Motivating boys and motivating girls: Does teacher gender really make a difference?

Andrew Martin
Herb Marsh
University of Western Sydney

We explore the impact of student gender, teacher gender, and their interaction on academic motivation and engagement for 964 junior and middle high school students. According to the gender-stereotypic model, boys fare better academically in classes taught by males and girls fare better in classes taught by females. The gender-invariant model suggests that the academic motivation and engagement of boys and girls is the same for men and women teachers. We also examine the relative contribution of student-, class-, and school-level factors, finding that most variation was at the individual student level. Of the statistically significant main effects for gender, most favoured girls. In support of the gender-invariant model, academic motivation and engagement does not significantly vary as a function of their teacher's gender, and in terms of academic motivation and engagement, boys do not fare any better with male teachers than female teachers.

Introduction

Do boys fare best in classes taught by male teachers? Do girls fare best in classes taught by female teachers? In recent years, there has been considerable popular debate around these questions. A recent media release by the Attorney General's Department reported, 'The Government is extremely concerned about the decreasing number of male teachers and male role models, particularly in primary schools and the possible effect on learning and development of both boys and girls in schools' (Ruddock, 2004). An Australian Labor Party (2004, p. 14) policy document leading up to the 2004 federal election stated: 'now, more than ever, young boys need contact with men who can offer positive role models and mentor them in the right direction . . . Labor wants to see many more male teachers teaching and making a difference to the lives of young boys in our schools'. There have also been a number of reviews commissioned by government (House of Representatives Standing Committee on Education and Training, 2002; Lingard, Martino, Mills, & Bahr, 2002; Martin, 2002).

The present study seeks to address this debate by specifically examining the impact of student gender (the term 'gender' rather than the term 'sex' is used

throughout the article) as a function of teacher gender on academic motivation and engagement. Essentially, it assesses two competing models. The first model can be considered a *gender-stereotypic model* which suggests that boys fare better in classes taught by males and girls fare better in classes taught by females, extended perhaps by the gender intensification principal suggesting that gender-role stereotypes becomes increasingly important with age. The second model can be considered a *gender-invariant model* which suggests that the motivation and engagement of boys and girls does not significantly vary as a function of their teacher's gender.

Over the past two decades there has been a great deal of research investigating student motivation and engagement. Most of this research (but with important exceptions—Roeser, Eccles, & Sameroff, 2000) is conducted on the assumption that motivation is primarily a student-level construct and does not account for the fact that there is also variation at other levels such as at the class and school levels. To date, it appears that most of the multilevel research has been directed towards academic achievement. In terms of academic achievement, there is existing evidence that a good proportion of the variance is explained at the student and class levels (Hill & Rowe, 1996; Rowe & Rowe, 2002).

To complement the existing body of research into the multilevel nature of achievement, the present study applies multilevel statistical procedures to determine the relative contribution of student, class, and school factors in boys' and girls' academic motivation and engagement and, in the same model, determine the relative contribution of student gender and teacher gender across junior and middle high school classes. The findings hold not only pedagogical implications for practitioners and researchers, but also have potential to better inform popular debate surrounding boys' and girls' educational needs and how these can best be met.

Gender and educational outcomes

There are gender differences on key educational outcomes. For the most part, these differences are not in boys' favour. Indeed, given this, the education of boys has been an issue of ongoing debate, research, and policy implementation over the past decade (Weaver-Hightower, 2003). On average, girls outperform boys in a greater number of subjects and there are more girls among the higher achieving students (Collins, Kenway, & McLeod, 2000). More females complete school (Department of Education, Training and Youth Affairs, 2000). According to Marks and Fleming (1999), the ratio of early school leaving is 3:2 (males:females), although it needs to be noted that many boys leave school to take apprenticeships and when controlling for this factor, the gender gap in early school leaving is smaller. There are markedly higher rates of suspension for boys (Ainley & Lonsdale, 2000). Boys are more negative about school, see homework as less useful, are less likely to ask for help, and are more reluctant to do extra work. Moreover, teachers believe that boys are less able to concentrate, are less determined to solve difficult problems, and are less productive.

The interaction of student and teacher gender

There has been substantial anecdotal evidence pointing to the need for more male role models in boys' lives. This expressed social and emotional need has filtered into the academic domain and translated into the need for more male teachers in boys' lives. Indeed, in interviews with teachers as well as key researchers and policy makers in the boys' education debate, Martin (2002) found that participants consistently endorsed the need for more male teachers in boys' lives. This, it was considered by participants, was a key element to the success of any boys' education strategy.

