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Colin Carmichael

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Transitioning to secondary school: The case of mathematics

Colin Carmichael
University of Southern Queensland, Australia

Abstract
At a time when Australia's international competitiveness is compromised by a shortage of skilled workers in Science, Technology, Engineering and Mathematics (STEM) related careers, reports suggest a decline in Australian secondary school students' performances in international tests of mathematics. This study focuses on the mathematics performance of students in the first year of secondary school and in particular the impact, if any, that the move to secondary school has on this performance. Utilising current state differences in the structure of schools and population data, the study identifies a small effect associated with the transition to secondary school that is comparable to similar international studies. It then explores this effect through a multivariate analysis of data from the Longitudinal Study of Australian Children (LSAC). Results suggest that even after controlling for known predictors of mathematical performance, the transition from primary school to secondary school is associated with a small effect that is not apparent when students change from one primary school to another. These findings confirm a number of qualitative studies that suggest the need for a closer focus on the early secondary mathematics classroom. Implications for researchers and policy makers are also discussed.

Keywords: mathematics education, educational transition, secondary school

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Improvements in the teaching and learning of mathematics in Australian secondary schools are necessary if the country is to address skills shortages in science, technology, engineering, and mathematics (STEM) related industries. In recent reports, the Office of the Chief Scientist has highlighted: the importance of STEM related disciplines in maintaining Australia's international competitiveness; the relative shortage of STEM related graduates in Australia; and the need for reform of education in STEM related disciplines (Chubb, Findlay, Du, Burmester, & Kusa, 2012; Office of the Chief Scientist, 2014). Given the national significance of STEM related disciplines and the foundational role that mathematics plays in them, Australia's performance in the Programme for International Student Assessment (PISA) over the last decade is of concern. This test of 15-year-old students suggests a relative decline in the mathematics attainment of Australian secondary students has occurred since 2003 when PISA was first implemented (Thomson, De Bortoli, & Buckley, 2013). It appears, therefore, that a greater focus on mathematics teaching and learning in Australia is warranted and in particular during the secondary years. This study explores the commencement of this phase of education and in particular the transition from primary to secondary schools.

The motivational and affective issues surrounding the transition to secondary school are well documented. Of concern is whether sufficient attention has been paid to the curriculum changes that also accompany this transition. The move into secondary school is associated with lower levels of student engagement (Watt, 2004) and increases in anxiety (Cotterell, 1992). These, in turn, contribute to increased rates of school absenteeism (Barone, Aguirre-Deandreis, & Trickett, 1991) and behavioural infractions (Cook, MacCoun, Muschkin, & Vigdor, 2008). In response, programs have been developed to address student anxiety and engagement (e.g. Bloyce & Frederickson, 2012; Humphrey & Ainscow, 2006).

The transition to secondary school, however, also includes significant changes to the mathematics curriculum. In primary school mathematics, for example, there is a focus on numeracy, the application of mathematics in the real world, whereas in the secondary school there is a greater emphasis on the abstract thinking associated with algebra. In addition, the teaching of mathematics tends to move from a hands-on approach in the early primary years to a transmission approach in the upper secondary years (Tytler, Osborne, Williams, Tytler, & Cripps-Clark, 2008). In the midst of these changes, studies paint a bleak picture of early secondary school mathematics classrooms, where children spend a lot of time on repetition and drill, and are not provided with the necessary intellectual challenges (Attard, 2013; Galton, Morrison, & Pell, 2000; Luke et al., 2003; Skilling, 2014). Reports suggest that their teachers are either unaware of, or ignore, children's previous learning experiences (Sdrolias & Triandafillidis, 2008; Skilling, 2014). Such claims may be exacerbated in Australia where up to 40% of Year 7 to 10 mathematics classes are taught by unqualified teachers (Office of the Chief Scientist, 2014).

Despite an extensive body of literature examining the transition from primary school to secondary school, there is a dearth of studies that quantify its impact on students' academic achievement and, in particular, achievement in mathematics. This may be due to difficulties in obtaining measures that can be compared pre and post transition. Galton et al. (2000), for example, in their UK based study, reported that 45% of boys and 35% of girls failed to demonstrate any change in their mathematics performance during the first year of secondary school. These sombre results, however, were based on children's performance in tests of basic skills held in the last year of primary school and the first year of secondary school. Such tests, however, may not reflect the curriculum being taught in the secondary school where students are often introduced to abstract level mathematics in their first year. Other studies exploring this transition also struggle to find valid measures of achievement. Ryan, Shim, and Makara (2013), for example, based their conclusions on the grade point average (GPA) taken before and after the commencement of secondary school. They acknowledged, however, that the grading practices of secondary school teachers are likely to be different from those used by primary school teachers and could explain apparent drops in achievement.

