Investigating expected progress in mathematics in an English secondary school

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England is notorious for its high stakes performativity culture and a school inspection regime that strikes fear and dread into the heart of many teachers and school leaders. A key driver in any school inspection is academic outcomes (exam results) and, more recently, progress. Children are tested at the end of primary schooling (age 11) and awarded a level, level 4 is the national expectation. Secondary schools are expected to secure three levels of progress for all learners by the end of the subsequent five years of schooling. Children who achieve level 4 at the end of primary are expected to progress to achieve GCSE grade C which has been matched to level 7. Drawing on data for two cohorts of students from a school in a relatively deprived area of the country, this research found that three levels of progress was unlikely to be achieved by students who failed to meet the national expectations at the end of primary, and was probably insufficiently challenging for students who had exceeded national expectations at the end of primary. Only prior attainment, eligibility for free school meals and being on the school's SEN register were found to produce statistically significant progress outcomes.

Keywords: accountability; assessment; progress; secondary school

Introduction

Ball's seminal paper (2003) on the terrors of performativity described a culture in English education that has not diminished over time. Alongside absolute performance schools are increasingly held to account for progress. The expected progress each individual child is to make during their five years of secondary schooling is three full levels; so a child gaining a level 4 at the end of primary school is expected to attain level 7 (equivalent to a grade C, see Figure 1) at GCSE (see Figure 1). In order to track each pupil's progress on an annual basis the majority of schools subdivide the levels into 4c (only just achieving), 4b and 4a (totally secure). These sub-levels are commonly used to set targets for each child to make expected progress i.e. two sub-levels each year or just over three full levels in five years.

GCSE Grade	A*	A	B	C	D	E	F	G
Notional level	10	9	8	7	6	5	4	3

Figure 1 - Notional Levels for GCSE grades in Mathematics and English (DCSF, 2009)

This research explores whether a relationship exists between a child's prior attainment and his/her ability to meet or exceed expected progress in mathematics. In the academic year 2012/13, DfE reported that 72% of secondary school students made expected progress in mathematics (DfE, 2014). Whilst the DfE analysis on expected progress considered ethnicity, location, Free School Meal status (FSM), and Special Educational Needs (SEN), etc. there was no analysis that looked at primary school attainment including sublevels. In this research we consider primary attainment by sublevel and compare the progress of autumn born and summer born children.

The data used in this study is from a larger than average secondary academy in one of the historically worst performing local authorities in the country, the school's catchment area encompasses a particularly deprived community centred around one of the largest social housing conurbations in Europe. The community is predominantly white working class. In 2012 the school was inspected and was judged to 'Require Improvement' as "too few students make more than expected progress from their starting points" this was despite teaching being good with outstanding features.

The purpose of this research was to explore whether there is a relationship between secondary school progress and children's primary school attainment and if so, what factors influence this relationship.

Children's progress in secondary school

Levels of attainment were first introduced alongside the National Curriculum in 1988. The 'average' child was expected to attain level 4 at the end of primary school and GCSE grade C (level 7) at the end of secondary school. The 'expected progress' measure became popular during the National Strategies (1999 – 2009). Many schools have developed systems for tracking student attainment expecting students to improve by two sublevels each year. This is despite the DfE data analysis product: Reporting and Analysis for Improvement through School Self-Evaluation (RAISEonline) stating:

> These minimum standards of expected progress were not developed for target-setting purposes (though we appreciate many schools do use them in this way) and do not include any "stretch" or challenge – in particular for able students e.g. while students progressing from Level 5 at KS2 to grade B GCSE English are seen as having made expected progress, in many cases an A or A* would be a more appropriate target. (RAISEonline, 2014).