However, in the same study, focus groups and interviews with boys themselves indicated no particular preference for male or female teachers on the topic of teaching and learning. Focus groups and interviews with girls derived similar findings. When asked about their most effective teachers, boys and girls were able to identify a solid list of key characteristics reflected in educational research (Hill & Rowe, 1996; Martin, 2002). The gender of the teacher did not emerge in any consistent fashion. Boys and girls were more concerned that their teacher could teach well than whether their teacher was male or female. Interestingly, there was a marginal preference for one gender over the other in relation to personal and emotional issues with boys preferring the involvement of male teachers and girls preferring the involvement of female teachers. Hence, from an academic perspective, boys and girls expressed a preference for a good teacher irrespective of gender, whereas from an emotional and personal development perspective, the gender of the teacher was partly an issue.

Because these findings were derived from qualitative methods, there is a need for generalisable quantitative work to determine whether and to what extent this occurs on a larger scale. Numerous commentators over the past four decades have noted the benefits to be derived from complementary quantitative and qualitative approaches to educational research (Patton, 2002) and motivation research is no exception (see Martin, Marsh, Williamson, & Debus, 2003).

Grade and gender

It appears that grade (year in school) is another significant factor in motivation and engagement. From a motivational perspective, the transition from junior high to middle high can be a difficult one resulting in declines in motivation, engagement, and performance—particularly in mathematics (Jacobs, Lanza, Osgood, Eccles & Wigfield, 2002). However, motivation and engagement can vary as a function of gender and grade. Martin (2005), for example, found that although both boys' and girls' motivation and engagement is lower in middle high school, only girls' motivation is relatively higher in senior high school. Hence, grade and gender are important elements to include in research on academic motivation and engagement. When studies concentrate on only one and not the other, vital information may be lost as to the level of student motivation and engagement as a function of the independent and interactive effects of gender and grade.

The hierarchical nature of motivation and engagement

Duda (2001) emphasised the need to evaluate the combined effects and interactions of individual motivation and class-level motivation on a variety of outcome measures as well as the theoretical basis for pursuing such research. She lamented, however, that this is rarely pursued in motivational research. Duda also indicated that particularly strong class-level effects might override the effects of individual orientations, whereas individuals with particularly strong motivation orientations are likely to be less affected by class-level motivation. Although there is a relatively more consistent line of research assessing the hierarchical nature of achievement, there is relatively little that examines the hierarchical nature of motivation and engagement and the issue of class-level motivation in the academic context (Midgley & Urdan, 1995). The present study therefore, not only examines the issue of student and teacher gender in motivation and engagement, but also in the same analysis accounts for the hierarchical structure of the data. Hence, the relative contribution of student and teacher gender can be assessed after accounting for variance at student, class, and school levels. This constitutes a powerful analysis of the contribution of teacher and student gender to motivation and engagement.

Present research

The present study explores (a) the extent to which student gender, teacher gender, and their interaction impact on student motivation; (b) the extent to which grade interacts with student gender and teacher gender to impact on motivation; (c) the extent to which motivation and engagement vary at student, class, and school levels; (d) the relative salience of each of these levels and what level accounts for most variance in motivation and engagement; (e) the implications of these findings for educational intervention aiming to enhance motivation and engagement; and (f) the implications of findings for current thinking and theorising about student motivation and engagement.

Method

Sample and procedure

The present study focuses on Year 8 and Year 10 high school students in their mathematics classes. The sample comprises 964 high school students in Year 8 (60%) and Year 10 (40%) from five Australian co-educational government schools. Just under half (48%) the respondents were girls and 52% were boys. The mean age of respondents was 14.30 (SD = 1.12) years. In total, 68 classrooms were surveyed. Fifty-five per cent of the teachers teaching the target classes were females and 45 per cent were males.

Teachers administered the Student Motivation and Engagement Scale (Martin, 2001) as well as a set of items capturing other educational constructs of relevance to students during class. The rating scale was first explained and a sample item presented. Students were then asked to complete the instrument on their own and to return the completed instrument to the teacher at the end of class.

Importantly, students rated their mathematics motivation and engagement in their mathematics class.

Materials

The instrument comprised the Student Motivation and Engagement Scale (Martin, 2001, 2003) as well as a set of other constructs deemed to be of relevance to the breadth of students' experience in the classroom.

The Student Motivation and Engagement Scale

The Student Motivation and Engagement Scale is an instrument that measures high school students' motivation and engagement. It is hypothesised to assess motivation through three adaptive cognitive dimensions, three adaptive behavioural dimensions, three impeding cognitive-affective dimensions, and two maladaptive behavioural dimensions of motivation and engagement. Each of the 11 factors comprises four items—hence it is a 44-item instrument. To each item, students rate themselves on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree). Martin (2001) has shown that the Student Motivation and Engagement Scale has a sound factor structure, comprises reliable and approximately normally distributed dimensions, is significantly associated with literacy, numeracy, and achievement in mathematics and English, and is sensitive to age- and gender-related differences in motivation.

