Department
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Influences on students' GCSE attainment and progress at age 16

Effective Pre-School, Primary & Secondary Education Project (EPPSE)

Research Report

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Executive summary

The Effective Pre-school, Primary and Secondary Education (EPPSE 3-16+) project represents the secondary school phase of a major longitudinal study that started in 1997. The original first phase of the research, the Effective Provision of Pre-school Education (EPPE) project, was designed to explore the impact of pre-school on children's cognitive and social-behavioural outcomes, as well as other important background influences (including family characteristics and the home learning environment). For this purpose, a pre-school sample was recruited to the study at age 3. An additional 'home' sample of children who had not attended pre-school was recruited later, at the start of primary school. The whole sample was followed up through primary and secondary school until the end of Key Stage 3 (KS3) when they were 14 years old. The EPPSE 3-16+ project is an extension of this research and follows the same sample (pre-school and 'home' children) to the end of KS4 of secondary schooling when they were aged 16. Although EPPSE was originally developed to investigate pre-school effects on development, its extension to Key Stage 4 (KS4) allows for the exploration of any additional effects of primary as well as secondary schooling (see Sylva et al., 2014, Taggart et al., 2014).

The research design of this project has been based on a longitudinal educational effectiveness and mixed methods approach (Sammons et al., 2005; Siraj-Blatchford et al., 2006). This type of design allows for the study of individual, family and home influences on children's and young people's cognitive/academic and developmental outcomes. Furthermore, the relative importance of background influences can be investigated in relation to the strength of pre-school, primary and secondary school influences.

This report presents the results of analyses of students' academic attainment at the end of Year 11, when they took the General Certificate of Secondary Education (GCSE) examinations. It also studies the students' academic progress from the age of 11 to 16, between KS2 and KS4. The results extend the findings about these students' educational outcomes at younger ages. Companion reports on students' social-behavioural development, views of schools and dispositions over the same period will be presented separately (Sammons et al., 2014a; 2014b; 2014c).

Throughout the research, the EPPSE project has gathered a wide range of data on children's development, individual, family, home learning environment (HLE), neighbourhood, pre-school, primary and secondary school characteristics. Measures such as secondary schools' academic effectiveness[1] and Ofsted inspection judgements

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[1] Independent indicators of secondary school academic effectiveness and quality were obtained from the Department for Education (DfE) and Ofsted. The measure of secondary school academic effectiveness is represented by the average KS2 to KS4 contextual value added (CVA) school level score over 4 years (2006-2009) during which the EPPSE students were in secondary school. The measures of secondary school quality were derived from various Ofsted inspection judgments.

were used to provide indicators of the quality of the secondary schools attended by EPPSE students. These complement the measures of quality[2] and effectiveness[3] for pre-school settings and the measures of primary school academic effectiveness[4]. It was therefore possible to explore pre-school, primary and secondary school influences on EPPSE students' academic attainment in Year 11 as expressed through various outcome measures based on GCSE results. The sample size for the analyses presented in this report varies on different outcomes, but includes a minimum of 2582 students representing over ninety-four percent of the sample tracked to the end of KS4 (n= 2744) and eighty-one percent of the original sample of children who attended pre-school and 'home' children (n= 3172).

The aims of this report are to:

- Investigate the relationships between students' academic attainment in KS4 (Year 11, age 16) and individual student, family and home learning environment (HLE) characteristics.

- Model students' academic attainment in Year 11, and their progress between KS2 and KS4 (Year 6 to Year 11). It should be noted that in the progress analyses, prior attainment in National Assessment tests taken at the end of primary education (Year 6, KS2) was included as a baseline in the statistical models.

- Explore the continuing influence of pre-school experience, particularly in terms of attendance, quality and academic effectiveness, on students' later academic outcomes.

- Examine the combined influence of gender, parental qualification levels, HLE and pre-school characteristics on students' academic attainment in Year 11.

- Investigate the influence of primary school academic effectiveness on later secondary school academic attainment and progress, when individual student, family and HLE characteristics have been taken into account.

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[2] Pre-school quality was measured for each setting using the aggregate scores from observations made using the ECERS-R (Harms et al., 1998) and ECERS-E (Sylva et al., 2003) – for more details of these measures see Glossary.

[3] Measures of the effectiveness of individual pre-school centres were derived from value added models of the children's progress during the pre-school period, controlling for prior attainment and children's background characteristics (Sammons et al., 2004a). That is, children's cognitive/academic progress was analysed from age 3 to rising 5 years and estimates of centre effects derived for a range of outcomes.

