perceptions According to Gender and Domain in 7th- through 11th-Grade Australian Students

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Latent growth models estimated developmental trajectories for adolescents' math and English self-perceptions (perceived talent, success expectancies), values (intrinsic, utility) and task perceptions (task difficulty, effort required). A longitudinal cohort-sequential study included 1,323 participants spanning Grades 7 to 11, with Occasion 1 mean ages 13.19, 12.36, and 14.41, respectively, for Cohorts 1, 2, and 3. Self-perceptions and values declined through adolescence, and ratings about difficulty and effort required increased. Gender differences favored boys for math and girls for English, with little evidence for gender intensification or gender convergence hypotheses. Explanations reference socialization and social-cognitive developmental theories and features of the curricula, with domain-specific patterns implying domain-specific explanations. Existing research is extended by modeling a broadened set of social-cognitive constructs within the Australian context.

Expectancy-value theory is one of the major frameworks for achievement motivation and was developed to explain students' gendered choices and achievement in relation to math. Wigfield and Eccles (2000) have provided an overview of this framework. Within it, success expectancies and the subjective valuation of success are the most proximal influences on achievement-related choices and behaviors, and these are in turn predicted by ability perceptions as well as perceived task demands. The work of Eccles, Wigfield, and colleagues has demonstrated that expectancies and values relate to achievement-related choices operationalized as course enrollment and achievement (e.g., Eccles, 1985; Eccles, Adler, & Meece, 1984; Eccles (Parsons), 1984; Eccles (Parsons) et al., 1983; Meece, Eccles (Parsons), Kaczala, Goff, & Futterman, 1982; Meece, Wigfield, & Eccles, 1990; Wigfield, 1994; Wigfield & Eccles, 1992).

Given the importance of expectancy-value social-cognitive constructs in influencing achievement-related outcomes, it is necessary to understand their development over time. Two recent North American studies, both based on the same data set, have modeled the development of ability-related beliefs and composite values perceptions through Grades 1 to 12 (Fredricks & Eccles, 2002; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). The present study extends that work by modeling the development of differentiated ability-related beliefs including a new talent perception measure, different types of values, and additional task beliefs. This study is based on a new data set, from a different country and school system, but it was collected at about the same time as the data set on which the two North American studies were based. Therefore, the age cohort is similar, but it is possible to contrast the effects of setting and context. In particular, the New South Wales (NSW) Australian context has a different curricular structure from that of North America, permitting a focus on different kinds of junior to senior high transitions. Jacobs et al. (2002) focused on perceptions related to math and language arts (as well as sports, which is outside the scope of the present study). They found that ability perceptions for math linearly declined through Grades 1 to 12. Initial gender differences favoring boys converged because of a steeper decline in boys' perceptions. Language arts ability perceptions also declined, steeply through Grades 1 to 6, then plateaued for girls whereas boys' perceptions continued to decline to middle secondary school and then showed some recovery in senior high although not to the same level as girls. Math value also declined, most steeply through secondary school. Girls had higher values than boys, except in late elementary through to early secondary school when boys' and girls' values were

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similar. In contrast, language arts values declined most up to Grade 7 and favored girls, then plateaued for boys and increased for girls through secondary school.

The second longitudinal study was based on the same data set as the first and focused on perceptions related to math and sport (Fredricks & Eccles, 2002), finding similar declines in math ability perceptions, declines in intrinsic value in Grades 3 through 9 with slight subsequent recovery, and declines in a combined utility – attainment value construct, particularly through secondary school. Fredricks and Eccles (2002) found evidence of greater declines in intrinsic value for girls in math, and no gender effects on their combined utility – attainment factor. Different math value trajectories across the two studies can be explained by the Fredricks and Eccles separation of intrinsic value from a combined utility – attainment value factor rather than by analyzing a composite intrinsic – utility – attainment value factor as in the first study, which masks differences on component values. Definitions of these aspects of task value are provided later.

Other developmental studies of ability-related beliefs and values were conducted during the 1980s and 1990s. The first cross-sectional study examined differences for students in Grades 5 to 12, finding that math valuation decreased through Grades 5 to 12 whereas English valuation increased (Eccles (Parsons) et al., 1983). Another study (Wigfield et al., 1997; based on the same data set as Jacobs et al., 2002) reported that ability beliefs declined with age for both math and English through Grades 1 to 6. Mean-level gender differences in math ability beliefs favoring boys also were reported by Eccles, Wigfield, Harold, and Blumenfeld (1993), Singer and Stake (1986), Wigfield, Eccles, Mac Iver, Reuman, and Midgley (1991), and Wigfield et al. (1997). It has been 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. An earlier study by Watt (1996) suggests this may not be the case in math, at least, because boys scored higher than girls both on their ipsative judgments of mathematical talent (i.e., relative to each of their other school subjects) and on traditional measures of their talent at math. There is also evidence that females hold more positive ability-related perceptions than do males for English (e.g., Eccles et al., 1989; Eccles et al., 1993; Wigfield et al., 1991).

Less work has been done on values, with most of the research done by Eccles, Wigfield, and colleagues, who have identified gender differences favoring girls in English values as early as the first grade (Eccles et al., 1993; Wigfield et al., 1997). Although those studies showed no gender differences in math values, other studies have found that males score higher than females on more differentiated dimensions of values such as perceived usefulness (e.g., Forgasz, 1995; Perl, 1982).

How are gender differences in beliefs and activities explained? Gender intensification theory (Hill & Lynch, 1983) suggests 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). This suggests that girls become more negative about male-stereotyped domains such as math and boys become more positive, but that boys become more negative about female-stereotyped domains such as English. A gender intensification hypothesis (Hill & Lynch, 1983) was not, however, supported by either the Jacobs et al. (2002) or the Fredricks and Eccles (2002) study. An alternative viewpoint argued by both studies was that gendered perceptions converge as students progress through school. Fredricks and Eccles attributed this to boys' higher and more unrealistic perceptions in elementary school, and boys' and girls' more realistic perceptions over time resulting from increased performance feedback and the increasing salience of social-comparative processes. The evidence on which Jacobs et al. based their gender convergence argument for math and English constructs was mainly from perceived math competence trajectories. They also had some support for this perspective from perceived English competence in Grades 11 to 12, which showed some evidence of gender convergence, although certainly not to the same point. It is worth noting that values perceptions diverged for boys and girls through secondary school in that study.

Jacobs et al. (2002) concluded that competence perceptions and values generally decline through school in relation to both math and language arts, providing evidence for continued declines after transition to secondary school, which have been well documented (e.g., Midgley, Feldlaufer, & Eccles, 1989a, 1989b; Wigfield et al., 1991; Yates, 1999). They suggested that such declines may be reality based and inevitable because of social-comparative processes in which individuals increasingly engage through adolescence (e.g., Nicholls, 1978) but which are also promoted by the secondary school context. Jacobs et al. concluded that gender gaps generally narrow or remain stable through school, with different gendered patterns across math and language arts implying that domain-specific explanations for gender differences are needed. Furthermore, they concluded that boys experience greater declines in perceptions than do girls, which they suggested may be a consequence of greater declines in boys' achievement through school and which may lead to problematic outcomes for boys in terms of dropping out of academic settings such as college. The authors emphasized the need for other studies to document trends for ability beliefs and values in other samples from other contexts (see also Volet, 1999).

Further research is needed to clarify the gendered nature of adolescents' intrinsic and utility math values, and to model intrinsic and utility value trajectories for English, which no study has done. In the present study I expected that where gender differences occurred, they would favor boys in math and girls in English, with the possible exception of math utility values because of the frequently emphasized importance of math by both educators and the media, which the Fredricks and Eccles (2002) data support. Additional long-term longitudinal studies are needed to clarify conflicting findings from shorter term studies based on separate data from the data set used by the two existing long-term longitudinal studies, and to estimate separate developmental trajectories for component values constructs. The present study focused on two academic domains to determine whether developmental patterns were domain specific. Trajectories were estimated for math and English because math is the domain within which the Eccles, Wigfield, and colleagues' expectancy-value framework was developed (Eccles, 1984; Eccles (Parsons) et al., 1983). Also, these are both domains in which gender differences may be expected, based on math being perceived as a male sex-typed domain and English as a female sex-typed domain (e.g., Hyde, Fennema, Ryan, Frost, & Hopp, 1990; Leder, 1992; Stipek & Gralinski, 1991). However, some researchers have suggested that math may be seen increasingly less as a sex-typed domain (e.g., Watt, 2002a; Wigfield et al., 1991). Also, in NSW Australia, math and English are commonly studied subjects through secondary school, permitting assessment of the ontogeny of students' perceptions throughout secondary school.