Adaptive dimensions of motivation and engagement

Each adaptive dimension falls into one of two groups: cognitions and behaviours. Adaptive cognitions include self-efficacy, mastery orientation, and valuing of subject. Adaptive behaviours include persistence, planning, and study management.

Self-efficacy (e.g., 'If I try hard, I believe I can do my school work well'): Adapted in part from the Midgley et al. (1997) Patterns of Adaptive Learning Survey, self-efficacy is students' belief and confidence in their ability to understand or to do well in their schoolwork, to meet challenges they face, and to perform to the best of their ability.

Valuing of subject (e.g., 'Learning in this subject is important to me'): Adapted in part from Pintrich, Smith, Garcia, & McKeachie's (1991) Motivated Strategies for Learning Questionnaire, valuing of a subject is how much students believe what they learn in that subject is useful, important, and relevant to them or to the world in general.

Mastery orientation (e.g., 'I feel very pleased with myself when I really understand what I'm taught in this subject'): Adapted in part from Nicholls (1989), mastery orientation is being focused on learning, solving problems, and developing skills.

Planning (e.g., 'Before I start an assignment I plan out how I am going to do it'): Adapted in part from Miller, Greene, Montalvo, Ravindran, & Nichols (1996), planning is how much students plan their schoolwork, assignments, and study and how much they keep track of their progress as they are doing them.

Study management (e.g., 'When I study, I usually study in places where I can concentrate'): Adapted in part from Pintrich et al. (1991), study management refers

to the way students use their study time, organise their study timetable, and choose and arrange where they study.

Persistence (e.g., 'If I can't understand my school work at first, I keep going over it until I understand it'): Adapted in part from Miller et al. (1996), persistence is how much students keep trying to work out an answer or to understand a problem even when that problem is difficult or challenging.

Impeding cognitive-affective dimensions

Impeding cognitive-affective dimensions are anxiety, failure avoidance, and uncertain control.

Anxiety (e.g., 'When exams and assignments are coming up, I worry a lot'): Adapted in part from Pintrich and DeGroot (1990), anxiety has two parts: feeling nervous and worrying. Feeling nervous is the uneasy or sick feeling students get when they think about their school work, assignments, or exams. Worrying is their fear about not doing very well in their school work, assignments, or exams.

Failure avoidance (e.g., 'Often the main reason I work in this subject is because I don't want to disappoint my parents'): Adapted from an orientation outlined by Harter, Whitesell and Kowalski (1992), students have an avoidance focus when the main reason they do their school work is to avoid doing poorly or to avoid being seen to do poorly.

Uncertain control (e.g., 'I'm often unsure how I can avoid doing poorly in this subject'): Adapted in part from Connell's (1985) Unknown Cognitive Dimension of the Multidimensional Measure of Children's Perceptions of Control (1985), this subscale assesses students' uncertainty about how to do well or how to avoid doing poorly.

Maladaptive behavioural dimensions

Maladaptive behavioural dimensions are self-handicapping and disengagement.

Self-handicapping (e.g., 'I sometimes don't study very hard before exams so I have an excuse if I don't do as well as I hoped'): Adapted from the Academic Self-Handicapping Scale (Midgley, Arunkumar, & Urdan, 1996) and the Shortened Self-handicapping Scale (Strube, 1986), students self-handicap when they do things that reduce their chances of success at school. Examples are putting off doing an assignment or wasting time while they are meant to be doing their school work or studying for an exam.

Disengagement (e.g., 'I often feel like giving up in this subject'): Students are disengaged or at risk of disengagement when they feel like giving up in particular school subjects. Students high levels of disengagement tend to accept failure and behave in ways that reflect helplessness.

Educational 'Outcomes'

In order to conduct a more expansive analysis of the issues under focus, it was also of interest to explore the nature of effects on some other conceptually relevant educational constructs. To this end, the sample also administered items that explored students' enjoyment of the subject (e.g., 'I enjoy this subject'), class participation (e.g., 'I get involved in things we do in class'), educational aspirations

(e.g., 'I'd like to continue studying or training in this subject after I complete school'), teacher–student relationships (e.g.,'I get along well with my teacher'), and academic resilience (e.g.,'I think I'm good at dealing with school work pressures'). Psychometric properties of these scales are presented below.

Statistical analysis

Data analysis essentially involved two procedures: confirmatory factor analysis (CFA) and multilevel modelling. In the first instance, CFA was conducted to explore the psychometric properties of the instrument under focus. Having established the psychometrics, the analysis progressed to an assessment of variance as a function of student, class, and school level factors and the relative salience of a set of predictors comprising the main effects of grade, student gender, teacher gender and the interaction of these.