The introduction of the National Assessment Program - Numeracy and Literacy (NAPLAN) in Australia during 2008 has allowed for the collection of valid achievement data across the primary/secondary transition. Test items are designed to assess the curriculum being taught rather than basic or generic skills. Moreover, the scoring process used in NAPLAN tests allows for meaningful longitudinal comparisons, because, irrespective of a child's year level at school, their performance score is placed on a scale ranging from 0 through to 1000. Accordingly, the study seeks to utilise published population NAPLAN data to quantify the effect that transiting to secondary school has on Australian children's mathematics growth. It then draws upon a sample of children in the Longitudinal Study of Australian Children (LSAC) to identify factors that might influence this effect.

Background

The impact of the primary/secondary transition on mathematics achievement is likely to vary from one individual to another and be influenced by factors associated with the individual and the schools they attend. Some children benefit from changing school because they have the opportunity to leave behind old social roles and pathways (Lucey & Reay, 2000). As discussed, however, the change can be detrimental with studies showing a decline in motivation during this period. The following discussion explores known factors that influence children's academic development across the primary/secondary transition. It commences with child, family, and school related factors. The discussion also provides some background to differences among states in Australia.

Child, family and school related factors

Several studies have reported that the transition to secondary school impacts differently on boys and girls. Cantin and Boivin (2004), for example, found that girls reported higher levels of emotional support and positive feedback from peers than boys during the transition, yet no gender differences in perceived scholastic competence were evident. Further, Riglin, Frederickson, Shelton, and Rice (2013) reported that associations between problems with transition and attainment were stronger for boys than for girls, suggesting that boys are more vulnerable than girls to effects associated with transition.

The wealth of a child's family is also thought to influence his or her transition to secondary school, with Evangelou et al. (2008) reporting that children from poorer homes are more likely to experience difficulty with the transition than those from richer homes. This could be the result of less choice of school for poorer children, reducing the likelihood of their gaining from the transition (McGee, Ward, Gibbons, & Harlow, 2003). Alternatively, it may be that the parents of these children lack the social capital necessary for navigating large secondary schools (Harris & Goodall, 2008).

School level factors, such as governance system and wealth, also may impact on children's transition to secondary school. In Australia, schools are broadly classified into three sectors: Government, Catholic and Independent. By far the largest is the Government sector, where school governance in most cases is guided or mandated by the centralised State Education Authorities. Schools in the other two systems are likely to have more flexibility in how they manage the primary/secondary transition. In addition to this, schools in the Independent sector have greater access to financial resources than those in the other two sectors (Australian Curriculum Assessment and Reporting Authority [ACARA], 2009). These extra resources are likely to influence the reported higher NAPLAN numeracy scores achieved by students attending Non-Government schools (Miller & Voon, 2012). However, it is unknown whether the growth trajectories across the transition are also influenced by attendance at these higher resourced schools. In regards to academic competence, a recent Australian study by Vaz, Parsons, Falkmer, Passmore, and Falkmer (2014) suggests that this is not the case.

State differences in Australia

The introduction of national testing in Australia during 2008 and the subsequent development of National Curricula have created the impetus for significant structural changes in some Australian states that may have impacted on the academic growth of children, including during the primary/secondary transition. In Queensland, for example, children's mean NAPLAN results in 2008 were quite poor relative to the rest of the nation. A key factor was that many children in that state at that time had completed one less year of compulsory schooling than their peers from other states. These results motivated a state level report (Masters, 2009), and the subsequent introduction of a preliminary year of compulsory schooling.

In addition, state differences currently exist in relation to the transition to secondary school. Most children attending schools in the Australian states of Queensland (Qld), South Australia (SA) and Western Australia (WA) currently move from primary school at the end of Year 7, after seven years of primary-school education. Those attending schools in New South Wales (NSW), Victoria (Vic), the Australian Capital Territory (ACT) and the Northern Territory (NT), on the other hand, mostly move from the primary school at the end of Year 6, after a preliminary (or kindergarten) year and then six years of primary-school education. Consequently a substantial proportion of Australian children undertake their Year 7 NAPLAN tests whilst in a primary school setting, whereas the remainder do so in a secondary school setting[1].