Key Social-Cognitive Constructs Within the Expectancy-Value Framework

Success expectancies have been defined by Eccles and colleagues (Eccles (Parsons) et al., 1983) as beliefs about how well one will perform on an impending task and are distinguished conceptually from ability beliefs, which are defined as perceptions of one's current competence at a given activity. Eccles and colleagues have not, however, been able to distinguish empirically between their ability and expectancies constructs in factor analytic work (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000).

Ability perceptions have mostly been operationalized through broad questions asking students to rate their own performance in different areas. For example, Eccles and colleagues used the questions "How good at math are you?" "If you were to order all the students in your math class from the worst to the best in math, where would you put yourself?" and "How have you been doing in math this year?" to assess math-related ability beliefs (Eccles & Wigfield, 1995), which may invite evaluations of performance for some students. In other research, Marsh (1992) has operationalized math self-concept of ability through questions such as, "Have you always done well in math?" "Do you get good marks in math?" and "Do you often need help in math?" It is likely that students' responses to such questions depend partly on evaluations of their performance and partly on evaluations of their aptitude.

For the present study, the term *talent* was adopted, following Bornholt et al. (1994). They stated that natural talent is a concept that best represents the notion of ability distinct from performance, basing this on early discussion about the distinction between aptitude and achievement (Green, 1974). Ability perceptions operationalized as competence beliefs are theoretically different from talent perceptions, as a student may well feel that he or she performs successfully on a certain task yet still not feel that he or she has an aptitude for it. Claims relating to differences between talent and ability perceptions as commonly operationalized in the literature have not been supported by empirical evidence, with use of the talent terminology based largely on speculation.

Values have been defined by Eccles and colleagues as relating to how a task meets individual needs (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 1992). Four major components of values have been proposed: intrinsic, utility, attainment, and cost values. Intrinsic value is the enjoyment one gets from carrying out a task, utility value refers to how a task will be useful to an individual in the future, attainment value refers to the importance of doing well on the task, and cost is what the individual has to sacrifice to carry out the task. Most of the empirical work has been done with the first three constructs

(Wigfield & Eccles, 2000). The present study focuses on intrinsic and utility values.

Intrinsic value is described similar to the construct of intrinsic motivation as defined by Deci and colleagues (Deci & Ryan, 1985; Deci, Vallerand, Pelletier, & Ryan, 1991) and by Harter (1981), that is, engaging in a task out of interest or enjoyment. In contrast, utility value has some resemblance to extrinsic motivation (Deci & Ryan, 1985; Harter, 1981) in that it taps more instrumental reasons for engaging in a task. These constructs, however, have developed from different intellectual roots despite having some overlap in operationalization (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000).

Less work has been done within the expectancy-value model of Eccles, Wigfield, and colleagues (see Wigfield & Eccles, 2000) in relation to task perceptions compared with self-perceptions and values. Task perceptions have been defined as including subjective task difficulty beliefs and beliefs about the effort required to complete successfully a task (Eccles & Wigfield, 1995). In the expectancy-value model these factors are posited (along with ability beliefs) to influence achievement-related outcomes through their influence on expectancies and values (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000), although Eccles, Wigfield, and colleagues have acknowledged that there has been little research directly addressing the relationship between perceived difficulty and task choice. Task perception factors are incorporated in the present study given their prominence in the expectancy-value model.

The Present Study

The present study took place in NSW Australia with students from Grades 7 through 11. In NSW, students attend secondary school Grades 7 through 12. For math and English, syllabi exist for each of Grades 7 and 8, Grades 9 and 10, and Grades 11 and 12. Junior Grades 7 and 8 are focused largely on consolidation of material learned through primary Grades 3 through 6 for math, whereas new texts are introduced for study in English. In Grades 9 and 10, students are streamed into levels of advanced, intermediate, and standard math based on their demonstrated ability up to that point, whereas students study a common curriculum in English through these grades (although most schools stream classes based on students' demonstrated ability). In senior Grades 11 and 12, which lead up to a major external examination supplemented by within-school assessment results called the Higher School Certificate (HSC), students elect which subjects they wish to study. English is a required subject and math is not, though the overwhelming majority of students elect to study math given that it is perceived as an important subject and is in fact a requirement for many tertiary courses. In addition to students selecting which academic subjects they wish to study for the HSC, they also select which difficulty level they wish to undertake.

Latent growth modeling was employed to analyze the gendered trajectories for adolescents' perceptions related to math and English in this context. Expectancy-value social-cognitive constructs assessed were self-perceptions of natural talent and success expectancies; intrinsic and utility values; and task beliefs, which included perceived task difficulty and effort required. The new talent perception measure was empirically distinguishable from success expectancies (see Watt 2001, 2002b), enabling estimation of separate trajectories for these two constructs, which prior research based on ability beliefs operationalized as perceived competence has been unable to do (see Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). Component values constructs were examined, given evidence for their factorial distinctness as well as some evidence that they may develop differentially and that the effect of gender differs for each (Fredricks & Eccles, 2002). Task difficulty perceptions and perceptions of effort required are expectancy-value constructs on which less work has been done despite expectations that these perceptions may also influence achievement-related outcomes (Eccles (Parsons) et al., 1983).

As in the North American context, declines in ability-related beliefs and values were expected through secondary school, particularly through Grade 7, the first year of secondary school, given evidence relating to mismatch in person–environment fit at this stage (see Watt, 2000). In contrast, for the additional task beliefs constructs, increases were anticipated through secondary school. Given structural and curricular changes that occur on commencement of Grade 11 in the NSW Australian system, it may be that once students select which subjects they wish to study for the HSC and which difficulty levels they will undertake, they exhibit greater satisfaction in relation to math and English. Alternatively, HSC assessment pressures after Grade 10, when formal assessment toward the final HSC matriculation result commences, may suggest that heightened negative changes are likely for student perceptions at these times.

Consequently, although negative patterns were expected overall, with declines in talent perceptions, success expectancies, and intrinsic and utility values, and increases in task difficulty perceptions and perceptions of effort required, I expected that the magnitude of these changes would alter between Grades 10 and 11. To assess possible patterns of change involving two turning points, it was necessary to model cubic patterns of change within the present study. The two previous studies (Fredricks & Eccles, 2002; Jacobs et al., 2002) confined themselves to measuring quadratic change, which precludes potential identification of more complex developmental patterns, should these exist.

As has already been argued by Jacobs et al. (2002) in their long-term longitudinal study, the use of latent growth modeling to analyze developmental trajectories provides a flexible framework for tracing nonlinear trajectories and assessing the existence and pathways of separate trajectories for boys and girls (Fredricks & Eccles, 2002; Jacobs et al., 2002). Techniques such as multivariate analysis of variance (MANOVA), which have been implemented in short-term longitudinal studies and which address changes in mean levels over time, have frequently been limited to measuring linear change and are less elegant and parsimonious to apply to multiple waves of data.

Method

Participants

Participants spanned Grades 7 to 11 in a longitudinal cohort-sequential design consisting of 1,323 students in three cohorts. Table 1 depicts the sample size for each cohort, the grade of participants at each year of data collection, and their gender and home language spoken. The sample was predominantly of English-speaking background, with Asians as the largest ethnic subgroup. The combined sample provided information on students from Grades 7 to 11, with replication of grade effects across cohorts. Participants were from three upper-middle-class coeducational secondary schools in northern metropolitan Sydney, matched for socioeconomic status according to the Index of Education and Occupation based on census data (Australian Bureau of Statistics, 1991). Approximately half of the participants in each cohort were present for all administrations, and approximately one fourth missed only one administration. Students were not excluded on the basis of missing administrations because missing data can be accommodated within growth models, which use all available information for each respondent.

Materials

Questionnaires assessed students' self-perceptions (talent and success expectancies), values (intrinsic and utility values), and task perceptions (difficulty and effort required) in relation to math and English. Items for values, task perceptions, and success expectancies were based on those used by Eccles and colleagues (see Eccles & Wigfield, 1995; Wigfield & Eccles, 2000), using perceptions of talent instead of their perceptions of ability factor. Modifications to the Eccles and colleagues' subscales included minor changes to grammar appropriate to the Australian context (e.g., *maths* instead of the U.S. term *math*) and anchor labels (all of which were labeled from 1 [*not at all*] to 7 [*very*]), as well as more substantial modifications.