Confirmatory factor analysis

Confirmatory factor analysis (CFA), performed with LISREL version 8.54 (Joreskog & Sorbom, 2003), is the primary method used to test the psychometric properties of the Student Motivation and Engagement Scale and the other educational constructs. Maximum likelihood was the method of estimation used for the models. In evaluating goodness of fit of alternative models, the root mean square error of approximation (RMSEA) is emphasised. Although the RMSEA is apparently the most widely endorsed criterion of fit, also presented are the non-normed fit index (NNFI), the comparative fit index (CFI), the χ^2 test statistic, and an evaluation of parameter estimates. For RMSEAs, values at or less than .08 and .05 are taken to reflect an acceptably close fit and an excellent fit respectively. The NNFI and CFI vary along a 0 to 1 continuum in which values at or greater than .90 and .95 are typically taken to reflect acceptable and excellent fits to the data respectively. The EM Algorithm was used to handle missing data. Only 3.74 per cent of the data were missing and so the EM Algorithm was considered an appropriate procedure. We also explored a variety of alternative approaches to this problem, which showed that results based on the EM algorithm that we used were very similar to those based on the traditional pairwise and listwise deletion methods for missing data—as would be expected to be the case when there was so little missing data.

Multilevel modelling

For the present investigation, the data were conceptualised as a three-level model, consisting of student at the first level, class at the second level, and school at the third level. The multilevel analyses (Goldstein, 2003; Raudenbush & Bryk, 2002) were conducted using MLwiN version 2.00 (Rasbash, Steele, Browne, & Prosser, 2004). In preliminary analyses, a baseline variance components model (Rasbash et al., 2004) or intercept-only model (Hox, 1995) was used to evaluate how much variation in each of the outcome measures could be attributed to the school (level 3), the class (level 2) and the student (level 1). Following variance components models, the major focus of analyses was on a set of multilevel path models to test

the effects of student and teacher gender, grade, and their interactions on various dependent variables. The major analyses consisted of a three-level model, with student at the first level, class at the second level, and school at the third level. For each dependent variable, the predictor variables consisted of student gender, teacher gender, grade level, and the two-way and three-way interactions of these main effect factors.

Several data transformations were conducted to facilitate interpretations and infer interaction effects. We standardised (z-scoring) all variables to have $M = 0$, $SD = 1$ across the entire sample. Product terms were used to test interaction effects. In constructing these interaction effects, we used the product of individual (z-score) standardised variables. The product terms that were formed were not re-standardised.

Preliminary psychometric properties of the measures

Before conducting the central multilevel analyses, it was first important to establish the psychometric properties of the instrument used. This comprised a 16-factor CFA based on the 44-item Student Motivation and Engagement Scale items and the additional 20 items assessing each of the five additional educational constructs (enjoyment of subject, class participation, academic resilience, teacher–student relationship, and educational aspirations). For mathematics, the CFA yielded an excellent fit to the data ($\chi^2 = 7458.64$, $df = 1832$, NNFI = .97, CFI = .97, RMSEA = .047). Factor loadings are presented in Table 1. Taken together, the loadings are acceptable. Reliabilities (Cronbach's alpha) for each scale are presented in Table 1 as well. These data show that each scale can be considered reliable.

Results

Variance components model

Having established the psychometric properties of the instrument, we moved data analysis on to the issues under focus. The first part of this focus involved an assessment of the relative contribution of student-, class-, and school-level variance to the 16 motivation and engagement measures. The variance components model tests for such effects and this is conducted in MLwiN. The 16 measures were computed by aggregating the four items for each factor and then standardising ($M = 0$, $SD = 1$) this score. Findings are presented in columns two to four of Table 2. This table displays unstandardised parameters' estimates and the standard error.

Clearly, the bulk of variance is accounted for at the student level. That is, there is greater variation from student to student than there is from class to class or school to school. On some of the measures in mathematics there is significant class-level variance. Specifically, there is significant class-level variation on mastery orientation, self-handicapping, disengagement, enjoyment of the subject, educational aspirations, and teacher–student relationship. Perhaps not surprisingly, where there is class-level variation, it appears to be greatest on the measure of teacher–student relationship which was the only factor on which there was relatively more substantial teacher-level variation.