Research questions

The study seeks to address the following question: What effect does the transition to secondary school have on children's

[1] *This was the case at the time of writing, but some state jurisdictions have since announced changes to their primary/secondary school structures.*

mathematics performance? Consideration is also given to the following sub-questions: Does the transition impact differently on boys and girls; and, to what extent do home, school, and state related factors influence the impact of the transition?

Methodology

Analysis of population data

Published NAPLAN data (ACARA, 2008, 2010, 2012) were analysed with a particular focus on children's growth in mathematics. More specifically, state means were used to calculate weighted means for those three states where Year 7 is included in the primary school (hereafter called "primary states") and those states and territories where Year 7 is included in the secondary school (hereafter called "secondary states").

Analysis of sample data

Sample details The sample used a sub-sample of the K-cohort, one of two cohorts in the Longitudinal Study of Australian Children (LSAC). Data collection for the K-cohort commenced in 2004 when these 4983 children were aged between 4.5 and 5 years of age, and has continued biennially through to 2012, the most recently available data collection. Further details regarding the design and implementation of LSAC are available in Sanson et al. (2002). However, a significant amount of data in the study were collected during interviews conducted with a parent of the child and the child themselves.

The sub-sample used in this study are those 3345 students in the K-cohort for whom NAPLAN numeracy results were available in 2010, and 2012, when these children were in Years 5 and 7 respectively. The sample contained 49.3% boys with a mean age in 2012 of 12.4 years. These children came from families with a mean social economic position (SEP) of 0.02. The SEP (Blakemore, Strazdins, & Gibbings, 2009) is a standardised index of socio-economic wealth, developed for the study. Hence the mean of 0.02 for this sample was very close to the expected population mean of 0.

Outcome variables The main outcome variable in the study is the children's NAPLAN numeracy scores, hereafter called mathematics scores[2], which are based on their responses to tests of 45 minutes duration each. These tests contain a mix of multiple-choice and short-response items that reflect the Australian Curriculum: Mathematics (ACARA, 2013). Mathematics scores for the children in this sample in 2010 (M = 504, SD = 71) and 2012 (M = 557, SD = 73) were on average higher than corresponding population figures[3].

Explanatory variables Apart from demographic details such as children's age, sex and SEP, a number of other variables were considered to have a possible impact on children's mathematics performance during the transition to secondary school.

The children themselves were asked whether they had changed school in the two years prior to their interview during Year 7. Two thirds of students indicated they had changed school, with 6% failing to respond to the question. It should be noted that the interviews were conducted over a twelve-month period so that changes of school for some children could have occurred during the current school year and after the NAPLAN tests, which are held in May each year.

Information about children's schools came from the following sources: data released by ACARA; information asked of parents; and/or, questionnaires sent to the child's teachers in 2010 and 2012. In Year 5, 15% of children attended Independent schools and 23% attended Catholic schools. By Year 7, 24% of children attended Independent schools and a further 25% attended Catholic schools. In Year 7, 53% of children attended secondary schools, defined as those catering for students only in Years 7 through to 12 and a further 28% attended combined schools, defined as those catering for children from Kindergarten through to Year 10 or 12. There was, however, a significant proportion (25%) of missing data for this

[2] *Numeracy is regarded as the application of mathematics and is the focus of the primary school mathematics curriculum.*
[3] *These are reported in Table 1.*

variable because it was obtained from teacher questionnaires where response rates were low relative to the other sources.

Analysis Bivariate analyses were conducted between the key explanatory variables and children's mathematics scores in Year 7. After this, linear regression was used to identify factors that impacted on children's Year 7 mathematics scores after controlling for their Year 5 scores. The analysis was undertaken using MPlus, which is able to model the complex sampling design employed by LSAC where both stratification and clustering were used (Soloff, Lawrence, & Johnstone, 2005). Multiple imputation techniques were also used to estimate missing values on all variables for each model because these techniques are found to produce less biased estimates than alternative methods for dealing with missing data (Schafer, 1999). Model estimates are based on average results across twenty five data-sets imputed using Bayesian methods, as described in Muthén and Muthén (2011).