[4] Independent indicators of primary school academic effectiveness were obtained from the analysis of National Assessment data for several cohorts across all primary schools in England. Mean value added scores of school academic effectiveness across the years 2002 to 2004 were calculated for each primary school in England and then extracted for schools attended by children in the EPPE 3-11 sample. These value added measures provide indicators of a school's academic effectiveness in terms of National Assessment outcomes (Melhuish et al., 2006a; 2006b).

- Investigate the influence of secondary school academic effectiveness and quality on students' academic attainment and progress, when individual student, family and HLE characteristics have been taken into account.

- Explore the influences of student reported experiences of secondary school on their academic attainment and progress when individual student, family and HLE characteristics have been taken into account.

Previously, the project has demonstrated that a range of measures related to child, family and HLE characteristics are important predictors of children's early cognitive and later academic attainment and progress up to age 14 in secondary school (Sammons et al., 2008a; Sammons et al., 2011a; Sylva et al., 2010). The influences of these characteristics can be detected from a young age and can also predict later educational attainment. Analyses of variations in achievement point to the negative effects of socio-economic disadvantage and the importance of early years experiences. The results have contributed to policy developments in England associated with issues of equity and social inclusion (for example, see Taggart et al., 2008; The Equalities Review, 2007; Sylva et al., 2007) and informed the Allen Review on Early Interventions (2011) and Field Review on Poverty and Life Chances (2010).

The analyses presented in this report are based on the students' GCSE results at the end of year 11:

- the total GCSE and equivalents point score

- the grade achieved in full GCSE English

- the grade achieved in full GCSE maths

- the total number of full GCSE entries.

The analyses presented in this report also used some important benchmark indicators:

- achieving 5 or more GCSE/GNVQs at grades A*-C

- achieving 5 or more GCSE and equivalents at grades A*-C including GCSE English and maths

- achieving the English Baccalaureate (EBacc).

These analyses identify which child, family and HLE characteristics predict EPPSE students' KS4 academic attainment. The results show similarities to earlier findings for this sample. While many findings about the influences of gender, parents' qualification levels or family socio-economic status (SES) are in accord with those from other educational research studies, EPPSE also reveals the continued importance of the early years HLE. The EPPSE project is unique in its exploration of early HLE across different phases of students' later education. It shows that the early years HLE continues to predict attainment up to age 16. In addition, the latest research discussed in this report demonstrates that various individual and family background characteristics continue to

shape students' academic progress between KS2 and KS4 (especially ethnicity, parents' highest qualification levels and the KS3 HLE measure of academic enrichment).

As well as investigating the impact of child, family and HLE background, the EPPSE research has explored the continued influence of pre-school and primary school as predictors of students' later attainment at age 16 and also tested a range of measures related to secondary school experiences based on students' reports of their experiences and views of school in KS3 and KS4. The results, therefore, provide new evidence on the way different educational settings (pre-school, primary and secondary school) affect GCSE attainment and progress across five years in secondary education.

This report focuses on statistical trends and quantitative analyses of factors that predict attainment and progress in KS4 based on results using multilevel statistical models. Elsewhere, EPPSE has reported, in keeping with the mixed methods research design, findings from qualitative case studies of children and families who are educationally successful in overcoming disadvantage (see Siraj-Blatchford et al., 2011). These qualitative data help to provide a broader understanding of the way social disadvantage shapes students' educational outcomes and experiences at different ages and what factors help to protect against its adverse consequences.

Summary of findings[5]

Raw differences in attainment for different student groups

Gender

In Year 11, on average females continue to obtain better results in GCSE English than males (with a difference of about half a grade). However, there were no significant gender differences in GCSE maths. Females also obtained higher total GCSE scores (Mean=472.3; Std. Deviation=165), were entered for more full GCSEs (Mean=7.6; Std. Deviation=2.7) than males and were more likely to achieve the various DfE benchmark indicators of performance like 5 A*-C, 5 A*-C including English and maths and the EBacc. At younger ages, girls had been found to have higher attainment in reading and English. They also had higher maths and science outcomes in primary school, but by age 14 and later at 16, these differences are no longer statistically significant.

Ethnicity

There was some evidence of ethnic differences in attainment, but due to low numbers for most ethnic origin subgroups in the EPPSE sample the results should be interpreted with caution. The differences found in average results by ethnic group are in line with those evident in other studies indicating higher attainment for some groups (e.g., those

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[5] Only statistically significant differences are presented.

students of Indian or Bangladeshi heritage) and lower attainment for others (e.g., those students of Pakistani heritage) when compared with students of White UK heritage.