Table 1 Factor Loadings and Reliabilities for the Student Motivation and Engagement Scale and Educational 'Outcomes'

	Item 1	Item 2	Item 3	Item 4	Reliability
	Student Motivation and Engagement Scale Factors				
Self-efficacy	.69	.70	.65	.74	.77
Mastery orientation	.68	.72	.76	.81	.81
Valuing of subject	.57	.75	.74	.68	.76
Planning	.66	.77	.77	.45	.74
Study management	.69	.70	.83	.72	.82
Persistence	.61	.72	.73	.77	.80
Anxiety	.75	.69	.55	.70	.77
Failure avoidance	.80	.82	.47	.61	.76
Uncertain control	.64	.67	.75	.73	.79
Self-handicapping	.64	.80	.77	.73	.82
Disengagement	.62	.72	.71	.79	.80
	Educational 'Outcomes'				
Educational aspirations	.84	.85	.68	.64	.85
Enjoyment of subject	.68	.85	.67	.79	.84
Academic resilience	.67	.69	.71	.68	.79
Class participation	.73	.80	.86	.79	.87
Teacher–student relationship	.77	.85	.78	.80	.89

Multilevel path modelling

The second model under focus built on the variance components model presented above to also include the predictive effects of grade (G), student gender (S), teacher gender (T) and the interactions of these three main effects, $G \times S$, $G \times T$, $S \times T$, and $G \times S \times T$. Findings are presented in the second part of Table 2.

There are three major findings from this set of analyses. First, the inclusion of the main and interaction effects do not alter the effects of student- and class-level variance in any substantial way. Second, consistent with this, is the finding that there are relatively few significant main and interaction effects. Third, of all possible $S \times T$ and $S \times T \times G$ effects (that is, interactions involving teacher and student gender), only one statistically significant effect emerged out of 64 that were tested—and on closer inspection, even this one significant effect does not reflect the stereotypical view that boys fare better under male teachers (discussed more fully below).

Grade is a significant predictor of anxiety and academic resilience with Year 10 students scoring higher than Year 8 students on anxiety and Year 8 students scoring higher than Year 10 students on academic resilience. Student gender significantly predicts mastery orientation, study management, anxiety, and academic resilience such that girls score higher than boys on all factors (including anxiety which is not in girls' favour) with the exception of academic resilience where boys score higher than girls. Teacher gender predicts no dependent variables. There is one significant teacher gender × student gender interaction on teacher–student

Table 2 Parameters Estimates and Standard Errors for Variance Components and Multilevel Path Models

	Variance Components Model			*Multilevel Path Model Including Gender and Grade Main and Interaction Effects*									
	Student level	*Class level*	*School level*	*Student level*	*Class level*	*School level*	*Grade (G)*	*Student Gender (S)*	*Teacher (Gender (T)*	*S x G*	*S x T*	*T x G*	*S x T x G*
				Student Motivation and Engagement Scale Factors									
Self-efficacy	951(045)*	046(020)	000(000)	938(044)*	035(017)	000(000)	057(042)	-035(033)	-046(042)	-040(033)	057(033)	-068(042)	-083(033)
Valuing of subject	944(044)*	053(021)	000(000)	932(044)*	040(018)	000(000)	-032(043)	-008(033)	-061(043)	-032(033)	062(043)	-107(043)	-077(033)
Mastery orientation	943(044)*	057(022)*	000(000)	922(043)*	034(017)	000(000)	097(041)	-144(033)*	-077(042)	-031(033)	022(033)	-066(041)	051(033)
Planning	971(045)*	028(016)	000(000)	967(045)*	024(015)	000(000)	-028(040)	-047(033)	033(040)	006(033)	021(033)	-051(040)	-007(033)
Study management	999(046)*	000(000)	000(000)	983(045)*	000(000)	000(000)	029(033)	-119(033)*	-002(033)	-012(033)	-006(033)	-034(033)	-034(033)
Persistence	942(044)*	050(021)	009(012)	936(044)*	039(019)	010(012)	-005(043)	-080(033)	002(044)	-025(033)	-006(033)	-076(045)	-061(033)
Anxiety	975(046)*	019(015)	005(008)	901(041)*	000(000)	003(005)	133(032)*	-287(032)*	-023(032)	-077(032)	-027(032)	-004(033)	-048(032)
Uncertain control	935(044)*	058(023)	007(011)	927(043)*	055(022)	005(009)	006(046)	-062(033)	-031(047)	-052(033)	001(033)	057(047)	-060(033)
Failure avoidance	968(045)*	033(017)	000(000)	964(045)*	031(017)	000(000)	-036(041)	-037(033)	-050(041)	-039(033)	-017(033)	-024(041)	-018(033)
Self-handicapping	887(042)*	122(034)*	000(000)	887(042)*	099(029)*	000(000)	-103(054)	014(032)	-058(054)	025(032)	022(032)	078(054)	-002(032)
Disengagement	942(044)*	057(022)*	000(000)	938(044)*	054(021)*	000(000)	018(046)	-014(033)	013(046)	024(033)	-016(046)	058(046)	047(033)
				Educational "Outcomes"									
Class participation	972(046)*	026(016)	000(000)	964(045)*	023(016)	001(005)	031(039)	-019(033)	-020(040)	041(033)	050(033)	-034(040)	-048(033)
Enjoy subject	916(043)*	082(026)*	000(000)	908(043)*	071(025)*	001(008)	075(049)	-037(033)	-022(050)	-005(033)	041(033)	-038(049)	-072(033)
Ed aspirations	918(043)*	080(026)*	000(000)	913(043)*	061(023)*	006(011)	078(047)	022(033)	-046(048)	-001(033)	037(033)	-057(048)	-057(033)
Tch-student r'ship	788(037)*	206(049)*	000(000)	775(036)*	192(048)*	005(017)	059(067)	-016(030)	-067(068)	015(030)	079(030)*	000(067)	-070(030)
Academic resilience	969(045)*	024(016)	006(009)	939(043)*	000(000)	007(008)	-151(033)*	178(032)*	-071(033)	038(032)	029(032)	-034(034)	007(033)

