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Aspirations, Progress and Perceptions of Boys from a Single Sex School Following the Changeover to Coeducation

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Career and further education aspirations, educational progress and perceptions of the learning environment were measured annually over three years in primary and secondary boys from a single sex non-government school, following the changeover to coeducation. Hierarchical Linear Modelling analyses revealed the significant role played by the career aspirations of cohorts on boys' progress over time. Further education plans and perceived difficulty of schoolwork were also significant influences, with difficulty at the grade level affecting boys' progress over time. Furthermore, satisfaction with life at school at both cohort and grade levels was a significant determinant of boys' educational progress. These findings suggest new directions for research into single sex/coeducational learning environments.

boys, single-sex, coeducation, aspirations, progress, school climate

INTRODUCTION

The last three decades have witnessed a growing trend towards coeducation in many countries (see, Mael, 1998), prompted by legal, social and economic considerations (Lee and Bryk, 1986; Tyack and Hansof, 1990). However, there is little research evidence as to the efficacy of this trend. Three longitudinal studies of the changeover from single sex to coeducation have indicated no adverse effects on student academic achievement (Marsh, 1989; Marsh, Smith, Marsh and Owens, 1988; Yates, 2001a; 2001b; 2002a), academic self-concept (Marsh *et al.*, 1988; Smith, 1996; Jackson and Smith, 2000) and explanatory style (Yates, 2000). Another study found girls were uncomfortable and perceived teachers gave more attention to the boys during mathematics lessons in mixed sex classrooms (Steinbeck and Gwizdala, 1995), but whether these differences persisted beyond the initial transition period was not examined. Student perceptions of the school learning environment have not been considered in the changeover from single to mixed sex settings.

Learning takes place in social contexts both inside and outside the classroom (Hofman, Hofman and Guldemond, 2001), with the climate of the school and classroom impacting significantly on student learning (Fraser, 1994). A large body of evidence attests to strong relationships between student perceptions of the psychosocial climate of the classroom learning environment and cognitive and affective outcomes (Haertel, Walberg and Haertel, 1981; Fraser, Welch, Hattie and Walberg, 1987; Fraser, 1998). A meta-analysis of studies of 17,805 students in 823 classes in eight subject areas across four nations found student achievement to be higher in classrooms with greater Cohesiveness, Goal Direction and Satisfaction and less Disorganisation and Friction (Haertel *et al.*, 1981). Human environments have been classified into three dimensions (Moos, 1974), with Cohesiveness, Satisfaction and Friction encompassed within the Relationship dimension, Goal Direction and Disorganisation included in System Maintenance and Change and

the third dimension of Personal Development embracing Competitiveness and Difficulty. All three dimensions have been studied in many different environments (Fraser, 1998), but have not been measured at the school level following the conversion from single to mixed sex education.

Proponents of single sex education and coeducation claim various benefits for the social, emotional and educational development of students (Caspi, 1995; Mael, 1998; Woodward, Fergusson, and Horwood, 1999), but research evidence as to the efficacy of each school type is inconsistent and inconclusive (Office of Educational Research and Improvement, [OERI], 1993; American Association of University Women, [AAUW], 1998). Separate and mixed sex schools have been compared and evaluated in relation to academic achievement and attitudes, curriculum access, selection of non-stereotypical subjects, classroom discipline, social interaction, student self esteem, self concept and post school success (Mael, 1998; Jackson and Smith, 2000). Some studies support single sex education for boys (McGough, 1991; Reisman, 1991; Hawley, 1993; Watts, 1994), some single sex education for girls (Lee and Byrk, 1986; Bauch, 1989; Cairns, 1990; Lawrie and Brown, 1992; Moore, Piper and Scheafer, 1993; Petruzella, 1995; Streitmatter, 1999; Speilhofer, O'Donnell, Benton, Schagen and Schagen, 2002) some single sex education for both sexes (Finn, 1980; Lee and Bryk, 1986; Jimenez and Lockheed, 1989; Young and Fraser, 1990; Rowe, 2000; Spielhofer *et al.*, 2002), while yet others find no advantages in single sex schooling for either boys or girls, particularly once other variables have been taken into account (Willis and Kenway, 1986; Rowe, 1988; Marsh, 1989; Lee and Marks, 1990; Riordan, 1993; Brutsaert and Bracke, 1994; Marsh and Rowe, 1996; Harker and Nash, 1997; LePore, and Warren, 1997; Harker, 2000). Large scale studies of secondary schools in Ireland (Cairns, 1990) Australia (Foon, 1988) and the United States (Lee and Byrk, 1986) found adolescent achievement to be higher in single sex schools, but these academic advantages were tied to higher career and educational aspirations (Trice, Naudu, Lowe and Jaffee, 1996). Furthermore, students from single sex schools were more likely to undertake postgraduate programmes at the University level (Lee and Marks, 1990), although this latter effect disappeared once controls were applied for attendance (Haag, 2000).