For perceived talent, Watt (2001, 2002b) expanded the talent concept through consideration of the bases for students' talent perceptions, conceptualized as comparative (based on frames of reference related to other people, e.g., other students in the grade, class and friends) and domain specific (based on different tasks within the domain, e.g., statistics, measurement and number, geometry, problem solving for math). She demonstrated that for math these two talent constructs were empirically distinct yet fairly closely related and were empirically distinct from ability perceptions operationalized as perceived competence (as measured by items from Marsh's, 1992,

Table 1
Cohort Sample Size, Grade, Gender, and Home Language Spoken

	1995 grade	1996 grade	1997 grade	1998 grade	% girls	% ESB[a]
Cohort 1 ($n = 428$)	7 (Dec)	8 (June)	9 (Feb)	10 (Feb)	44.9	78.6
Cohort 2 ($n = 436$)		7 (Feb, Dec)	8 (June)	9 (Feb)	43.6	82.4
Cohort 3 ($n = 459$)		9 (Feb)	10 (Feb)	11 (Feb)	42.9	73.1

[a]ESB = students who nominated English as their home language. Other home language groupings within each cohort were: Cohort 1—Asian 16.7%, European 3.0%, Middle Eastern 1.5%, Tagalog 0.2%; Cohort 2—Asian 12.1%, European 2.0%, Middle Eastern 3.3%, Tagalog 0.2%; Cohort 3—Asian 21.6%, European 2.0%, Middle Eastern 3.1%, South American 0.2%.

Math Self-Concept of Ability subscale), administered at the first wave of data collection. For English, one talent factor was identified, consisting of comparative and domain-specific items combined, which was empirically distinct from ability–competence perceptions (see Watt, 2002b, for details). Plausible explanations for nondistinct comparative and domain-specific English talent perceptions may relate to different assessment feedback in English compared with math, where frequently normative feedback in math may be more likely to promote the development of distinct math comparative talent perceptions (see Cocks & Watt, 2004). On this basis I concluded that talent perceptions tapped the aptitude rather than the demonstrated capability component of ability beliefs as intended.

For success expectancies, one of the two Eccles–Wigfield (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000) items measuring expected success this year was retained, as were two others developed to measure expected success in the near future (next test and this term). Their item asking about expected success in ''learning something new'' was not used because this was considered to introduce a new dimension about task familiarity not necessarily consistent with other items asking about success expectancies in math more generally. For intrinsic value, the Eccles–Wigfield item asking about interest in working on assignments was replaced by one question generally asking how interesting students found math or English because in the Australian context *assignments* refer specifically to projects to be completed excluding homework, which may not be comparable across classes, schools, or grades. For comparability, their item asking how much students like ''doing'' math or English was replaced with one asking how much they like math or English compared with other school subjects. A third item was also developed asking how much students ''enjoy'' math or English, again compared with other school subjects. For utility, the two Eccles–Wigfield items were modified in terms of more objective questions about math and English usefulness (in general, in the everyday world, and in the workplace) rather than the subjective utility assessed by Eccles and Wigfield (which asked about utility of math or English of ''what *you* learn in math,'' the content of which would differ across school grades, timing of topic teaching within the school year in relation to survey administrations, and streamed ability levels in the Australian context).

For task difficulty, the Eccles–Wigfield (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000) item asking about difficulty relative to other school subjects was dropped because students may not all be studying comparable subjects at school, particularly in senior years where there is increasing choice in subject selection. Instead, an item asking about difficulty relative to other students was developed, as well as two other general items asking about the extent to which students rated math and English as complicated and tough. Effort required was measured by four items in the Eccles–Wigfield measures. Two of these items were modified for the present study. Their item asking how hard students have to try to get good grades was modified by replacing the term *grades* with *marks*, more familiar to Australian students. Second, their incomplete stem ''To do well in math I have to work . . . 1 (much harder in math) to 7 (much harder in other subjects)'' was modified by completing the stem: ''How hard do you have to work at math/English?'' and removing the school subject-relative frame of reference, with anchors ranging from 1 (*not at all*) to 7 (*very hard*) because not all students study the same subjects at school. Their additional two items were omitted because one asked about effort required to do well in an advanced high school course, which younger students would have difficulty answering because of ignorance about what such courses involve, and the other asked, ''How hard do you have to study for math tests to get a good grade?'' which was seen as redundant with the first included item.

Table 2 shows the number of items for each construct for math and English, sample items, and Cronbach's alpha measures of internal consistency for each cohort at each administration. Measures were sufficiently reliable, with alpha coefficients ranging from .72 to .94.

Confirmatory factor analyses were used to establish the construct validity of the latent constructs, separately for each administration for each cohort, for both math and English. (Note that an additional perceived status factor was included in these confirmatory analyses.) Separate models for math and English were estimated at each occasion for each cohort, using maximum likelihood estimates based on covariance matrices, resulting in a total of 22 models. In each case, items were specified as indicators only for the construct for which they were designed, no error covariances were estimated (except for Items 59 and 61, see footnote to Table 3), and correlations between constructs were freely estimated. Table 3 shows the fit statistics for each analysis, and Table 4 presents zero-order correlations between constructs using combined Grade 9 data. The highest correlations in both domains were between talent perceptions and success expectancies (.72 for math,

Table 2
Sample Construct Items and Cronbach's Alphas for Math and English at Each Occasion

Construct	Alpha Cohort 1 T1 math/English T2 math/English T3 math/English T4 math/English	Alpha Cohort 2 T1 math/English T2 math/English T3 math/English T4 math/English	Alpha Cohort 3 T1 math/English T2 math/English T3 math/English	No. of items	Sample item	Anchor
Self-perceptions						
Talent: comparative	.88/.90	.91/.88	.75/.76	3	Compared with other students in your class, how talented do you consider yourself to be at maths/English?	1 (*not at all*) 7 (*very talented*)
	.77/.86	.88/.89	.74/.80			
	.74/.84	.76/.82	.72/.80			
	.72/.77	.77/.82				
Talent: domain specific	.88/.85	.87/.81	.85/.76	4	How talented do you think you are at problem solving/creative writing in maths/English?	1 (*not at all*) 7 (*very talented*)
	.87/.79	.86/.79	.78/.77			
	.84/.79	.82/.81	.82/.76			
	.85/.80	.85/.81				
Success expectancies	—	.90/.85	.90/.88	3	How well do you expect to do in your next maths/English test?	1 (*not at all*) 7 (*very well*)
	.93/.88	.90/.88	.90/.89			
	.93/.86	.90/.91	.89/.92			
	.89/.84	.90/.88				
Values						
Intrinsic value	.93/.93	.94/.93	.94/.93	3	How much do you like maths/English, compared with your other subjects at school?	1 (*much less*) 7 (*much more*)
	.92/.93	.94/.92	.94/.93			
	.93/.89	.92/.92	.94/.93			
	.91/.90	.91/.91				
Utility value	.91/.89	.88/.82	.89/.90	3	How useful do you believe maths/English is?	1 (*not at all*) 7 (*very useful*)
	.90/.89	.88/.91	.89/.90			
	.92/.92	.91/.92	.90/.93			
	.92/.92	.90/.91				
Task perceptions						
Task difficulty	.82/.86	.88/.85	.80/.82	3	How complicated is maths/English for you?	1 (*not at all*) 7 (*very complicated*)
	.82/.85	.77/.85	.78/.79			
	.79/.79	.79/.80	.80/.81			
	.79/.77	.82/.83				
Effort required	.81/.84	.82/.80	.87/.85	2	How hard do you have to work at maths/English?	1 (*not at all*) 7 (*very hard*)
	.87/.79	.86/.76	.85/.87			
	.83/.74	.86/.81	.89/.86			
	.86/.79	.81/.86				

Note. The dash indicates these data are not available at this time point. Two of the three success expectancies items (Items 51 and 52) were not administered to Cohort 1 at the end of Grade 7 as they referred to expected end-of-year results that students had already received in this instance. Underscorings appeared on the survey for emphasis.

Table 3
Construct Validity for Math and English Variables for Each Cohort Administration From Confirmatory Factor Analyses (Completely Standardized Solutions)

Variable	Cohort	Occasion grade/year	RMSEA	GFI	AGFI	NFI	NNFI	χ^{2a}	*df*
Math	Cohort 1	7b/95	.058	.90	.86	.93	.95	374.90	180
		8/96	.060	.89	.85	.91	.93	544.51	238
		9/97	.059	.89	.85	.91	.94	525.82	238
		10/98	.056	.90	.86	.91	.94	501.41	238
	Cohort 2	7a/96	.055	.89	.85	.92	.95	454.46	238
		7b/96	.051	.90	.86	.92	.95	432.57	238
		8/97	.052	.90	.87	.92	.95	453.30	238
		9/98	.055	.90	.86	.92	.95	486.52	238
	Cohort 3	9/96	.046	.92	.89	.93	.96	422.39	238
		10/97	.048	.91	.88	.92	.95	433.54	238
		11/98	.057	.90	.86	.91	.94	505.56	238
English	Cohort 1	7b/95	.044	.92	.89	.93	.96	279.98	180
		8/96	.056	.90	.86	.92	.94	503.23	238
		9/97	.047	.91	.88	.92	.95	414.21	238
		10/98	.050	.91	.87	.91	.94	449.47	238
	Cohort 2	7a/96	.040	.91	.88	.92	.96	345.15	238
		7b/96	.043	.91	.87	.92	.96	365.72	238
		8/97	.052	.90	.86	.92	.95	436.60	238
		9/98	.053	.90	.86	.92	.95	466.88	238
	Cohort 3	9/96	.037	.93	.90	.94	.97	358.85	238
		10/97	.053	.90	.87	.92	.94	475.98	238
		11/98	.047	.91	.88	.93	.96	420.00	238

Note. RMSEA = root mean square error of approximation; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; NFI = normed fit index; NNFI = non-normed fit index. Cohort 1, Occasion 1 (7b/95) omits success expectancies construct. The error covariance between Items 59 and 61 was freely estimated because both items contained parallel wording asking students to compare themselves with other students in their class on different attributes (task difficulty and talent, respectively). Occasion references both the grade level of students and year of administration. Grade levels are: 7a (start of grade 7), 7b (end of grade 7), 8, 9, 10, and 11. Years span 1995 through to 1998.
[a]Normal theory weighted least squares chi-square.