* $p<0.01$; Decimals omitted.

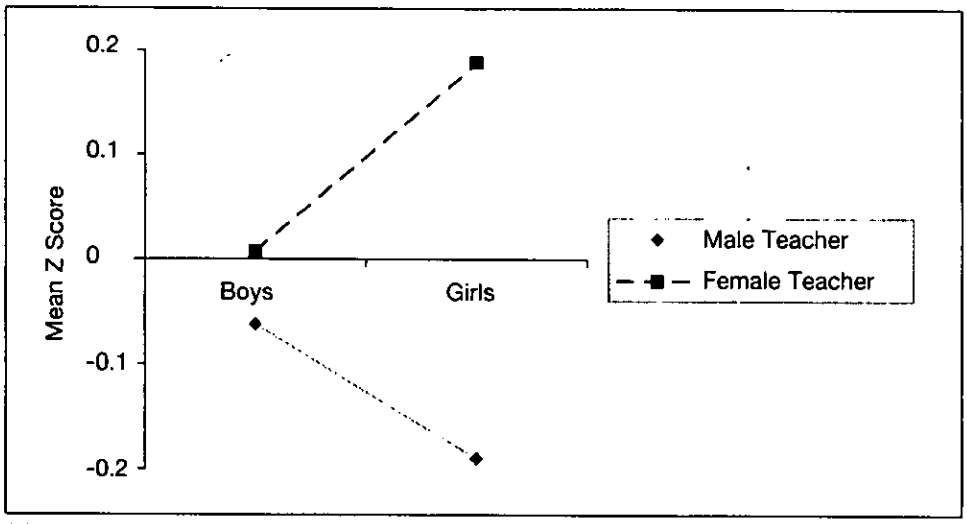

Figure 1 Student Gender x Teacher Gender interaction on: Teacher–Student relationship

relationship: boys rate their relationship with male and female teachers on fairly equal terms whereas girls rate their relationship with female teachers better than they rate their relationship with male teachers.

Discussion

The present study had two broad aims: (a) to explore the effects of student gender, teacher gender, grade, and their interaction on a set of psychometrically sound and reliable motivation and engagement constructs, and (b) to examine student-, class-, and school-level variance on each of these constructs. There were a few main effects for gender that were mainly in girls' favour with the exception of anxiety and academic resilience. Because there was only one significant interaction, findings demonstrate that boys and girls are no more or less motivated or engaged in classes taught by males than they are in classes taught by females. Hence, the data support the gender-invariant model and call into question the gender-stereotypic model and the gender intensification principal that suggests that gender-stereotypic differences grow larger with age. In terms of the multilevel structure of the data, findings showed that the bulk of variance is accounted for at the student level and on a relatively small set of constructs there was significant variance at the class level. No significant variance was explained at the school level.

Significance of findings

Counter to popular argument that boys fare better academically under male teachers (and that girls fare better under female teachers), it was found that there existed no such significant interaction between student gender and teacher gender. In fact, the only significant interaction that emerged was that girls reported a better relationship with female teachers than with male teachers, while boys reported fairly similar relationships with both female and male teachers. Taken as a

whole, this argument supports previous contentions by multilevel research (Hill & Rowe, 1996; Rowe & Rowe, 2002) that where there is a class/teacher impact on academic outcomes, it is probably the nature of pedagogy that is key and not the gender of the person delivering it. This is also consistent with previous qualitative work (Martin, 2002) that shows it is the nature of pedagogy rather than demographic-type variables that students are most concerned about.

Another key finding is that the bulk of variance in motivation and engagement occurs at the student level. Where there was relatively more class-level variance, the construct related more explicitly to class and teacher factors, such as teacher–student relationships where up to a third of the variance was explained at the class level. Hence, on the more mentalistic or intrapsychic dimensions there exists more variance at the student level, and as the construct involves factors external to the individual, the context plays more of a role. This finding holds implications for educational intervention. It suggests that student-level intervention rather than whole-class or whole-school intervention on motivation and engagement will yield the best results.