Results

Analysis of population data

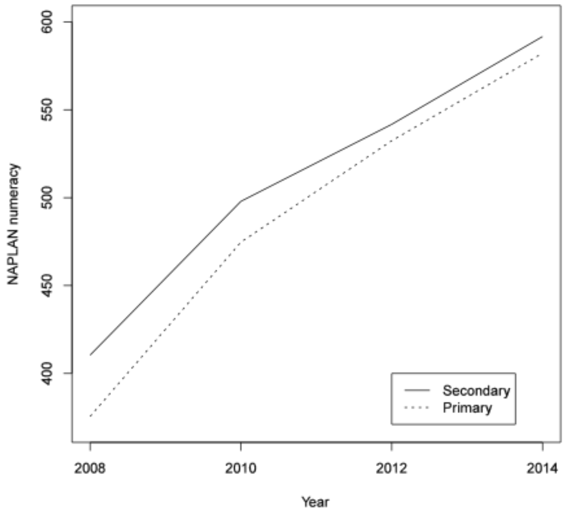
Population data are shown in Table 1, which displays mathematics means[4] for students attending school in secondary and primary states. As is seen in the last column of the table, mathematics growth for children attending schools in the secondary states was 13 points lower over the two years than those attending schools in the primary states. As recommended by Cumming (2012), standardisation of this difference was in terms of the average of the two population standard deviations (σ_{2010} = 69.9, σ_{2012} = 73.9), producing an effect associated with the transition to secondary school of $d \approx 0.18$[5]. This is regarded as a small effect (Cumming, 2012). For comparative purposes, an effect of approximately 0.4 is associated with one year's normal academic development in a child (Hattie, 2009).

Table 1
Population mathematics means by sub-population

Sub-population	Year 5 (2010)	Year 7 (2012)	Difference
	μ_5	μ_7	$\mu_7 - \mu_5$
Secondary states	498	542	44
Primary states	475	532	57
Overall	489	538	49

The mathematics growth trajectories for these two groups of students are shown in Figure 1, which utilises published data from 2008 through to 2014 when the students were in Year 9. As shown in Figure 1, all children experienced a slowing of growth between 2010, when they were in Year 5, and 2012, when they were in Year 7. Children in the secondary states, however, experienced a greater slowing of growth than those in the primary states. This difference may be attributable to the secondary school transition experienced by many of them in 2012. Interestingly, the figure shows a negligible reduction in growth for children in the primary states after 2012, when they too made the transition to secondary school. For this particular cohort, the late transition to secondary school appeared to be beneficial.

Figure 1
Mathematics growth trajectories for children in secondary and primary states



[4] *These are based on published state means that are weighted by the number of children sitting for each test in each state.*

[5] *Analysis on other Australian Year 5 population cohorts from 2008 through to 2012 show similarly small effects ranging from 0.2 to 0.3, with a mean of 0.24 and with no obvious trend.*

Bivariate analysis of sample data

Results of bivariate analyses between key factors identified in the literature review and mathematics results in both Years 5 and 7 are reported in Table 2. As is seen from the table, boys reported higher means than girls in both tests. Age was significantly associated with mathematics achievement in Year 5, but not in Year 7, suggesting that younger children catch up as they move through the school years. The socio-economic position of children, however, was positively associated with mathematics achievement in both of the tests. Changing school appeared to have little impact on mathematics performance prior to Years 5 and 7. The type of school children attended, however, had a significant impact on their mathematics achievement, with those attending Independent schools scoring significantly higher than those in either Government or Catholic schools. Finally, the state jurisdiction impacted on mathematics achievement, with children attending schools in secondary states out-performing their colleagues in the primary states in both tests, though this difference declined over the two years.

Table 2

Results of bivariate analyses

Variable	M/SD (if relevant)	*n*	Test statistic
Year 5 mathematics score			
Sex (male)	510/73	1649	
Sex (female)	498/69	1696	$t = 5.0$
Age at Year 5 test (years)		3345	$r = 0.13$
Family Socio-economic position		2960	$r = 0.30$
Changed school (no)	505/70	2741	
Changed school (yes)	506/74	487	$t = 0.3$
Attend Independent school	525/69	424	
Attend Catholic school	502/63	692	
Attend Government school	502/73	2051	$F = 19.3$
Attend school in secondary state	513/73	1955	
Attend school in primary state	491/67	1390	$t = 9.0$
Year 7 mathematics score			
Sex (male)	563/77	1649	
Sex (female)	551/70	1696	$t = 3.5$
Year 5 mathematics score		3345	$r = 0.80$
Age at Year 7 test (years)		3345	$r = 0.00$
Family Socio-economic position		3345	$r = 0.33$
Changed school (no)	562/77	836	
Changed school (yes)	558/73	2266	$t = 1.4$
Attend Independent school	582/73	740	
Attend Catholic school	555/66	777	
Attend Government school	550/75	1585	$F = 50.7$
Attend school in secondary state	560/75	1948	
Attend school in primary state	553/71	1397	$t = 2.6$
Attend a secondary school	552/69	1385	
Attend a combined school	576/74	766	
Attend a primary school	554/74	340	$F = 29.3$