Family characteristics

There were marked differences in GCSE attainment related to parents' qualification levels when children were age 3/5. As might be anticipated, students with highly qualified parents (degree level) had much higher attainment on average than those students whose parents had no qualifications. The differences were equivalent to 141 points for total GCSE score, 10 points in GCSE English, 13 points in GCSE maths (equal to two grades higher e.g., the difference between achieving a grade B instead of a grade D), and 4 extra full GCSE exam entries.

There were also large differences related to family socio-economic status (SES) between those students whose parents were from the professional non-manual category and those from lower SES categories. Moreover, students eligible for Free School Meals (FSM) had lower average attainment than students who were not eligible for FSM. The differences for FSM versus no FSM were around a full GCSE grade in size in GCSE English and GCSE maths.

The quality of the early years HLE showed a clear association with later differences in average GCSE results. The differences for GCSE English and GCSE maths were approximately 10 grade points, and for total GCSE score the difference was 125 points for those who had experienced a high versus low quality early years HLE. This again confirms earlier findings about the likely importance of parents providing a stimulating HLE in the early years.

The net impact of child, family and HLE characteristics on GCSE attainment in Year 11

The average group differences described above do not take into account the relative influence of other characteristics. Multilevel modelling provides more detailed results of the 'net' contribution of individual characteristics, whilst controlling for other predictors and so enables the identification of the 'strongest' net predictors. For instance, effects can distinguish differences in attainment for students with mothers who have degrees compared with those with no qualifications, net of the influence of other associated family and individual student level characteristics (e.g., family SES, income, HLE, age or gender). Results are reported in effect sizes (ES), a statistical measure of the relative strength of different predictors or in odds ratios (OR) representing the odds of achieving certain benchmark performance indicators given certain characteristics relative to the odds of the reference group (see Summary Tables).

Parents' highest qualification level, when children were age 3/5, was the strongest net predictor of better attainment in terms of grades in GCSE English (ES=0.69 - for degree versus no qualification; ES=0.80 - for higher degree versus no qualification) and GCSE maths (ES=0.65 - for degree versus no qualification; ES=0.74 - for higher degree versus

no qualification) and achieving 5 A*-C including English and maths (OR=2.86 - for higher degree, OR=3.92 - for degree). All these comparisons are to parents with no qualifications (see Summary Tables).

Differences related to ethnicity were strong predictors of total GCSE score (ES=0.76 for students of Bangladeshi heritage). Family income, measured in KS1, showed larger effects in terms of the likelihood of achieving 5 A*-C (OR=3.94 - for an income larger than £67000 when compared to no earned salary) and the EBacc (OR=4.04 - for an income larger than £67000 when compared to no earned salary).

There were also a number of additional strong/moderately strong effects for various family influences that are noted below:

- Total GCSE score: parents' highest qualification level, KS3 HLE academic enrichment and the early years HLE.

- GCSE grade in English: ethnicity, family SES, early years HLE, KS3 HLE academic enrichment and family income.

- GCSE grade in maths: family SES, ethnicity, KS3 HLE academic enrichment, early years HLE and Year 11 FSM.

- Total number of full GCSE entries: family SES, ethnicity, family salary, early years HLE and KS3 HLE academic enrichment.

- Achieving 5 A*-C: early years HLE, parents' highest qualification level, KS3 HLE academic enrichment and gender.

- Achieving 5 A*-C including English and maths: the early years HLE, KS3 HLE academic enrichment, ethnicity and family income.

- English Baccalaureate (EBacc): KS3 HLE academic enrichment, parents' highest qualification level and gender.

It should be noted that ethnicity was not a significant predictor of the overall benchmark indicators (i.e., achieving 5 A*-C or the EBacc), but it was for the other GCSE outcomes like the total GCSE score and subject grades. Students of Pakistani[6] and Bangladeshi[7] heritage obtained statistically significant and higher total GCSE scores, better grades in GCSE maths and were entered for more full GCSEs than students of White UK heritage when account was taken of the effects of all other significant predictors like SES, income etc.

Both FSM (a low income indicator; ES=-0.31) and family SES (ES=-0.49 – for unskilled versus professional non-manual) have moderate effects on grades in GCSE English, but

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[6] This shows that for Pakistani students, their low raw scores are accounted for by background influences.
[7] There is only a small sample size of EPPSE students who are of Bangladeshi heritage.

the family SES effect was stronger for grades in GCSE maths (ES=-0.66 - for unskilled versus professional). The SES effects for grades in GCSE English were similar in size to the effects of the early years HLE (ES=0.51 - for high versus low) and KS3 enrichment HLE measure for English (ES=0.48 - for high versus low). Interestingly, the early years HLE had a stronger impact on all measures of students' GCSE results than the low income indicator, FSM.