.73 for English), followed by correlations between perceived talent and task difficulty (− .54 for math, − .57 for English) and between intrinsic value and self-perceptions constructs (.49 and .55 for math intrinsic value and each of perceived talent and success expectancies, respectively; .55 and .53 for English intrinsic value and each of perceived talent and success expectancies, respectively). Model fits were adequate for each analysis, providing evidence of convergent and divergent construct validity for measures (root mean square errors of approximation [RMSEAs] close to or below 0.05, goodness-of-fit indexes [GFIs], adjusted goodness-of-fit indexes [AGFIs], normed fit indexes [NFIs], and non-normed fit indexes [NNFIs] close to or exceeding 0.90, many NNFIs in fact exceeding 0.95, and χ^2 *df* ratio near 2 for each model). Note that measurement properties of subscales were found to be invariant across both cohorts and genders, indicating that relations among items did not vary across these groups (for details, see Watt, 2001, 2002b).

Procedure

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 maximize ecological validity, with the exception of the final wave for each cohort, which was administered to a larger group in each school's hall. It was considered that the greater organizational ease of mass administration did not sacrifice data integrity because participants were by this wave accustomed to the instruments and procedure for the study. The researcher was present at each administration to clarify or answer questions where necessary, with a trained assistant to aid with disseminating and collecting instruments and answering questions. Administration at each time point was spread over 2 days, the first for math tasks and the second for English, in order not to overburden respondents.

Table 4
Bivariate Pearson Correlations Among Self-Perceptions, Values, and Task Perceptions for Math and English Using Combined Grade 9 Data

		Math correlations					
		1	2	3	4	5	6
1.	Talent	—					
2.	Success expectancies	.72	—				
3.	Task difficulty	−.54	−.47	—			
4.	Effort required	−.23	−.17	.48	—		
5.	Intrinsic value	.49	.55	−.42	−.15	—	
6.	Utility value	.34	.38	−.15	.08	.43	—
		English correlations					
		1	2	3	4	5	6
1.	Talent	—					
2.	Success expectancies	.73	—				
3.	Task difficulty	−.57	−.46	—			
4.	Effort required	−.29	−.19	.48	—		
5.	Intrinsic value	.55	.53	−.35	−.18	—	
6.	Utility value	.31	.38	−.12	.13	.37	—

Note. All correlations are statistically significant at $p < .01$.

Analyses

Growth models were estimated for each of math and English self-perceptions (perceived talent, success expectancies), values (intrinsic and utility value) and task perceptions (task difficulty, effort required). Note that a combined perceived talent factor was analyzed: Separate comparative and domain-specific talent factors were not supported for English and were relatively highly correlated for math. Twelve models were estimated using MLwiN multilevel modeling software for Windows (Version 1.10.0007), with three cohorts combined in an accelerated longitudinal design (Raudenbush & Chan, 1993). Two-level models were fitted in each case, with Level 1 referring to the occasion level and Level 2 referring to the student level. Predictors at Level 2 included linear, quadratic, and cubic change; gender; and interactions of gender with linear, quadratic, and cubic change. Each model was built initially from a baseline variance components model (fitting a constant only as an explanatory variable, random at both occasion and student levels), which partitioned the total variance into two components: between students and between occasions within students. This model was not interesting in itself but provided a useful baseline with which to compare subsequent, more elaborate models. Explanatory variables were added to each model one at a time to evaluate the improvement in model fit from each additional term. Models were estimated using full maximum likelihood so that model fits could be compared using the likelihood ratio test, as each model was nested within the preceding one.

First linear change was added (i.e., grade, using standard linear polynomial contrasts to represent Grades 7 at the start of the year; 7 at the end of the year; 8, 9, 10, and 11 respectively). Next quadratic and then cubic change were added (using standard polynomial contrasts). These were entered as both fixed effects and random effects at the student level so as not to assume students followed change patterns at exactly the same rate. This was followed by gender (coded 1 for girls and 0 for boys), and the interaction of gender with linear, quadratic, and cubic change, testing for improvement to model fit at each step. At any stage where the model fit was not improved to a statistically significant level by the addition of an explanatory variable, this variable was removed, except where, for example, some quadratic but not linear term was significant, in which case the linear term was also retained. For parsimony and interpretability, models were estimated omitting school and cohort effects because initial analyses incorporating these showed overlapping 95% confidence intervals for all but two point estimates. (These two point estimates were for math utility value and English intrinsic value at Grade 8, with the youngest Cohort 2 having significantly higher predicted values than the middle Cohort 1.) As grade

Table 5

Explanatory Models for the Development of Boys' and Girls' Self-Perceptions, Values, and Task Perceptions Through Grades 7 to 11

	Math						English					
	Talent *b* est(*SE*)	Success *b* est(*SE*)	Intrinsic value *b* est(*SE*)	Utility *b* est(*SE*)	Difficulty *b* est(*SE*)	Effort required *b* est(*SE*)	Talent *b* est(*SE*)	Success *b* est(*SE*)	Intrinsic value *b* est(*SE*)	Utility *b* est(*SE*)	Difficulty *b* est(*SE*)	Effort required *b* est(*SE*)
Fixed effects												
Constant[a]	4.806 (.032)	5.136 (.035)	3.877 (.051)	5.591 (.031)	3.884 (.033)	5.054 (.038)	4.555 (.033)	4.933 (.034)	4.076 (.043)	5.658 (.037)	3.767 (.034)	5.082 (.038)
Grade[b]	−0.025 (.005)	−0.010 (.008)	−0.059 (.008)	−0.089 (.007)	0.037 (.008)	0.010 (.008)	−0.007 (.007)	−0.031 (.008)	0.016 (.011)	−0.019 (.007)	0.033 (.008)	0.005 (.007)
Grade_q[b]	–	0.000 (.006)	0.023 (.006)	−0.015 (.005)	−0.003 (.006)	0.001 (.005)*	–	−0.015 (.006)*	0.000 (.008)	0.013 (.005)*	–	–
Grade_c[a]	–	–	–	−0.003 (.003)	–	−0.007 (.003)	–	−0.010 (.003)	0.017 (.004)	−0.009 (.003)	–	–
Gender	−0.490 (.047)	−0.287 (.052)	−0.377 (.075)	–	0.174 (.049)	0.146 (.056)	0.067 (.049)*	0.126 (.050)	0.595 (.064)	0.341 (.054)	−0.269 (.050)	−0.350 (.056)
Gender × Grade	–	−0.015 (.013)*	–	–	0.024 (.012)	–	−0.024 (.011)	0.000 (.012)*	−0.022 (.015)*	–	0.051 (.012)	–
Gender × Grade_q	–	0.021 (.009)	–	–	−0.029 (.009)	–	–	0.019 (.008)	0.032 (.012)	–	–	–
Gender × Grade_c	–	–	–	–	–	–	–	–	–	–	–	–
Random effects												
Between-student variance												
Constant/constant	0.631 (.032)	0.564 (.043)	1.450 (.084)	0.900 (.086)	0.471 (.037)	0.668 (.043)	0.676 (.034)	0.531 (.031)	0.941 (.056)	0.638 (.079)	0.609 (.034)	0.725 (.043)
Constant/grade	−0.016 (.004)	−0.015 (.005)	−0.020 (.010)	0.044 (.008)	−0.014 (.005)	−0.002 (.007)	−0.009 (.005)	0.005 (.005)	0.000 (.000)	0.027 (.007)	−0.011 (.005)	−0.007 (.007)
Constant/Grade_q	–	−0.026 (.006)	−0.027 (.010)	0.004 (.019)	−0.023 (.005)	0.000 (.000)	–	0.000 (.000)	−0.014 (.007)	−0.021 (.017)	–	–
Constant/Grade_c	–	–	–	0.005 (.004)	–	0.007 (.003)	–	0.000 (.000)	0.013 (.004)	0.007 (.004)	–	–
Grade/grade	0.008 (.002)	0.009 (.004)	0.014 (.005)	0.003 (.010)	0.013 (.003)	0.008 (.003)	0.007 (.002)	0.002 (.002)	0.000 (.000)	0.012 (.010)	0.006 (.002)	0.016 (.003)
Grade/Grade_q	–	0.005 (.001)	−0.001 (.001)	0.002 (.001)	0.002 (.001)	0.000 (.000)	–	0.000 (.000)	0.000 (.000)	0.004 (.001)	–	–
Grade/Grade_c	–	–	–	−0.005 (.002)	–	−0.002 (.001)	–	0.000 (.000)	0.000 (.000)	−0.003 (.002)	–	–
Grade_q/Grade_q	–	0.004 (.001)	0.002 (.002)	0.009 (.005)	0.003 (.001)	0.000 (.000)	–	0.000 (.000)	0.005 (.002)	0.005 (.004)	–	–
Grade_q/Grade_c	–	–	–	−0.001 (.001)	–	0.000 (.000)	–	0.000 (.000)	0.000 (.001)	0.000 (.000)	–	–
Grade_c/Grade_c	–	–	–	0.001 (.001)	–	0.000 (.001)	–	0.000 (.000)	0.002 (.001)	0.000 (.001)	–	–
Within-student variance												
Constant/constant	0.395 (.013)	0.572 (.022)	1.067 (.038)	0.738 (.033)	0.601 (.021)	0.981 (.037)	0.408 (.014)	0.558 (.019)	1.016 (.042)	0.712 (.032)	0.623 (.020)	0.831 (.027)