SEP appeared to be a mediating influence on these bivariate associations. Children attending Independent schools, for example, tended to come from wealthier homes than those attending either Catholic (ΔM = 0.29, t = 7.8) or Government (ΔM = 0.53, t = 15.7) schools. Similarly, Year 7 children attending combined schools were significantly wealthier than those attending primary (ΔM = 0.44, t = 9) or secondary schools (ΔM = 0.33, t = 8.3). Combined schools were more likely to be independent schools than Government schools. While only 25% of children attended independent schools in Year 7, 67% of children in combined schools in Year 7 attended independent schools. Children in secondary states were also slightly wealthier than those in the primary states (ΔM = 0.11, t = 3.8).

State structures also appeared to influence these bivariate associations. Children in the primary states were significantly younger in

Year 7 than those in the secondary states (ΔM = 0.17, t = 14.9), much of this a result of the then school commencement age in Queensland children. Children attending school in Queensland scored significantly lower than all other children in Year 5 (ΔM = 20, t = 7.2), but this difference had reduced substantially by Year 7 (ΔM = 7, t = 2.5). A small number of children changed state (n = 58), but this change was not associated with any significant differences in Year 7 mathematics scores.

Multivariate analysis of sample data

Given the close relationship between some of the explanatory variables identified in the literature review, further classification of some variables was necessary. For example, the type of school children attended in 2012 is related to state. Children attending combined schools, that is, those catering for both primary and secondary students, occurred in both primary and secondary states. To disentangle these data, the 766 children attending combined schools were divided into two categories: the 353 who attended combined schools in primary states and the remainder who attended combined schools in secondary states. Similarly, children attending secondary schools by definition have to change schools, but many children attending combined schools will not change schools even when they enter the secondary program. Consequently, of the 2266 children who changed school prior to Year 7, consideration is given to the 468 who changed schools but did not attend secondary schools.

A linear regression model was then used to explore the influence of these factors on children's Year 7 mathematics scores after first controlling for their Year 5 mathematics score. Child related factors were entered first into the model, followed by home and then school related factors. The model, shown in Table 3, suggests that after controlling for age, sex, parental wealth, and school system, the move into a secondary school is associated with a reduction of ten points in the Year 7 mathematics test relative to children who remain in the primary school. Changing to a non-secondary school prior to Year 7, however, was not associated with any reduction.

Table 3
Results of linear model predicting Year 7 mathematics score

Predictor	Estimate	*SE*	*p*
Intercept	561.20	2.60	0.00
Year 5 mathematics (z)	57.30	1.00	0.00
Sex (Male)	2.60	1.40	ns
Age (z)	-6.50	0.80	0.00
SEP	6.90	0.90	0.00
Catholic school	0.30	1.10	ns
Independent school	1.60	1.00	ns
Combined school primary state	-6.20	3.90	ns
Combined school secondary state	-4.00	3.90	ns
Secondary school	-10.20[6]	2.80	0.00
Change school non-secondary	2.00	3.00	ns
Adjusted R-square		0.67	

In order to assess whether boys coped with the transition to secondary school better than girls, a sex by secondary school interaction was entered into the model. The results suggest that, for this group, means for boys attending secondary schools in Year 7 were slightly lower than means for similar girls. This difference, however, was not statistically significant and thus is not reported in the model. An interaction between SEP and secondary school attendance was explored, but also was not statistically significant.

Discussion

Analysis of population data has shown that children attending schools in the primary states reported lower mathematics means in Year 5 but achieved greater subsequent growth than their peers in the secondary states. The apparent effect associated with remaining in primary school was small (d = 0.18), suggesting a hiatus in mathematics development occurs for children making the transition to secondary school. Because the

[6] *These figures are based on imputed data. However, a separate analysis using list-wise deletion of missing values produced relatively similar estimates for all regression coefficients.*

analysis of population data was unable to control for family or school related factors, data from a large representative sample were then analysed.

In line with findings elsewhere, males in the sample enjoyed a slight advantage in mathematics (Leder & Forgasz, 2008), but there was little evidence to suggest that those boys who transited to secondary school suffered (or gained) as result of that move. Younger children appeared to have a slight advantage over the two-year period, but as shown in Table 2, the earlier advantage experienced by the older children appeared to wane between Year 5 and 7. These two years of schooling may have ameliorated any disadvantages associated with starting school later. In line with the literature, the results indicate that children from wealthier homes were likely to report higher achievement in mathematics than their poorer peers (Chiu & Xihau, 2008), but this advantage did not appear to influence the impact of their transition to secondary school.