Older students (for their age group e.g., Autumn-born) showed better results although the effect was not strong. There were also small positive effects related to the age of the child's mother (at age 3/5); the older the mother the better the academic outcomes (grades in GCSE English and GCSE maths), but also the higher the likelihood of achieving overall benchmark indicators (5 A*-C and the EBacc) when compared with students whose mothers were younger.

These results broadly confirm patterns identified at younger ages indicating that differences in attainment related to individual student and family background influences emerge early (measured when children were recruited to the study) and remain fairly stable as students progress through primary and secondary school. Evidence for this conclusion was well established in previous research (Mortimore et al., 1988; Nuttall, 1990; Rutter & Madge, 1976; Tizard et al., 1988; Sammons, 1995), but EPPSE shows the important effects of the HLE that have been little studied elsewhere.

Neighbourhood Influences

A number of neighbourhood measures were tested as potential predictors of GCSE results from Year 11. These measures reflect the neighbourhood environment in which the child lived while in pre-school and primary school and do not necessarily reflect later neighbourhood environments resulting from moving house.

Previous research has suggested that contextual influences outside the family (such as 'place poverty' linked to living in a disadvantaged neighbourhood and school composition) can influence student attainment. Living in a disadvantaged area while in pre-school or primary school and attending a school with a higher representation of disadvantaged students may affect individual student and family aspirations and attitudes towards education, but also teacher expectations, classroom processes and school climate (Leckie, 2009; 2012; Sammons et al., 1997; Sampson, 2012).

Levels of neighbourhood disadvantage measured by the national indicators the Index of Multiple Deprivation (IMD - see Noble et al., 2004), and the Income Deprivation Affecting Children Index (IDACI – see Noble et al., 2008) were used as predictors of GCSE results from Year 11.

The IDACI was a significant and negative predictor of lower grades in GCSE English (ES=-0.15) and in GCSE maths (ES=-0.16), and also of lower likelihood of attaining the benchmark performance indicators (OR ranges between 0.32-0.39). This was not the case during the primary school years, possibly because neighbourhood influences

increase as adolescents interact more with their peer group outside the home. Students who lived in more disadvantaged neighbourhoods in the early years had poorer attainment in GCSE outcomes, over and above their own and their family characteristics, although these neighbourhood effects are relatively small compared with those of the family.

Other neighbourhood measures were also studied. These included the level of unemployment, level of crime, percentage of White British residents and the percentage of residents with limiting long term illnesses. Except for the last measure, all these other indicators were significant negative predictors of different GCSE outcomes in Year 11, although the effects were fairly weak. Thus, for example the percentage of the population who were classed as White British was statistically significant with small negative effects for grades in GCSE English (ES=-0.20) and in GCSE maths (ES=-0.15) and the three benchmark indicators. The level of crime and unemployment recorded in a neighbourhood were both found to have small negative effects on attainment in maths and slightly stronger negative effects on the number of full GCSE entries. Similarly, parents' perceptions of higher levels of safety in their neighbourhood (measured by parental questionnaire during KS1) also showed small but positive effects on grades in GCSE maths, total GCSE score and achieving 5 A*-C (see Summary Tables).

School composition

There is some evidence that the 'social composition' of the school intake (as measured by the percentage of students entitled to free school meals, an indicator of poverty) predicts individual students' outcomes over and above their own FSM status. A higher percentage of students eligible for or receiving FSM measured at school level predicted significantly lower grades in GCSE English (ES=-0.18), fewer full GCSE entries (ES=-0.55) and a lower probability of achieving 5 A*-C (OR=0.98).

These findings are in line with research conducted by the DfE that has examined broader contextual influences when calculating the national Contextual Value Added (CVA) measure. The DfE's national CVA analyses of school performance have demonstrated that the school intake measure (% of FSM students) and neighbourhood measures such as the IMD and IDACI score predict poorer progress for students, even when individual student background measures are controlled.

Taken together the results indicate that attainment was lower for students who lived in more disadvantaged neighbourhoods compared with those living in more advantaged neighbourhoods, over and above their own and their family characteristics. The neighbourhood and school composition influences though relatively small become stronger as the EPPSE sample go through adolescence. The findings show the challenges faced in raising attainment in certain social contexts as recognised by research on schools in challenging circumstances (Muijs et al., 2004).