Note. Unless otherwise indicated (*), all *b* coefficients statistically significantly improved the model fit as indicated by the change in deviance test. _q = quadratic terms; _c = cubic terms. The dash indicates the variable did not significantly improve model fit.

[a]Random at both student and occasion levels.

[b]Random at the individual student level.

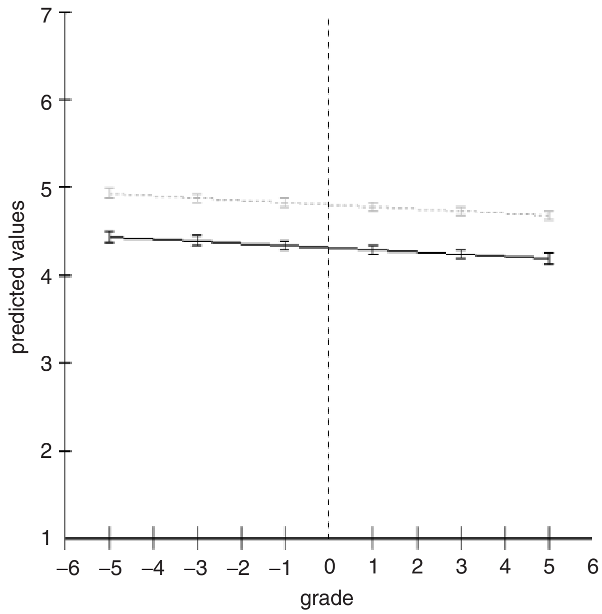

Figure 1. Latent growth model for boys' and girls' math talent perceptions through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line). Polynomial contrasts on *x* axis for all figures represent start of Grade 7, end of Grade 7, middle of Grade 8, and start of Grades 9, 10 and 11.

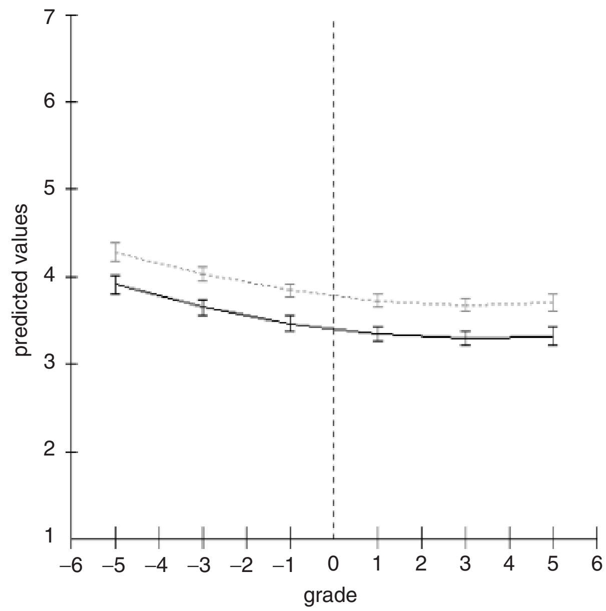

Figure 3. Latent growth model for boys' and girls' intrinsic value for math through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

was centered about the grand mean grade (Grade 9), intercept (constant) parameters refer to estimates at Grade 9, linear parameters (grade) refer to rate of change at Grade 9, quadratic parameters (Grade_q) refer to concavity at Grade 9, and cubic parameters (Grade_c) refer to cubic growth at Grade 9. Linear trajectories indicate consistent increase or decrease over time, quadratic trajectories indicate acceleration or deceleration in the rate of change over time, and cubic trajectories could indicate a decrease followed by a plateau and then a further decrease, for example.

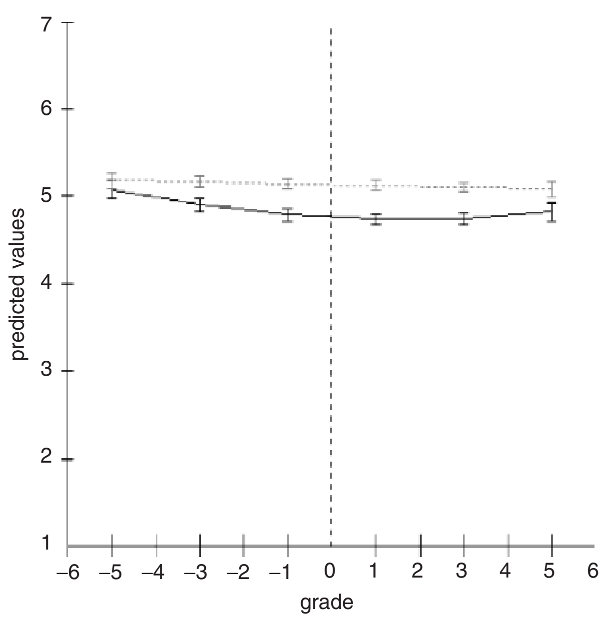

Figure 2. Latent growth model for boys' and girls' math success expectancies through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

Results

Trajectories for Math

Developmental trajectories for math- and English-related self-perceptions, values, and task perceptions were explained by different combinations of variables in each case, summarized in Table 5. Both math self-perception variables were characterized by gender differences favoring boys of magnitude around about 0.5 on the 7-point scales. However, for success expectancies, 95% confidence intervals for gender groups overlapped at the initial time point, indicating that both groups commenced Grade 7 expecting similar levels of success in math. Talent perceptions exhibited a linear decline through secondary school, with boys maintaining consistently higher perceptions than girls throughout Grades 7 to 11 (see Figure 1). In contrast, expectancies for success remained relatively stable for boys, whereas girls' expectancies displayed a curvilinear pattern, in

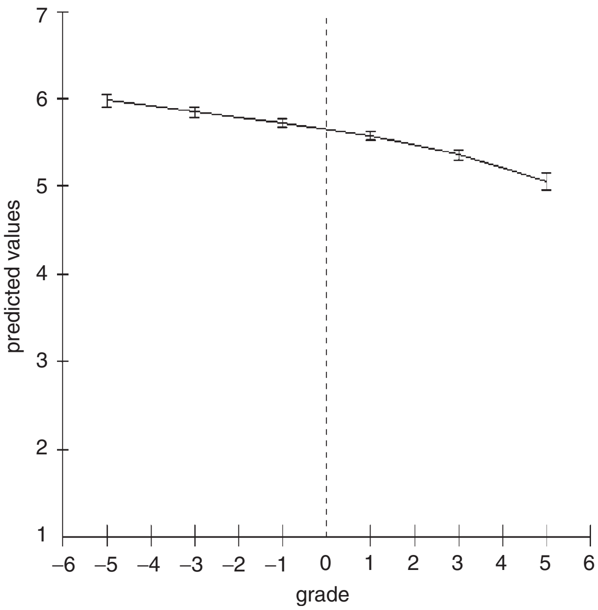

Figure 4. Latent growth model for math utility value through Australian Grades 7 to 11 with 95% confidence intervals appended.