The findings also provide further direction for intervention by way of the gender differences derived in the multilevel path modelling. As a general rule, where differences occur, they are in girls' favour: girls tend to score higher on a number of adaptive dimensions. However, it is important to note that they also score higher on anxiety. These findings not only support previous work demonstrating gender differences along similar lines (Martin, 2001, 2002, 2005), but extend earlier research because these differences emerged after accounting for variation at student, class, and school levels. Previous research has identified specific student- and class-level intervention aimed at enhancing boys' motivation, while sustaining girls' strengths (Martin, 2001, 2002).

Limitations and future directions

The present study provides much information on the role of student, class, and school-level variance in explaining motivation and engagement in mathematics and also sheds further light on the role of student gender and teacher gender in contributing to students' motivation and engagement. There are, however, a number of potential limitations which are important to consider when interpreting findings and which provide some direction for further research.

The data presented in this study are all self-reported. Although this is a logical and defensible methodology in its own right, given the substantive focus, it is important to conduct research that examines the same constructs using data derived from additional sources, for example, that from teachers and parents and also using different methodologies and paradigms such as those using structured interviews or observation to name but two (Martin et al., 2003). Inclusion of achievement data would also be important. Also in relation to the data, it is important to recognise that five schools were involved in the study and so this limits generalisability to other schools and is also thin in terms of a third level of a multilevel analysis. Future research needs to be conducted across more schools.

Further, on this issue of data collection, it is important to recognise that the data were collected at the one time point and so future longitudinal work is needed to explore the stability of constructs over time and to provide greater scope to partial out residual variance that in this study was manifested in student-level variance. Employment of longitudinal research also has the potential to clarify and uncover the possible motivational fluctuations across time (Jacobs et al., 2002). Possible change would be particularly interesting to test at critical educational-stage transitions (e.g., junior to middle to senior high school).

A major finding in the present study was that boys and girls are no more or less motivated and engaged in classes taught by females than they are in classes taught by males. This finding runs counter to the gender-stereotypic model and some popular claims and beliefs that boys' (and girls') academic development is dependent on there being ample presence of male (and female) teachers in their academic lives. In relation to this, it is important to consider carefully the generalisability of this finding. First, it does not necessarily apply to younger children because the data collected in this study were from middle and high school students only. Similar research is needed at the elementary school level to ascertain the generalisability of the finding to younger children. Second, it does not necessarily apply to the emotional and personal dimensions of students' lives. It may well be that boys prefer male teachers when dealing with emotional and personal issues just as girls may prefer female teachers on this count. Indeed, previous qualitative work (Martin, 2002) suggests this might be the case.

Conclusion

The present study used multilevel statistical procedures to determine the contribution of student gender and teacher gender across junior and middle high school and the relative salience of student, class, and school variance in boys' and girls' academic motivation and engagement. Of the few significant main effects that emerged, most of them were in girls' favour. Motivation and engagement did not vary substantially for boys and girls as a function of the teacher's gender, thus supporting the gender-invariant model and calling into question the gender-stereotypic model. Findings also demonstrated that the bulk of variance in motivation and engagement occurs at the student level. Relatively few measures yielded significant class-level variance. Taken together, the findings of the present investigation hold substantive and methodological implications for researchers studying issues relevant to motivation and engagement and are also relevant to educators seeking to enhance educational outcomes that rely in large part on the extent to which their students are affectively, cognitively, and behaviourally engaged.

Key words

sex differences
educational attitudes
student teacher relationship
student motivation
pedagogy
teacher influence

References

Ainley, J., & Lonsdale, M. (2000). *Non-attendance at school.* Report to the Department of Education, Training and Youth Affairs. Melbourne: Australian Council for Educational Research.

Australian Labor Party. (2004). *Making every day Father's Day: More male role models for boys.* Policy Document. Canberra: Author.

Collins, C., Kenway, J., & McLeod, J. (2000). *Factors influencing the educational performance of males and females in school and their initial destinations after leaving school.* Canberra: Department of Education, Training, and Youth Affairs.

Connell, J. P. (1985). A new multidimensional measure of children's perceptions of control. *Child Development, 56,* 1018–1041.

Department of Education, Training, and Youth Affairs (DETYA). (2000). *Submission to the House of Representatives Standing Committee: Inquiry into the education of boys.* Canberra: AGPS.

Duda, J. L. (2001). Achievement goal research in sport: Pushing the boundaries and clarifying some misunderstandings. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 129–182). Champaign, IL: Human Kinetics.

Goldstein, H. (2003). *Multilevel statistical models* (3rd ed.). London: Hodder Arnold.