DCSF (2009) found that in mathematics, 35% of children attaining Level 3 at Key Stage 2 made three levels of progress compared to 74% of children who achieved Level 5. In its most recent mathematics report Ofsted found

> … for those pupils reaching Levels 4c and 4b at age 11: 48% and 70% respectively of these pupils gained at least a GCSE grade C. While it is reasonable to anticipate that those who only just reach a particular level or grade might do less well subsequently than their peers who performed a little more strongly, the differences in progression rates are substantial. (2012: 15)

There is nothing in these reports about possible reasons for these differences in rate of progress. One could conjecture that children who are placed in 'bottom sets' with the consequent lack of access to the curriculum and associated lack of self esteem may contribute to the development of what Dweck (2008) would call a fixed mindset, "I'm rubbish at maths.". Other factors that are known to impact progress are deprivation (Parekh, MacInnes & Kenway, 2010; DCSF, 2009b) for which entitlement to Free School Meals (FSM) is a common proxy, gender (DCSF, 2009b), ethnicity (DCSF, 2009b), special educational needs (DCSF, 2009a) and whether children are summer born (Crawford, Dearden & Meghir, 2010).

Methodology

For this study attainment data was collected for two cohorts of GCSE students (n=476), this included their prior attainment (KS2 level and sublevel), gender, FSM status including whether they had been eligible for FSM at any time in the previous six years (Ever6 FSM), whether they were on the school's SEN register (SEN) and

date of birth. The school is in the highest quintile for both the percentage of pupils qualifying for FSMs (44% of all pupils; national average 28%) and for those with SENs (13% of all pupils; national average 8%). Given the school's population is predominantly white British working class no data on ethnicity was collected.

Data was analysed using statistical techniques looking for relationships through the use of contingency tables, conducting chi squared tests and calculating measures of association. Whilst the statistical measures such as Chi squared (Howell, 2007), Somers' d, Kendall's tau, Gamma (typically an upper bound) and Cramer's V (Göktas & Isçi, 2011) measure the strength of any mathematical relationship in the data, they do not provide any insight into the reason for the relationships nor the contribution of other variables. The interpretation of the statistics has followed advice from Pollock (2012).

Findings

Table 1 shows the number of children who made below expected, expected or above expected progress. Prior attainment matters, only children who achieved level 4 at the end of KS2 have a reasonable chance of making expected or better progress. The chi-squared value (calculated after combining level 2 and 3 frequencies) was significant at the 1% level. The measures of association suggested a moderately strong association (27% Kendall's tau and Somers'd, 45% Gamma) that was statistically significant at the 1% level.

Table 1 Mathematics KS2 Level and Expected Progress

			Expected Progress			Total
			Below	Expected	Above	
Mathematics KS2 Level	2	Count	14	0	0	14
		% within KS2 Level	100.0%	0.0%	0.0%	100.0%
	3	Count	62	10	5	77
		% within KS2 Level	80.5%	13.0%	6.5%	100.0%
	4	Count	120	124	21	265
		% within KS2 Level	45.3%	46.8%	7.9%	100.0%
	5	Count	45	45	25	115
		% within KS2 Level	39.1%	39.1%	21.7%	100.0%
Total		Count	241	179	51	471
		% of Total	51.2%	38.0%	10.8%	100.0%

Figure 2 below shows how the proportion making expected progress varies depending on the sublevel. Children assessed at sublevel C within in any level are far less likely to make expected progress. In table 2 the progress from different sublevels has been summarised. Again the chi squared value was statistically significant at the 1% level and the strength of association was between 43% and 27%.