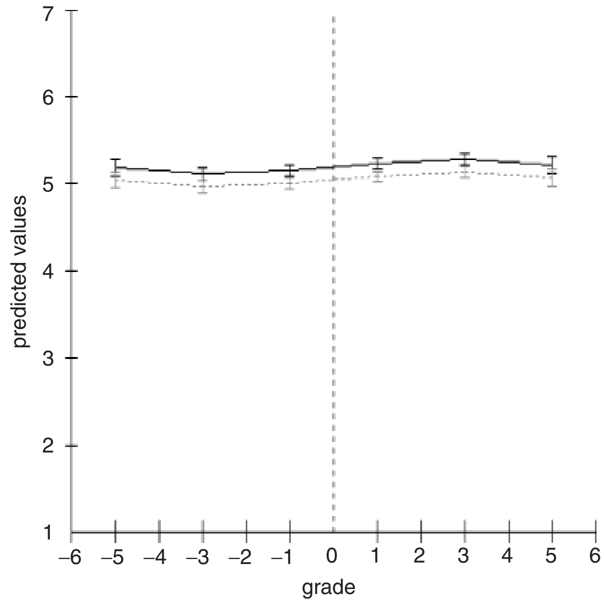

Figure 6. Latent growth model for boys' and girls' math perceptions of effort required through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

which their expectancies declined through junior high then recovered in senior years, although not to the same level as at the commencement of high school in Grade 7 (see Figure 2).

Intrinsic value for math was characterized by a consistent gender difference favoring boys, again of magnitude approximately 0.5 on the 7-point scale. For all students, intrinsic value declined through junior high and plateaued in senior years (see Figure 3). In contrast, boys and girls had similar math utility values, which declined through secondary school, with the extent of decline becoming greater over time (see Figure 4).

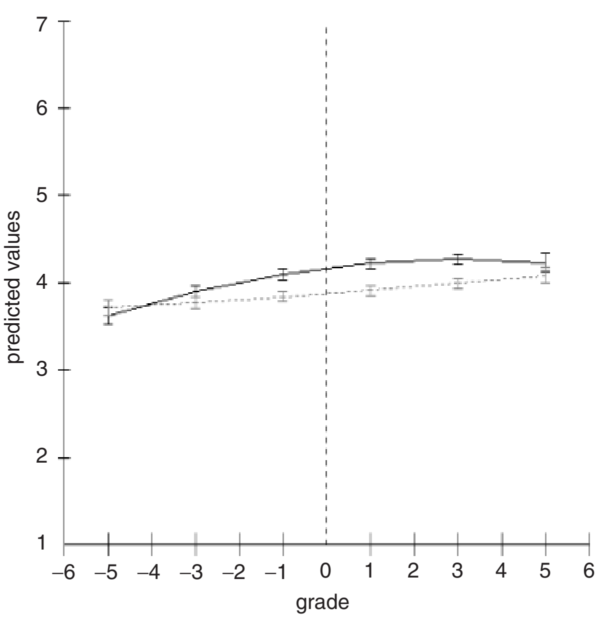

Figure 5. Latent growth model for boys' and girls' math difficulty perceptions through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

Girls perceived math as more difficult than did boys through most of secondary school, although Figure 5 shows overlapping 95% confidence intervals at both the commencement and end of Grade 7 as well as at the final Grade 11 time point. This indicates that girls perceived math as statistically significantly more difficult than did boys through Grades 8 to 10 only, with the maximum magnitude of gender difference reaching approximately 0.5. Girls perceived math as increasingly difficult through Grades 7 to 9, with difficulty perceptions plateauing from Grades 9 to 11. In contrast, boys exhibited a consistent (linear) but slight increase.

All students perceived math as requiring slightly reduced effort over Grade 7, a slight increase in effort from the end of Grade 7 through Grade 10, and a slight reduction in effort over Grades 10 to 11 (see Figure 6). Although the addition of gender to the model improved the model fit, and the predicted values for girls were higher than those for boys, confidence intervals for gender groups overlapped at Grades 7 and 11, indicating that estimates did not

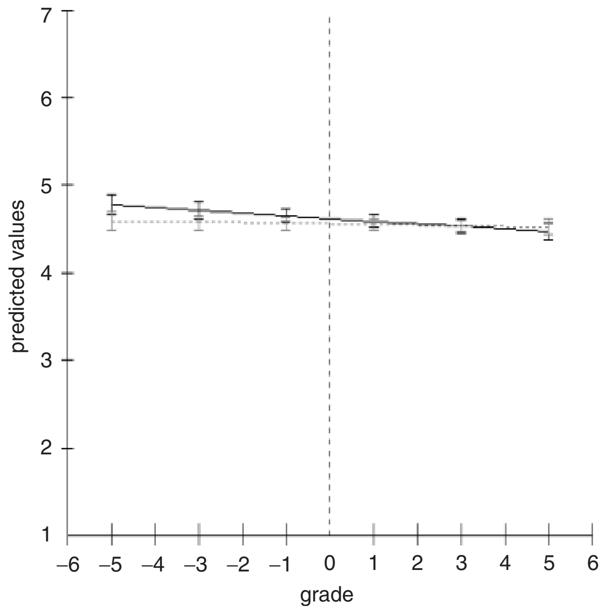

Figure 7. Latent growth model for boys' and girls' English talent perceptions through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

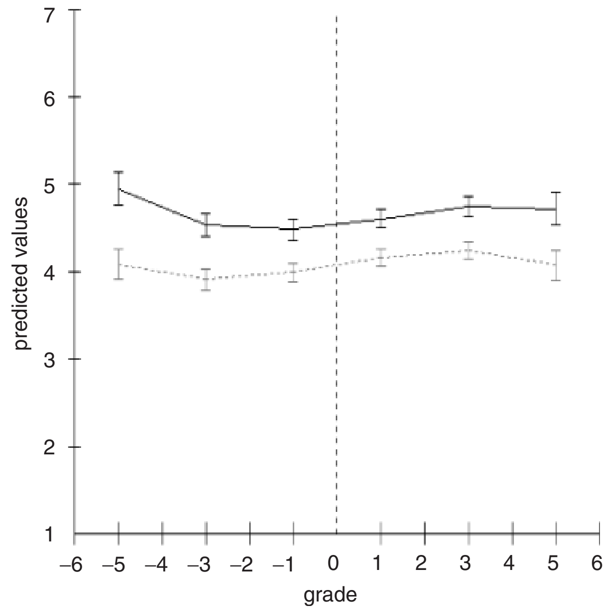

Figure 9. Latent growth model for boys' and girls' intrinsic value for English through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

differ significantly at these points. From Grades 8 though 10, however, girls' perceptions of effort required in math were statistically significantly higher than those for boys, with magnitude of approximately 0.25 on the 7-point scale.

Trajectories for English

English talent perceptions declined for girls and remained relatively stable for boys through secondary school (see Figure 7), although overlapping 95% confidence intervals at every grade point indicated

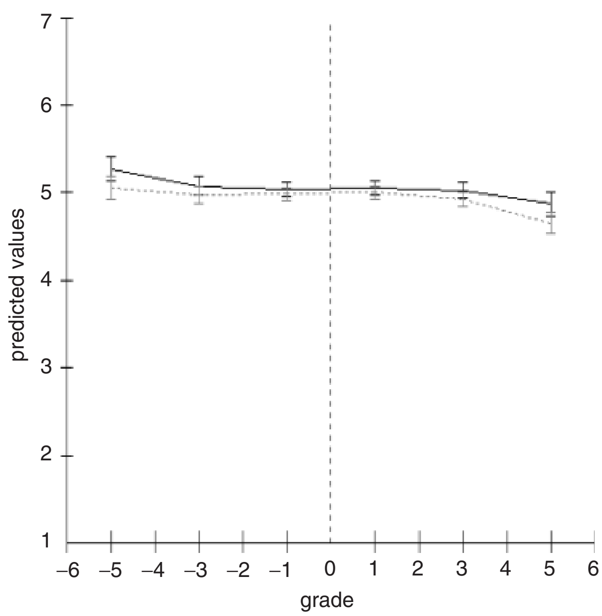

Figure 8. Latent growth model for boys' and girls' English success expectancies through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

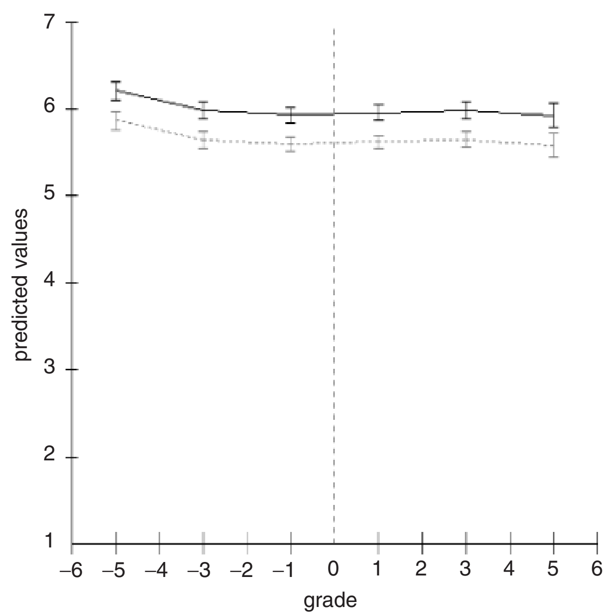

Figure 10. Latent growth model for English utility value through Australian Grades 7 to 11 with 95% confidence intervals appended.