The majority of single sex/coeducational studies have focussed on students at the secondary level (Mael, 1998; Pollard, 1999), with "the overwhelming preponderance of research ... focussed on females and female concerns" (Mael, 1998, p.117). There is dearth of systematic long-term studies of single and coeducational learning environments (AAUW, 1998; Pollard, 1999), particularly in relation to academic achievement (OERI, 1993), psychosocial development (OERI, 1993) and the socio-emotional effects of school type (Mael, 1998). Such studies need to take individual, group and school level differences into account (Mael, 1998; Rowe and Rowe, 2002) using statistical procedures such as Hierarchical Linear Modelling (HLM; Bryk and Raudenbush, 1988; 1992) in which the effects of change can be assessed as a function of multiple levels. HLM is also eminently suited to longitudinal designs (Von Eye, 2001). It has been suggested that within-type differences such as the characteristics of the student body, teachers and school may be more important than between type differences (Bone, 1983; Kenway and Willis, 1986; Richardson, 1999; Rowe, 1999).

The present study took place in a single campus non-government school with a long tradition of 'boys only' primary and secondary education. The changeover to coeducation was phased in over a two-year period, with girls enrolled in Grades 7 to 12 in the first year (Time 1) (T1) and Grades 3 to 6 in the second year (Time 2) (T2). Career aspirations, further education plans, educational progress and perceptions of the school-learning environment were measured annually in boys during the two-year conversion period as well as the following year (Time 3) (T3). The study focused on boys present in the school in the first year of the introduction of co-education and examined cohort and grade level effects over the three years T1, T2, T3.

AIMS

The aims of this study were twofold:

1. to measure aspirations, educational progress and perceptions of school climate in boys from a single sex school following the changeover to coeducation; and
2. to examine cohort and grade level differences in the boys' aspirations, educational progress and perceptions of school climate over time.

METHOD

Participants

Boys in Grades 3-11 attending the school when coeducation was first introduced participated at T1. The same boys were followed up in Grades 4-12 at T2 and Grades 5-12 at T3. The numbers participating at T1, T2 and T3 are presented in Table 1.

Table 1. Number of boys by grade level at Time 1, Time 2 and Time 3

	Gr 3	Gr 4	Gr 5	Gr 6	Gr 7	Gr 8	Gr 9	G 10	G11	G 12	Total
T1	25	31	34	40	40	49	71	75	76		441
T2		23	27	33	40	40	48	71	76	76	433
T3			22	23	27	29	32	43	48	57	363
Total	25	54	83	98	107	118	151	189	199	133	1237

Instruments

Educational and Career Aspirations Questionnaire

This single page questionnaire (ECAQ) (Yates, 2001a) comprised students' date of birth, gender, grade, length of time at the school, anticipated length of stay at school, plans for further education after leaving school and intended occupation.

Educational Progress

Educational progress was assessed with *Word Knowledge Test 1*, *Word Knowledge Test 2* or *Word Knowledge Test 3* (WKT1, WKT2 and WKT3) (Thorndike, 1973). Each test consists of 40 word pairs, rated as the same or opposite in meaning. Thirteen word pairs are common to WKT1 and WKT2 and twenty items are common to WKT2 and WKT3. One word pair is common to all three tests.

School Climate Questionnaires

Student perceptions of the psychosocial climate of the school were evaluated with *My School Inventory* adapted from *My Class Inventory* (MSI) (see, Fisher and Fraser, 1981; Fraser, Anderson and Walberg, 1982), or the *School Learning Environment Inventory* (SLEI) adapted from the *Learning Environment Inventory* (Anderson and Walberg, 1974; Fraser, *et al.*, 1982). MSI and SLEI have three Relationship subscales of Cohesiveness, Friction and Satisfaction and two Personal Development subscales of Competitiveness and Difficulty in common. The three Relationship Dimension subscales (Moos, 1974) tapped the nature and intensity of students' interpersonal relationships, conflict, arguments and disagreements between students and contentment and happiness with the learning environment of the school respectively. The Personal Development subscales assessed competitiveness between students and their perceptions of the difficulty of their schoolwork.

Procedure

The test of educational progress and the questionnaires measuring perceptions of the school climate were administered to all boys in their classrooms at the same time on the same day in October at T1, T2 and T3 as shown in Table 2. Boys in Grades 8 and 9 completed both MSI and SLEI to provide a common group for equating purposes Boys also completed the single page educational and career aspirations questionnaire.