School sector did not appear to have an influence on children's achievement during the transition to secondary school. Children attending independent schools achieved higher means than their peers attending other schools in Year 5 and even higher means in Year 7. After controlling for factors such as family wealth in the regression model, however, these differences were not statistically significant. This result suggests that sector differences do not explain differences in children's mathematics achievement after the transition, supporting to some extent the finding by Vaz et al. (2014) who studied sector influences on children's perceived academic competence.

The major finding of the study is that, after controlling for other factors, the move to secondary school is associated with a reduction in growth of only 10 points relative to children remaining in primary schools, an effect of $d \approx 0.14$[7] with a 95% confidence interval of [0.06, 0.21]. This figure is very similar to an estimate obtained by Mehana (2004) in their United States based meta-analysis on the effects associated with school change for elementary school students. They reported that the average effect of school changes on mathematics achievement was 0.22 and only 0.14 for older grade students. Surprisingly, however, the findings in this study suggest that school changes as such were not associated with a reduction in mathematics growth. It was only the change into secondary school that was associated with this effect. It is possible that the introduction of a National Curriculum in Australia, and the subsequent implementation of NAPLAN testing, have reduced differences between primary schools so that changing school is generally not a problem for Australian primary school children. Yet it remains a problem for those entering secondary school.

This finding does lend some support to the earlier cited research (see for example, Attard, 2013, Galton et al. 2000) that teachers of first-year secondary mathematics are teaching ineffectively. However, apportioning blame to secondary mathematics teachers is somewhat harsh. The results in Table 3 suggest that children attending *combined* schools in Year 7, irrespective of whether the children were in a "primary level Year 7" or a "secondary level Year 7" reported lower achievement gains relative to those children attending primary schools, though this difference was not statistically significant.

It is interesting to speculate about what may be happening here. Children attending primary schools in Year 7 did not attend school with older children. They were the oldest children in the school. They also showed greater gains over the two-year period than all other children. It is possible that socialisation difficulties may explain some of the estimated effect of 0.14. Waters, Lester, and Cross (2014), for example, reported that up to one fifth of pre-transition students were worried about older students and that these concerns sometimes translated into self-fulfilling prophecies. The results indicate that the transition to secondary school is associated with relatively lower gains in mathematics

[7] *Based on a population figure of σ = 73.9*

achievement. This lower growth is likely to be the result of multiple factors.

Interestingly, the results in Table 3 suggest that there was little difference between students who attended combined schools in primary states or secondary states. In other words, the primary-state/secondary-state dichotomy created in the study does not appear to impact on children's achievement.

Limitations

The study was limited in the number of longitudinal outcome measures available. This restricted the underlying growth model to a linear one when population data (displayed in Figure 1) suggested a non-linear relation. This limitation may have influenced the magnitude of reported effects.

The study is based on a secondary analysis of both population data and data from a large nationally representative sample. As a result, the researcher has had no control over the type of information gathered from participants.

Conclusion

Considerable research has been conducted into the transition from primary schools to secondary schools. This research has been the impetus for changes in secondary school practices, including the development of specific transition programs. There has been concern that secondary mathematics teachers are not sufficiently taking into account the changes in the mathematics curriculum (particularly the move to more abstract mathematical thinking) that occur as children move from primary school into secondary school. After controlling for factors such as family wealth, the effect of the transition on mathematics achievement was estimated at 0.14. This is small, suggesting a hiatus in children's mathematics development at the time of the transition. As cautioned by Valentine and Cooper (2003), however, important small effects are common in educational research. The commencement of more demanding secondary mathematics, whenever it occurs, needs to be done as seamlessly as possible.

The results of the study also demonstrated that, whereas family wealth and gender affect children's mathematics development, they do not impact on the negative effect associated with the move into secondary school. Further, changing school does not appear to have adverse effects on the mathematics achievement of children in the upper primary school. It is only when this change is accompanied by significant curriculum change, such as the introduction of secondary school mathematics that problems arise. It is possible that as the National curriculum is implemented in secondary schools across all states, the move to secondary mathematics might be somewhat smoother. It is also possible that reports of less than optimal teaching practices in early secondary mathematics classrooms are widespread and require further investigation.

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About the author

Colin Carmichael, PhD is a Senior Lecturer (Tertiary Preparation) at the University of Southern Queensland, Australia.

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