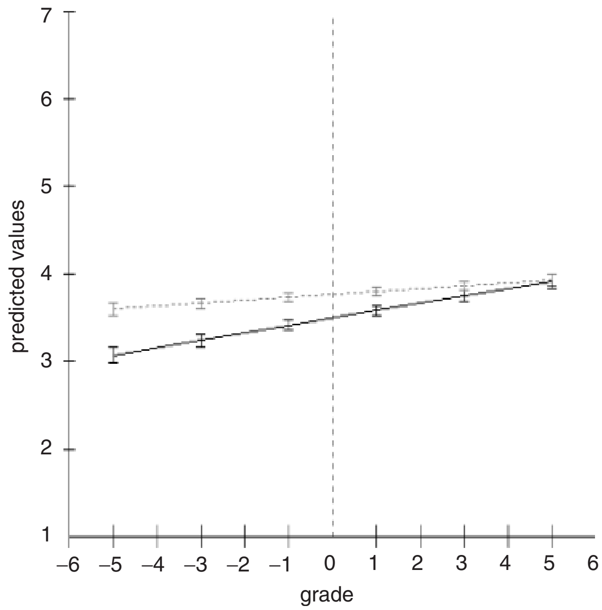

Figure 11. Latent growth model for boys' and girls' English difficulty perceptions through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

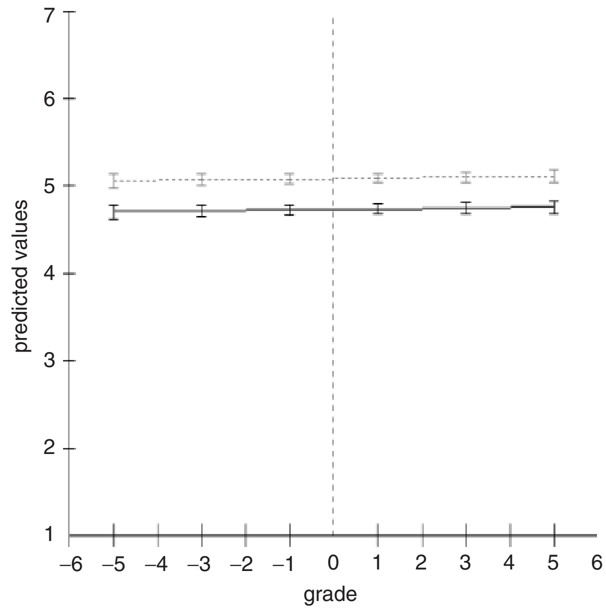

Figure 12. Latent growth model for boys' and girls' English perceptions of effort required through Australian Grades 7 to 11 with 95% confidence intervals appended (girls represented by solid black line).

that boys' and girls' talent perceptions did not differ statistically significantly through Grades 7 to 11. English success expectancies declined for both boys and girls from the beginning to end of Grade 7, remained relatively stable until Grade 10, then declined again from Grades 10 to 11 (see Figure 8). The extent of decline was slightly greater for girls than for boys over Grade 7, and the reverse was true over Grades 10 to 11, although point estimates did not differ statistically significantly across gender groups. Estimates for boys and girls were similar at each grade point, evidenced by overlapping 95% confidence intervals.

English values in the form of intrinsic and utility values declined over Grade 7 and again between Grades 10 and 11 (see Figures 9 and 10). For intrinsic value, some recovery occurred from the end of Grade 7 through Grade 10, although not to initial Grade 7 levels. Utility values plateaued between the end of Grade 7 and Grade 10, with no evidence of recovery following initial declines through Grade 7. Gender differences favoring girls were statistically significant for both English intrinsic and utility values. As for English success expectancies, girls suffered a slightly greater decline for intrinsic value than did boys at the beginning of junior high, and the reverse occurred over Grades 10 and 11 (see Figure 9). The magnitude of gender difference was greater for English intrinsic value than for any other construct of the set examined, reaching a maximum magnitude of approximately 1. For English utility values, girls and boys followed similar developmental trajectories, with girls maintaining consistently higher ratings than boys (see Figure 10) of magnitude around 0.5 on the scale.

Students perceived English as increasingly difficult over time, as evidenced by a linear effect. Girls initially rated English as substantially (approximate magnitude 0.5) less difficult than did boys on commencement of Grade 7 (see Figure 11), but girls' English difficulty ratings increased steeply and linearly through Grades 7 to 11. Boys' ratings also increased linearly, although with a less steep gradient than girls'. By Grades 10 and 11, boys' and girls' estimates were similar, evidenced by overlapping 95% confidence intervals. All students experienced a slight linear increase in perceptions of effort required in English through Grades 7 to 11, with boys maintaining consistently higher ratings than girls (see Figure 12) of approximate magnitude 0.5.

Discussion

As anticipated, developmental changes for this expanded set of expectancy-value constructs were negative through secondary school, with some indication that transitions at Grade 7 and after Grade 10 had stronger negative effects. Gender differences favored boys in math and girls in English, and there was little evidence for a gender intensification or gender convergence hypothesis.

Age Differences

Linear declines for talent perceptions in math and English and task beliefs in English implied changes were not tied to grade-related contextual changes. Declines in perceptions of effort required in math over Grade 7 as well as between Grades 10 and 11 may relate to structuring of the math curriculum in NSW Australia. Grade 7 math is largely repetition of previously learned material to increase consolidation before proceeding to new material in subsequent years. This may well lead students to believe they do not need to input as much effort in Grade 7. The fact that there were no corresponding declines in English perceptions of effort required lends support to this explanation because the NSW Australian English curriculum does not have this inbuilt repetition through Grade 7. Grade 11 declines may again be explained by organizational changes in math instruction in NSW schools, as in senior Grades 11 and 12 some relaxation may occur after students have chosen the HSC math level they perceived as most suitable for them.

English expectancies, intrinsic value and utility value appeared most vulnerable to declines over Grade 7 and from Grades 10 to 11, which may be explained by structural changes in the school environment at these points. Grade 7 is the first year of secondary school in NSW Australia, and declines in perceptions after transition to junior high have been well documented for self-esteem (Seidman, Allen, Aber, Mitchell, & Feinman, 1994), self-concept of ability (Wigfield et al., 1991), perceptions of competence (Anderman & Midgley, 1997), and liking of school subjects (Wigfield et al., 1991), with further declines through the first year of junior high also documented (Watt, 2000). Some theorists have suggested these negative changes are likely to occur because of the physiological and psychological pubertal changes occurring at this time (e.g., Blyth, Simmons, & Carlton-Ford, 1983; Hill & Lynch, 1983; Rosenberg, 1986; Simmons, Blyth, Van Cleave, & Bush, 1979). This view has been challenged by research showing that declines in students' expectancies and values in math relate to differences in the classroom environment before and after transition, interpreted in the form of a model of person–environment fit (Eccles & Midgley, 1989, 1990). This suggests that lack of fit between the junior high school environment and the needs of young adolescents has a negative impact on students.

This is also likely to be the case in NSW Australia, given similar structural changes such as the larger school and class sizes, disruptions to social and peer networks, more abrupt delivery of discipline, more rigorous academic standards, and increased normative assessment. The Schools Council (1993) in Australia has documented that students experience difficulties on transition to Grade 7 because of the large number of teachers with whom students are expected to deal on a daily basis, as well as the large range of academic subjects in secondary school. Prior research with this age group in the Australian context has also identified a negative psychological impact on commencement of Grade 7 (e.g., Trent, Russell, & Cooney, 1994; Watt, 2000; Yates, 1999). In the NSW Australian context, structural changes also occur on commencement of Grade 11, when students select their senior high courses for the HSC and select within each academic domain which difficulty level they wish to study. Although this autonomy in student choice might be expected to produce positive effects, other major changes at this time include the introduction of school-based assessment tasks, which contribute to students' final HSC result, generally accompanied by an increased homework load. These changes may be expected to exert stress on students, decreasing the fit between their needs and preferred school environment. It is interesting that different patterns were evident for English- and math-related perceptions, and future work should further investigate reasons for domain differences.