Table 2. Word Knowledge Tests and School Climate Questionnaires

Grades 3-7	WKT1	Grades 8-10	WKT2	Grades 11-12	WKT3
Grades 3-9	MSI	Grades 8-12	SLEI		

ANALYSES

Boys' responses at T1, T2 and T3 were entered into a Statistical Package for the Social Sciences (SPSS) file (Norusis, 1993), with data matched across occasions through an ID number. Boys' plans for further education after leaving school outlined in the ECAQ were coded from 1 to 4, with 1 representing no plans and 4 representing 4 or more years of further education. Future career aspirations were coded on a 6-point scale, with 6 representing the highest level of Professional occupations.

Reliability and validity of WKT1, WKT2, WKT3, MSI and SLEI were examined with QUEST (Adams and Khoo, 1994) and all non-fitting items deleted from each instrument (Yates, 2001b). The three word knowledge tests and two learning environment questionnaires were calibrated with the Rasch scaling procedure (Rasch, 1966) to bring them to common interval scales. A single Word Knowledge (WK) scale of educational progress was formed from WKT1, WKT2 and WKT3, with the tests linked by the common items. Scoring of WK was anchored to those students who answered all items at T1. Five separate school climate subscales of Cohesiveness, Competitiveness, Difficulty, Friction and Satisfaction were formed from the designated MSI and SLEI items, linked by responses from the Grade 8 and 9 boys who had completed both questionnaires. The combined Cohesiveness subscale contained 13 items, the Competitiveness subscale 12 items, the Difficulty subscale 14 items, the Friction subscale 15 items and Satisfaction subscale 14 items. Case estimate scores were equated concurrently for WK and five school learning environment subscales for all boys from Grades 3 to 11 at T1, and Grades 3 to 12 for T2 and T3.

Relationships between anticipated length of stay at school, plans for further education, career aspirations, educational progress and perceptions of cohesiveness, competitiveness, difficulty, friction and satisfaction were analysed with HLM5 (Raudenbush, Bryk, and Congdon, 2000) which permits examination of the direct effect of various potential predictors at both level-1 and level-2 as well as modelling cross-level interaction effects. Within group comparisons were made over time at level-1, and between cohort groups and grades at level-2. Cohort groups consist of the same students clustered by their initial grade at T1, while Grade groupings are composed of students in that grade level at T1, T2 and T3.

RESULTS

Two models were developed, with boys grouped at level-2 by cohort in Model 1 and by grade level at T1, T2 and T3 in Model 2. Educational progress was designated as the outcome variable in each model. All variables were considered in each model, but only significant effects at both levels were retained. Boys' anticipated length of stay at school, and perceptions of cohesiveness, competitiveness and friction across the school are not present in either final model, as they were not significant predictors of educational progress over time.

Figure 1 and Figure 2 present the results of significant effects for Model 1 and Model 2 respectively. Coefficients and standard errors are presented for each significant variable, which is enclosed within an ellipse. Figures 1 and 2 show that boys' further education plans (FED) and perceptions of the difficulty of school work (DIF) have a significant effect on educational progress (WK) at the student level-1. In both models DIF is negatively related to WK indicating that on average boys who perceive schoolwork to be difficult have lower scores. DIF is also a significant level-2 variable in Model 2 where it interacts negatively with Time and WK, indicating that, on average, grades with higher perceptions of the difficulty of schoolwork have correspondingly decreasing scores over time. At level-2 in both models boys' satisfaction with school life (SAT) is directly but negatively related to their educational progress, indicating that on average, cohorts and grades expressing lower levels of satisfaction with school life make better progress.

In Figure 1 the variable Time is a significant predictor of WK at the student level-1. The positive value of the coefficient of Time to WK in Model 1 suggests that overall, there are significant increases in WK scores for boys (in all cohorts) over time. However, there is an interaction between boys' occupational aspirations (OCC) at level-2, and Time influencing WK scores. Boys are progressing over time, but the rates of their progress vary from one cohort to another, depending on the average occupational aspirations of a particular cohort. Boys in cohort groups that, on average have high occupational goals, tend to have increasing scores over time and progress at rates that are significantly above the average. By contrast, boys in cohort groups that on average have low occupational ambitions, tend to have decreasing scores over time and progress at rates that are significantly below the average.

In Figure 2 the scores of boys in Grade 7 (G7) and Grade 11 (G11) have a higher increase in WK scores over time compared with the average. In this same figure, there is a consistent pattern of higher WK scores for Grade 12 (G12) on all three occasions. However, the variable Time is not a significant predictor of WK in Model 2.