Pre-school

The EPPSE research was designed to follow up children recruited at pre-school into primary and later secondary school in order to identify the contribution of different educational influences on their later progress and development during various phases of education. In addition to investigating the effects of individual student, family, HLE and neighbourhood characteristics, further analyses sought to establish whether pre-school influences identified as significant predictors of attainment and progress in both cognitive/academic and social-behavioural outcomes at younger ages continued to show effects thirteen years later.

Four measures were tested: pre-school attendance (in comparison with the 'home' group); the duration (in months), the quality of the pre-school attended (as measured by the ECERS-R and ECERS-E rating scales – see Glossary) and the effectiveness of the pre-school attended in promoting better child outcomes at entry to primary school.

Attendance

Attending a pre-school was found to be a statistically significant predictor of higher total GCSE score (ES=0.31), more full GCSE entries (ES=0.21), better grades in GCSE English (ES=0.23) and GCSE maths (ES=0.21) and of a higher probability of achieving 5 A*-C including English and maths (OR=1.48) when compared with students from the 'home' (or no pre-school) group. Although relatively modest, these effects are still stronger than those found for 'age' (i.e. being Autumn rather than Summer born) or the effects of some home learning measures (i.e. KS1 and KS2 HLE or family composition). They indicate that attending a pre-school (versus not) still shapes academic outcomes in the longer term (see Summary Tables).

Duration

The amount of time in months (duration of attendance) that a student had spent in pre-school also showed continued effects on Year 11 academic outcomes. Students who had attended between 2 and 3 years (whether part-time or full-time) in pre-school obtained higher total GCSE scores (ES=0.38), better grades in GCSE English (ES=0.28) and in GCSE maths (ES=0.30), and were entered for more GCSE exams (ES=0.24) than those who had not attended any pre-school.

Quality

There was some evidence that the quality of pre-school also continued to predict better GCSE results (total GCSE score – ES=0.37; GCSE English – ES=0.31; GCSE maths – ES=0.36). Those who had attended a high quality setting were more likely to achieve 5 A*-C including English and maths (OR=1.69) than students who had not attended pre-school. Students who had attended high quality pre-schools showed the most consistent pattern. These quality effects were mostly fairly small although still statistically significant.

This pattern shows broadly similar effects, but they are weaker than those found when students were in KS2 in primary school.

Effectiveness

The indicator of pre-school effectiveness in promoting pre-reading skills continued to predict academic attainment at the end of Year 11. Higher levels of pre-school effectiveness predicted more GCSE entries (ES=0.25), better grades in GCSE English (ES=0.31), and having a higher probability of achieving 5 A*-C including English and maths (OR=1.73).

The patterns of relationships between pre-school effectiveness (in terms of early number concepts) and students' later Year 11 academic outcomes also indicate positive and significant effects for grades in GCSE maths (ES=0.35) and total GCSE score (ES=0.48). However, no clear patterns for these predictors emerged for the various GCSE benchmark indicators.

Combined effects

Further analyses explored the joint effects of pre-school quality and gender. The results showed that males who had attended a medium (ES= 0.33) or a high quality (ES= 0.41) pre-school obtained significantly higher grades in GCSE maths than males who had not attended any pre-school at all. Similarly, we investigated the joint effects of pre-school quality and parental qualification levels. Results showed that students of low qualified parents who had attended a high quality pre-school obtained significantly better grades in GCSE English (ES= 0.35) and in GCSE maths (ES= 0.25) than students of low qualified parents who had not attended any pre-school. Additionally, a pre-school quality gradient was evident for grades in GCSE English for those students whose parents had moderate to high qualification levels when compared to students who had not attended a pre-school and whose parents had low qualification levels.

Summary table for Year 11 academic outcomes[8]