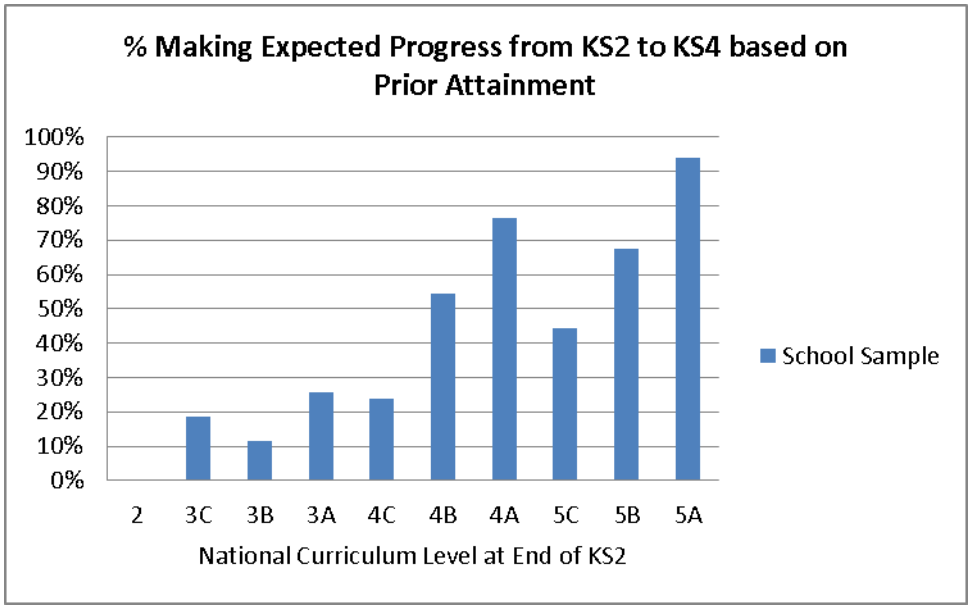

Figure 2 - Distribution of Percentage of Pupils Making Expected Progress by KS2 Level

Whilst children attaining level 2 at the end of KS2 do not make expected progress, 94% of children who achieve level 5A do. It is perhaps the children who are assessed at level 5C whose performance is most concerning. Just 44% make expected progress compared with those who attain 4A (76%) and those who attain 5B (67%). One could conjecture that the pressures on school to meet the accountability measure of five A*- C grades including the subjects of English and mathematics (Ofsted, 2012), means students are not being challenged to get any better than a grade C or perhaps at the end of KS2 the level is not wholly accurate.

Table 2 Mathematics KS2 Sub-Level and Expected Progress

			Expected Progress			Total
			Below	Expected	Above	
Mathematics KS2 Sub-Level	C	Count	101	37	5	143
		% within KS2 Sub-Level	70.6%	25.9%	3.5%	100.0%
	B	Count	89	69	20	178
		% within KS2 Sub-Level	50.0%	38.8%	11.2%	100.0%
	A	Count	51	73	26	150
		% within KS2 Sub-Level	34.0%	48.7%	17.3%	100.0%
Total		Count	241	179	51	471
		% of Total	51.2%	38.0%	10.8%	100.0%

Similar analyses were carried out for gender and the time of the year children were born but no statistically significant differences were found. The analysis of outcomes by Free School Meals found no difference between the two measures FSM and Ever6 FMS. However there was a statistically significant difference at the 5% level between the children on FSM who met expected progress (38%) and those not eligible for FSM (53%), see Table 3. However the association was weak at just 12%.

Table 3 FSM and Expected Progress

			Expected Progress			Total
			Below	Expected	Above	
FSM Status	Non-FSM	Count	174	149	40	363
		% within non-FSM Status	47.9%	41.0%	11.0%	100.0%
	FSM	Count	67	30	11	108
		% within FSM Status	62.0%	27.8%	10.2%	100.0%
Total		Count	241	179	51	471
		% within cohort	51.2%	38.0%	10.8%	100.0%

Comparing outcomes for those on the school's SEN register with those who are not reveals a statistically significant difference in those meeting or exceeding expected progress with a stronger association (22%) than for FSM.

Table 4 SEN Status and Expected Progress

			Expected Progress			Total
			Below	Expected	Above	
SEN Status	No SEN	Count	184	166	47	397
		% within no SEN Status	46.3%	41.8%	11.8%	100.0%
	SEN	Count	57	13	4	74
		% within SEN Status	77.0%	17.6%	5.4%	100.0%
Total		Count	241	179	51	471
		% all students	51.2%	38.0%	10.8%	100.0%

Conclusion

The findings suggest that expecting three levels of progress for all students through secondary school is not realistic. Student attainment at the end of primary school has the greatest impact on outcomes at the end of secondary school and eligibility for FSM and being on the school's SEN register makes a difference too. Consequently any system of school accountability should take account of the nature of the school population. The school inspection regime (Ofsted, 2014) has introduced an approach to comparing schools with similar prior attainment which does not take account of the proportion on FSMs or with SEN, or other factors known to impact progress and attainment.

To develop this research further it would have been worth collecting information about the classes students had been taught in, to investigate whether progress made related to the set they were allocated to. It would also be interesting to conduct a multivariate analysis of the data.

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