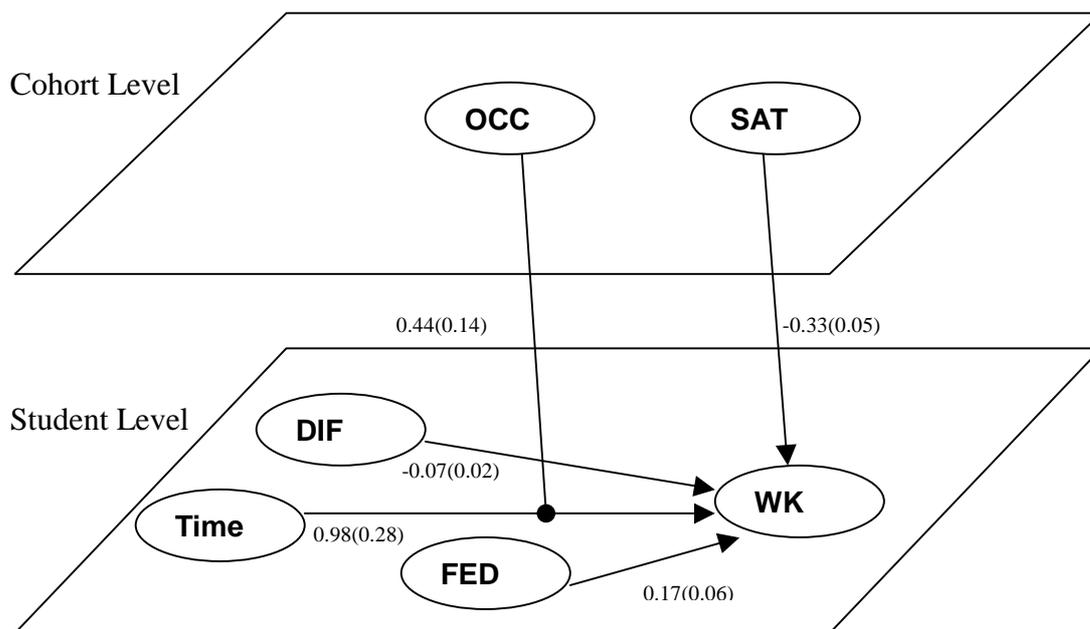


Figure 1. Two level model of word knowledge: Model 1 (grouped by cohort)

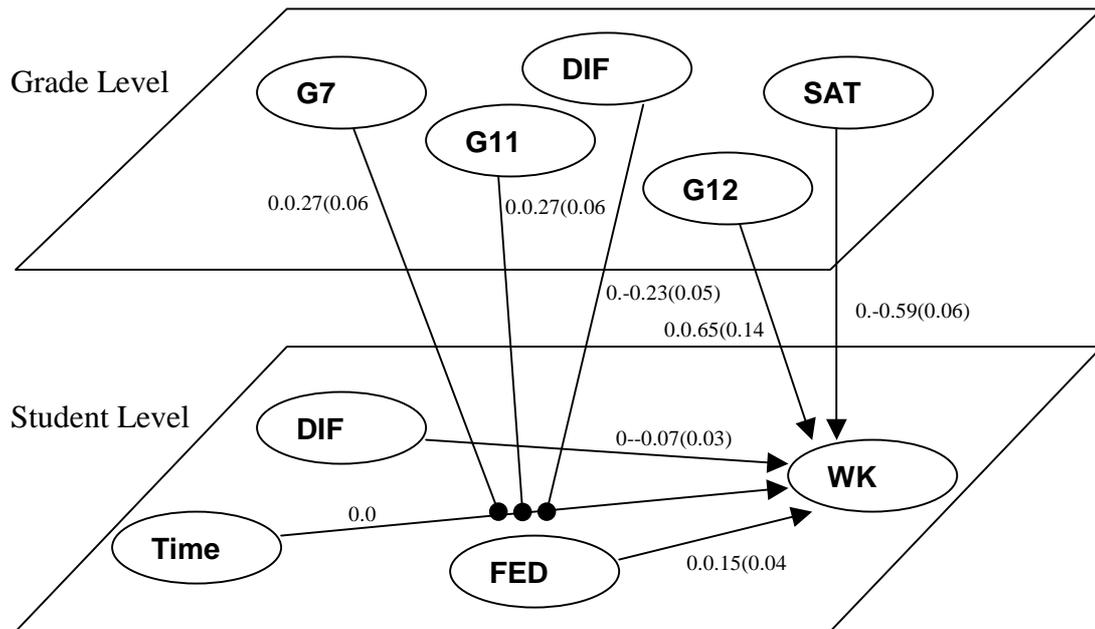


Figure 2. Two level model of word knowledge: Model 2 (grouped by grade)