	Total GCSE score	Total GCSE entries	GCSE English	GCSE maths
Individual student measures	ES	ES	ES	ES
Age	0.14		0.13	0.14
Gender	0.19	0.11	0.38	
Ethnicity	0.76 (B)†	0.58 (B)	0.55 (B)	0.53 (I)‡
Birth weight		-0.39		
Early behavioural problems	-0.29	-0.30	-0.17	-0.27
Early health problems	-0.12	-0.12	-0.14	-0.16
Number of siblings	-0.17	-0.33	-0.28	-0.17
Family measures				
Mother's age at age 3/5			0.15	0.10
Year 11 FSM	-0.32	-0.23	-0.31	-0.37
KS1 family salary	0.29	0.52	0.41	0.28
Parents' highest SES at age 3/5	-0.31	-0.58	-0.53	-0.66
Mothers' highest qualifications level at age 3/5	0.47	0.31	0.70	0.57
Fathers' highest qualifications level at age 3/5		0.25	0.33	0.40
Parents' highest qualifications level at age 3/5	0.59	0.36	0.80	0.74
HLE measures				
Early years HLE	0.36	0.51	0.51	0.45
KS1 HLE outing (medium)				0.11
KS1 HLE educational computing (medium)	0.11	0.13		
KS2 HLE educational computing (medium)		0.13	0.10	0.15
KS3 HLE computer (high)		0.15		
KS3 HLE academic enrichment (high)	0.47	0.43	0.48	0.47
Pre-school measures				
Pre-school attendance	0.31	0.21	0.23	0.21
Pre-school duration	0.38	0.24	0.28	0.30
Pre-school quality	0.37	0.20	0.31	0.26
Pre-school effectiveness pre-reading	0.27	0.25	0.31	
Pre-school effectiveness early number concepts	0.48	0.23		0.35
Primary school measures				
Primary school academic effectiveness - maths				0.25
Secondary school measures				
Secondary school academic effectiveness	0.42			
Secondary school quality – the quality of pupils' learning		0.93	0.47	0.47
Secondary school quality – attendance of learners		0.78	0.50	0.62

B†=Bangladeshi heritage; I‡=Indian heritage

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[8] ES are based on the models that included the combined measure of parental qualification levels. When multiple categories are significant, the highest ES is presented.

Primary school influence

Previous EPPSE research has shown that the academic effectiveness of a child's primary school was a statistically significant predictor of better attainment and progress across KS2 for English and more strongly for maths. Other educational effectiveness research has shown that primary schools can continue to influence students' longer term academic outcomes at secondary school (Goldstein & Sammons, 1997; Leckie, 2009). Indeed, earlier EPPSE results from KS3 (in Year 9) show that measures of the primary school academic effectiveness significantly predicted their later academic attainment in maths and science three years after transferring to secondary school. The latest GCSE analyses show that primary school academic effectiveness continues to influence EPPSE students' later academic attainment up to the end of Year 11. Thus, students who had attended a primary school that was more academically effective for maths had significantly better grades in GCSE maths (ES=0.25) than students who had attended a low academically effective primary school. Similarly, students who had previously attended a medium or highly academically effective primary school were almost twice as likely to achieve the EBacc as students who had attended a low academically effective primary school (OR=1.94), after controlling for student, family HLE and neighbourhood influences (see Summary Tables).

Secondary school influences

Contextual Value Added (CVA[9]) measures of the academic effectiveness of secondary schools attended by EPPSE students were obtained from the DfE. These were derived from the DfE's National Pupil Database (NPD). These CVA measures show the relative progress made by student intakes measured from KS2 to KS4 (across 5 years). In contrast to our primary school academic effectiveness measure that examined results in English, maths and science separately (Melhuish et al., 2006a; 2006b), we did not have subject specific results for these secondary school CVA indicators. The secondary school DfE based CVA combined measure of overall academic effectiveness significantly predicted students' academic attainment in terms of total GCSE score (ES=0.42), but not the specific subject grades or the benchmark indicators. It is likely that the total GCSE score is more susceptible to overall school level influences as also shown by the larger intra-school correlation. Subject grades are likely to be more shaped by departmental effectiveness (Sammons, Thomas & Mortimore, 1997).

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[9] The EPPSE CVA indicator is based on DfE CVA results for 4 successive years, covering the 4 EPPSE cohorts, 2006-2009 for all secondary schools attended by EPPSE students. The EPPSE results have an overall CVA averaged mean of 1004, which is close to the national CVA mean of 1000. The students in the sample (based on their secondary school's average CVA score) were divided into high, medium and low CVA effectiveness groups based on the average CVA score to 1 SD above or below the mean; nationally, approximately 10% of secondary schools are 1 SD above the mean and approximately 10% of secondary schools are 1 SD below the mean.