Curricular features may also account for declines in math values. The initial steep decline in intrinsic value through junior secondary years was similar to that identified by Fredricks and Eccles (2002) and could be accounted for in the NSW Australian context by the nature of the junior high math curriculum, which is focused on consolidation of material previously learned in elementary school, as the trajectory began to flatten out after Grade 8. The later sharp declines in math utility values could appear after the oft-repeated teacher rhetoric about the importance of math begins to wear off, particularly in light of competing developing interests for students as they progress through secondary school. Alternatively, the sharp declines could be due to math becoming progressively more abstract and hence less obviously useful by senior years.

Findings of accelerating declines in math utility values contrast with findings of decelerating declines by Fredricks and Eccles (2002) and may be due to their use of a combined utility–attainment values factor. It is likely, for example, that attainment value increases in senior high because of the influence of matriculation assessments and post-school plans, although these may not enhance utility value. Changes on transition to senior high played out most evidently for values constructs in both academic domains, suggesting that increased assessment pressures leading to the final major HSC examination in senior high years may negatively affect students' values because of an increasing focus on outcomes and performance.

Gender Differences

Gender effects were identified for all constructs except math utility value and English self-perceptions (talent perceptions and success expectancies). Similar math utility values for boys and girls may be due to the socially emphasized importance of math for all students in NSW Australian schools. Fredricks and Eccles (2002) found no gender differences on their combined utility–attainment value construct. Although Jacobs et al. (2002) found higher math values for girls in early elementary and late secondary school, trajectories were based on a composite intrinsic–utility–attainment value factor, which appears to have masked different gender effects on component values given that Fredricks and Eccles found greater declines for girls than for boys on math intrinsic value using the same data set. Similar English self-perceptions for boys and girls may be due to boys' tendency to overrate their capabilities (e.g., Bornholt et al., 1994) because other analyses with the present sample showed English performance differences favoring girls (Watt, 2002b). Findings of similar English self-perceptions were in contrast to Jacobs et al.'s findings that girls had substantially higher ability beliefs in language arts, which could be partly accounted for by differences in measures between their operationalization of ability in terms of competence beliefs, in contrast to differentiated perceived talent and success expectancies assessed in the present study.

Earlier I argued that the perceived talent measure taps the aptitude component of ability beliefs, whereas ability beliefs operationalized as perceived competence are likely to be based partly on perceived aptitude and partly on performance evaluations. In this case, convergent math and divergent English gendered trajectories for perceived competence may not be surprising, given related performance changes for boys and girls through secondary school. Jacobs et al.'s (2002) quadratic patterns for English may then also be explained by the relatively stable skills set developed and focused on in English instruction compared with the more hierarchically and sequentially structured instruction in math. In contrast, the new perceived talent measure appears to provide an assessment of ability beliefs that is less contingent on performance feedback, exhibiting linear declines of similar magnitude for boys and girls.

Boys exhibited linear decreases for math success expectancies and linear increases for difficulty perceptions, whereas girls exhibited the greatest negative changes through the first half of secondary school for these two constructs. This may relate to early adolescence being the years when social messages are most salient for adolescent girls, and girls have been found to be more sensitive than boys to failure information at earlier ages (Parsons & Ruble, 1977). Recovery for girls from Grades 10 to 11 may be brought about by increasingly realistic perceptions based on social comparative processes (Nicholls, 1978), teacher or family encouragement as the HSC approaches, students' own realization of the importance of the HSC and resultant focus on academic work, or organizational changes in NSW Australian Grade 11. It is plausible that after students have chosen the math level they believe is most suitable for them at Grade 11 (which for girls is likely to be lower than for boys; Watt, 2002b) this may lead to more positive perceptions about expected success and math difficulty for girls. This explanation could account for girls' perceptions recovering to align more with boys' perceptions of expected success and math difficulty by Grade 11.

In general, the magnitude of gender differences remained stable, with differently shaped trajectories for boys and girls on only three constructs of the full set. There was little evidence for either gender intensification (e.g., Eccles, 1987; Hill & Lynch, 1983; Maccoby, 1966) or gender convergence (Fredricks & Eccles, 2002; Jacobs et al., 2002). Absence of increasingly divergent gendered trajectories may imply that the point of divergence for boys' and girls' perceptions is at an earlier age. However, given that gender differences in ability beliefs and values have been identified in early school years (e.g., Eccles et al., 1993; Marsh, 1989; Wigfield et al., 1997), it appears likely that boys and girls commence school with these different beliefs already in place. Jacobs et al. (2002) attributed such early gender differences to socialization experiences in the home and the wider society, such as portrayals of men and women in the media, and the stable magnitudes for gender differences suggest that sex-typed messages similarly affect boys' and girls' perceptions. It is likely that similar socialization influences operate in the Australian context, particularly given the prevalence of American television and advertising.

Jacobs et al. (2002) based arguments for gender convergence in math and English largely on their trajectories for math ability beliefs. They did not identify this pattern consistently in their data, which showed evidence of divergence for math and English values through secondary school and mixed results for English ability beliefs. In contrast, boys' and girls' developmental trajectories were generally parallel in the present study, with little evidence for either a gender convergence or a gender divergence hypothesis. For ability beliefs, this may be accounted for by the use of the perceived talent measure in place of the Jacobs et al. measure for ability beliefs as discussed. For values, the analysis of component intrinsic and utility values compared with the composite values construct employed by Jacobs et al. makes the two sets of findings difficult to compare. Jacobs et al. reported boys as exhibiting greater declines than girls through secondary school for math values, although Fredricks and Eccles (2002) in their analysis of the same data set found girls to show greater declines than boys for math intrinsic value, and no gender differences for their composite math utility–attainment value construct, which underscores the importance of examining component values constructs. Jacobs et al.'s reported greater declines for boys' English values also contrast with parallel English utility values for boys and girls in the present study, likely because of the current examination of component rather than combined values. Similar to Jacobs et al.'s trajectories for English values, current data show greater declines for boys during senior high. In contrast to Jacobs et al., however, current data also identify greater declines for girls through junior high, most likely due to the estimation of more complex developmental patterns in this study compared with the restriction of polynomials to quadratic forms by Jacobs et al. It is difficult to compare North American with NSW Australian findings because of these methodological differences between the studies.

In relation to the three constructs where there was evidence for gendered developmental trajectories, the two math constructs showed girls to be exhibiting more negative change than boys through middle secondary school grades, but recovering somewhat by Grade 11. These constructs were math difficulty perceptions and success expectancies, not assessed by Jacobs et al. (2002). In contrast to Jacobs et al., who concluded that boys exhibited more negative changes than did girls in language arts, the present study (which examined component values constructs and tested for more complex developmental patterns) found that girls showed greater declines than boys earlier, and the reverse later. These findings emphasize the importance of retaining a focus on girls' academic well-being alongside current emphases on boys' academic progress, and caution against concluding that it is boys who are necessarily most at risk through secondary school. It will be useful for future research in North America to assess gendered developmental trajectories for the differentiated values and self-perceptions as well as task beliefs in math and English, and to contrast these with the patterns identified in NSW Australia so that gendered patterns can be compared across the two cultures when methodological features are controlled.

Limitations and Future Directions

There is a need for additional studies from other social and cultural contexts to identify how the range of self-perceptions, values, and task perceptions constructs are dependent on contextual features of different school systems and gender roles. Future research should investigate how and why school structural and curricular changes may bring about negative changes in perceptions and values, especially during the transition to senior high. Additionally, researchers should examine within-individual explanatory processes.

Jacobs et al. (2002) documented that changes in students' competence beliefs accounted for much of the change in values through Grades 1 to 12, although it is also possible that this relationship could operate in the reverse direction. Complex interrelationships between the range of perceptions studied here are likely. It will be important for future research to tease out and clarify the causal sequencing among these correlated constructs so that causal within-individual process explanations, in addition to contextual explanations focused on in the present study, can be validly applied to explaining developmental trajectories for adolescents' self-perceptions, values and task perceptions.

A limitation of the present study is that adolescents' actual achievement was not controlled for, and this is a factor likely to contribute to explaining developmental trajectories through secondary school. This study was also conducted with a relatively homogeneous sample in terms of ethnic group and socioeconomic status, and future research should investigate gendered trajectories with different ethnic and socioeconomic groups. It is possible that gender differences and developmental declines may be more pronounced in other groups, and the gender intensification hypothesis should not be ruled out without testing this across a range of cultural contexts. The present study's contribution rests on its examination of developmental trajectories for a range of expectancy-value constructs with a sample of NSW Australian secondary school students. Further studies from a range of cultures are needed to assess which trajectories may be culturally specific or tied to particular school systems, and how trajectories for boys and girls may differ within and across cultures.

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