DISCUSSION

The most striking result from Model 1 was the role played by career aspirations at the cohort level in influencing boys' educational progress over time, with rate of progress influenced by the average occupational aspiration of the cohort group. While the relationship between career aspirations and achievement has been well established in single sex secondary schools (Lee and Bryk, 1986; Foon, 1988; Cairns, 1990; Lee and Marks, 1990; Trice *et al.*, 1996), this study clearly indicated that the findings also hold for boys from a single sex school background at both primary and secondary levels, following the changeover to a coeducational context. The significant and influential role played by the cohort group over time became evident only when the inherent nested, hierarchical nature of the student data was taken into account (Rowe and Rowe, 2002; Rowe, Turner and Lane, 2002). The potential of multilevel analyses to reveal these hitherto hidden relationships has important implications for research in single sex/coeducational school learning environments in which differences at the individual, group and school levels must be taken into account (Mael, 1998; Rowe and Rowe, 2002). Future studies should examine whether these cohort effects are confined to boys or whether girls are equally affected.

Relationships between boys' further education plans, perceptions of difficulty of schoolwork and educational progress at the individual student level found in this study are not surprising. Trends towards boys' lower achievement (particularly in literacy), lower rates of engagement, poorer retention rates and lower participation rates in higher education have been evident in Australia since the 1980s (Cresswell, Rowe and Withers, 2002). However, results from earlier studies of classroom climate (Haertel, *et al.*, 1981) would suggest that cohesiveness and friction should have been significant factors and that the student satisfaction with school life should have been positively related to learning outcomes (Ainley, 1991; Epstein and McPartland, 1976; Fine, 1986). While structural equation modelling analyses of this longitudinal data do confirm the significant role played by these three variables (Yates, 2003), the HLM analyses indicate that over time, boys' perceptions of cohesiveness and friction in the coeducational environment are not influenced significantly by cohort and grade clustering effects. In the latter case, relationships between student satisfaction and achievement have been documented at the secondary school level. This study focussed on boys, grouped by cohort and grade, across primary and secondary

levels and tapped their perceptions of the school rather than the classroom. Previous analyses of this longitudinal data have shown boys' satisfaction with school life to decrease across Grade levels and WK scores to increase (Yates, 2001b, 2002b). In general, boys in the higher grade levels are less satisfied with school than boys in the lower grades, a trend confirmed in several studies (see, Gentry, Gable and Rizza, 2002).

The question of whether it is more effective for boys to be educated in single sex schools or within coeducational environments has been raised for some considerable time (OERI, 1993; AAUW 1998; Mael, 1998). The positive relationship evident between Time and WK in Model 1 in this study would lend support to the effectiveness of coeducation. Overall, boys' WK scores increased significantly over time, not only during the immediate period of the transition from single sex education to coeducation but in the ensuing year. However, the relationship between time and WK was influenced by the occupational aspirations of the cohort group to which students were assigned at T1. The influence of these cohort groups, emanating from a single sex educational context, clearly needs further exploration. In Model 2 there is a consistent pattern of higher achievement for boys in Grades 7, 11 and 12 on all three occasions. While the higher achievement in Grade 7 is less easy to explain, boys in Grades 11 and 12 are involved in the publicly accountable South Australian Certificate of Education. The influence of such external factors also suggests avenues for further research.

This study makes a significant contribution to understanding some of the factors that influence boys' learning outcomes following a period of educational reform. Perceptions of elements of school climate were important determiners of boys' progress in the changeover from single sex to coeducation at both the student and group level, but equally, educational and career aspirations of primary and secondary boys were significant. The use of the Hierarchical Linear Modelling analytical procedure allowed for the investigation of these causal factors operating not only at the individual student level but also at the cohort and grade levels over time. Furthermore, the measures were taken across boys at both the primary and secondary school levels within the school. The longitudinal nature of the study allowed for the factors to be measured across three years following the changeover from single sex education to coeducation.

This is a single study of a single school captured during a period of institutional change, with measurement confined to boys attending an independent school. Clearly there is a need to replicate the study with a more representative sample to determine the extent to which the findings are generalisable. In addition, further research into the effects of group level factors on school learning environments is required for boys and girls in single sex and coeducational settings.

Acknowledgments

1. Professor John Keeves for his advice and encouragement.
2. I Gusti Ngurah Darmawan for invaluable assistance with data analyses.
3. Research assistants John Harris and Dianne Harris.
4. The research was supported by two Australian Research Council Small Grants and a Flinders University Small Grant.

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