Summary table for Year 11 benchmark indicators

	Achieved 5 A*-C	Achieved 5 A*-C English & maths	EBacc
Individual student measures	OR[10]	OR	OR
Age		1.04	
Gender	1.45	1.24	1.74
Ethnicity		2.28(I)[‡]	
Developmental problems	0.68	0.67	
Behavioural problems	0.65	0.63	
Health problems	0.63		
Number of siblings	0.62	0.69	
Family measures			
Mother's age at age 3/5	1.33		1.39
Year 11 FSM	0.61	0.51	
KS1 family salary	3.94	1.95	4.04
Parents' highest SES at age 3/5	0.50	0.59	0.41
Mothers' highest qualifications level at age 3/5	3.14	4.11	
Fathers' highest qualifications level at age 3/5	2.48	2.07	3.16
Parents' highest qualifications level at age 3/5	3.58	3.92	2.83
School level FSM	0.98		0.96
HLE measures			
Early years HLE	3.61	2.90	
KS1 HLE outing (medium)		1.39	
KS1 HLE educational computing (medium)	1.36		0.51 (high)
KS3 HLE academic enrichment (high)	2.80	2.60	3.89
KS3 HLE parental interest (high)		1.34	
Pre-school measures			
Pre-school attendance		1.48	
Pre-school quality		1.69	
Pre-school effectiveness pre-reading		1.73	
Primary school measures			
Primary school academic effectiveness - maths			1.94
Secondary school measures			
Secondary school quality – the quality of pupils' learning	3.04	2.74	5.44
Secondary school quality – attendance of learners	2.89	2.74	

I[‡]=Indian heritage

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[10] Odds Ratios represent the odds of achieving certain benchmark performance indicators given certain characteristics relative to the odds of the reference group.

Ofsted[11] inspection ratings were used to provide additional measures of secondary school quality. EPPSE students who attended secondary schools classified as 'outstanding' based on the 'quality of pupils' learning and their progress' had significantly better results in GCSE English (ES=0.47) and GCSE maths (ES=0.47), were more likely to achieve 5 A*-C, 5 A*-C including English and maths, as well as the EBacc than students from secondary schools characterised as 'inadequate' in their learning quality. Again, these analyses controlled for students' individual, family and HLE and neighbourhood characteristics (see Summary Tables).

Ofsted inspectors also rated secondary schools based on the level of attendance of their students. 'Learners' attendance' as rated by Ofsted inspectors was a statistically significant predictor of academic attainment in Year 11. Students from secondary schools rated as 'outstanding' on the 'learners' attendance' got higher grades in GCSE English (ES=0.50) and GCSE maths (ES=0.62) than students from secondary schools characterised as 'inadequate' while controlling for other influences. Students from 'outstanding' schools (in terms of 'learners' attendance') were entered significantly for more full GCSEs than students from schools where attendance was assessed as 'inadequate' (ES=0.78). The probability of achieving 5 A*-C and 5 A*-C including English and maths was significantly higher for students from schools with 'outstanding' attendance. There was less evidence of differences for schools rated as 'good' on Ofsted's 'learners' attendance' measure.

These results indicate that secondary school quality was important in shaping students' academic attainment over and above the impact of background characteristics.

Students' academic progress between KS2 and KS4

Students' academic progress across five years in secondary school (Year 7-Year 11) was studied by controlling for their prior attainment at the end of primary school and taking account of the significant individual student, family, HLE, neighbourhood and school characteristics discussed previously. Fewer background characteristics predicted progress between KS2 and KS4 than were found to predict attainment. The patterns were similar to those found at younger ages when we studied students' progress between KS2 and KS3 (Year 7- Year 9) for this sample.

Overall, there was evidence that students with the following characteristics made greater overall academic progress and progress in specific subjects between KS2 and KS4:

- older for their year group (Autumn-born) (total GCSE score - ES=0.16; GCSE English - ES=0.18; GCSE maths - ES=0.20).

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[11] It should be noted that the inspector data are related to the time EPPSE students were in KS3 and were measured by the inspection frameworks in use between 2005 and 2010.

- females (total GCSE score - ES=0.25, GCSE English - ES=0.27; GCSE maths - ES=0.13).

- of Bangladeshi heritage[12] (total GCSE score - ES=0.83; GCSE English - ES=0.66; GCSE maths - ES=0.88).

- with higher family incomes (total GCSE score - ES=0.26; GCSE English - ES=0.34; GCSE maths - ES=0.21).

- with higher qualified parents (total GCSE score - ES=0.39; GCSE English - ES=0.59; GCSE maths - ES=0.42).

- who experienced more learning opportunities in terms of KS3 HLE academic enrichment (total GCSE score - ES=0.36; GCSE English - ES=0.37; GCSE maths - ES=0.45).

There were also small negative effects on progress related to early behavioural problems, early health problems and eligibility for FSM. Again, this is in accord with patterns found by EPPSE in KS2 and KS3.