Harter, S., Whitesell, N. R., & Kowalski, P. (1992). Individual differences in the effects of educational transitions on young adolescent's perceptions of competence and motivational orientation. *American Educational Research Journal, 29,* 777–807.

Hill, P. W., & Rowe, K. J. (1996). Multilevel modelling in school effectiveness research. *School Effectiveness and School Improvement, 7,* 1–34.

House of Representatives Standing Committee on Education and Training. (2002). *Boys: Getting it right.* Canberra: Author.

Hox, J. (1995). *Applied multilevel analysis.* Amsterdam: TT Publikaties.

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one though twelve. *Child Development, 73,* 509–527.

Joreskog, K. G., & Sorbom, D. (2003). *LISREL* (Version 8.54) [Computer Software]. Chicago: Scientific Software International.

Lingard, B., Martino, W., Mills, M., & Bahr, M. (2002). *Addressing the educational needs of boys.* Report to Department of Education, Science and Training. Canberra: AGPS.

Marks, G. N., & Fleming, N. (1999). *Early school learning in Australia: Findings from the 1995 Year 9 LSAY report.* LSAY Research Report No. 11. Melbourne: Australian Council for Educational Research.

Martin, A. J. (2001). The Student Motivation Scale: A tool for measuring and enhancing motivation. *Australian Journal of Guidance and Counselling, 11,* 1–20.

Martin, A. J. (2002). *Improving the educational outcomes of boys.* Report to ACT Department of Education, Youth and Family Services. Canberra: AGPS.

Martin, A. J. (2003). The Student Motivation Scale: Further testing of an instrument that measures school students' motivation. *Australian Journal of Education, 47*(1), 88–106.

Martin, A. J. (2005). *Examining a multidimensional model of student motivation and engagement using a construct validation approach.* Manuscript submitted for publication.

Martin, A. J., Marsh, H. W., Williamson, A., & Debus, R. L. (2003). Self-handicapping, defensive pessimism, and goal orientation: A qualitative study of university students. *Journal of Educational Psychology, 95,* 617–628.

Midgley, C., Arunkumar, R., & Urdan, T. C. (1996). 'If I don't do well tomorrow, there's a reason': Predictors of adolescent's use of academic self-handicapping strategies. *Journal of Educational Psychology, 88*, 423–434.

Midgley, C., Maehr, M., Hicks, L., Roesser, R., Urdan, T., Anderman, E., Kaplan, A., Arunkumar, R., & Middleton, M. (1997). *Patterns of adaptive learning survey (PALS)*. Ann Arbor, MI: University of Michigan.

Midgley, C., & Urdan, T. (1995). Predictors of middle school students' use of self-handicapping strategies. *Journal of Early Adolescence, 15*, 389–411.

Miller, R. B., Greene, B. A., Montalvo, G. P., Ravindran, B., & Nichols, J. D. (1996). Engagement in academic work: The role of learning goals, future consequences, pleasing others, and perceived ability. *Contemporary Educational Psychology, 21*, 388–422.

Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, MA: Harvard University Press.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Newbury Park, CA: Sage.

Pintrich, P. R., & DeGroot, E. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 33–40.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor, MI: National Center for Research to Improve Postsecondary Teaching and Learning.

Rasbash, J., Steele, F., Browne, W., & Prosser, B. (2004). A user's guide to MLwiN version 2.0. London: Institute of Education, University of London.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.

Roeser, R., Eccles, J. S., & Sameroff, A. J. (2000). School as a context for early adolescents' academic and social-emotional development: A summary of research findings. *Elementary School Journal, 100*, 443–471.

Rowe, K. J., & Rowe, K. S. (2002). *What matters most: Evidence-based findings of key factors affecting the educational experiences and outcomes for girls and boys throughout their primary and secondary schooling*. Supplementary submission to House of Representatives Standing Committee on Education and Training: Inquiry into the Education of Boys. Canberra: AGPS.

Ruddock, P. (2004). *Government moves to address male teacher decline*. Media release 186/2004. Canberra: Attorney General's Department.

Strube, M. J. (1986). An analysis of the Self-Handicapping Scale. *Basic and Applied Social Psychology, 7*, 211–224.

Weaver-Hightower, M. (2003). The 'boy turn' in research on gender and education. *Review of Educational Research, 73*, 471–498.

Authors

Dr Andrew Martin is a Postdoctoral Research Fellow at the SELF Research Centre, University of Western Sydney, Bankstown Campus, Locked Bag 1797, Penrith South DC NSW 1797.

E-mail: a.martin@uws.edu.au

Professor Herb Marsh is the founding director of the SELF Research Centre, University of Western Sydney, Bankstown Campus, Locked Bag 1797, Penrith South DC NSW 1797.

E-mail: h.marsh@uws.edu.au

Requests for further information about this investigation can be made to Dr Andrew Martin.