Of the neighbourhood measures tested, only the percentage of White British residents was a significant predictor of poorer student progress in English. For progress in maths however, reported crime, level of unemployment, perceived neighbour safety, and the IMD and IDACI were all statistically significant. These findings indicate that the disadvantage of the school's intake and students' neighbourhood characteristics had small negative effects predicting both poorer progress and attainment in some outcomes. The results suggest that neighbourhood context plays some role in shaping students' outcomes up to age 16.

Similar to findings in Year 9, the pre-school measures and the primary school academic effectiveness measure did not predict academic progress in specific subjects (English and maths) between KS2 and KS4. These may be more sensitive to subject department effects. However, pre-school attendance, quality and effectiveness significantly predicted EPPSE students' overall academic progress in terms of promoting a higher total GCSE score. Overall GCSE performance is likely to be a broader measure of school effects for all students in contrast to subject results that are more likely to reflect subject department effects. Similarly, the CVA[13] measure of secondary school academic effectiveness was a moderately strong predictor of overall academic progress in terms of total GCSE score

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[12] There is only a small sample size of EPPSE students who are of Bangladeshi heritage.

[13] The EPPSE CVA indicator is based on DfE CVA results for 4 successive years, covering the 4 EPPSE cohorts, 2006-2009 for all secondary schools attended by EPPSE students.   The EPPSE results have an overall CVA averaged mean of 1004, which is close to the national CVA mean of 1000. The students in the sample (based on their secondary school's average CVA score) were divided into high, medium and low CVA effectiveness groups based on the average CVA score to 1 SD above or below the mean; nationally, approximately 10% of secondary schools are 1 SD above the mean and approximately 10% of secondary schools are 1 SD below the mean.

(ES=0.53). Moreover, measures of secondary school quality (Ofsted ratings) were significant predictors of progress in specific GCSE subject grades in English and maths but not students' overall academic progress.

Students' experiences and views of secondary school

Students provided their own views on secondary school characteristics and on their experiences both in Year 9 (see Summary Table below) and Year 11. Various measures of school experiences were identified and tested whether they predicted variations in students' KS4 academic attainment and progress after control for individual, family, HLE characteristics and the percentage of students on FSM in the school (see related reports Sammons et al., 2014b; 2014c).

Views in Year 9

The results indicate that students who perceived their school to place higher 'emphasis on learning' in Year 9 had significantly higher GCSE attainment and made more progress across the five years in secondary school. The summary table below shows the strongest effects were on total GCSE score (ES=0.36). The effect on the overall academic progress was similar (ES=0.33).

Summary table of the effects of Year 9 views of schools on Year 11 academic outcomes

Year 9 views of schools	Year 11 Total GCSE score		Year 11 Total GCSE entries		Year 11 GCSE English		Year 11 GCSE maths	
Fixed effects (continuous)	**ES**	**Sig**	**ES**	**Sig**	**ES**	**Sig**	**ES**	**Sig**
Emphasis on learning	0.36	***	0.26	***	0.32	***	0.23	***
Behaviour climate	0.34	***	0.41	***	0.34	***	0.41	***
Headteacher qualities	0.14	*		ns	0.12	*		ns
School environment	0.15	*	0.19	**	0.12	*	0.13	*
Valuing pupils	0.22	***	0.20	***	0.15	*		ns
School/Learning resources	0.20	***	0.20	***	0.14	*	0.17	**
Teacher discipline and care	0.14	*		ns		ns		ns
Teacher support	0.15	*	0.12	*		ns		ns

* p<0.05, ** p<0.01, *** p<0.001

EPPSE students' attainment (in terms of all measures of GCSE results) was also found to be higher when they perceived a more positive 'behaviour climate' in their secondary school. The difference was particularly noticeable for grades in GCSE maths and the number of full GCSE entries (ES=0.41). For overall progress and progress in specific subjects the effects were similar and positive. Students' perceived quality of their 'school environment'[14] was also a predictor of better attainment (in total GCSE score and subject grades), although the effects were smaller. Similarly, small but positive effects were

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[14] This factor includes attractive and well decorated buildings, cleanliness of toilets etc.

identified for the factor related to students' perceptions of how much they felt teachers valued and respected them.

The factor 'learning resources' (related to whether students felt the school was well equipped with computers and technology) also predicted better attainment in all continuous measures of GCSE results. All Year 9 factors related to students' perceptions of school characteristics and processes significantly predicted overall academic progress measured by total GCSE score and progress in English and maths, controlling for Year 6 prior attainment and other background characteristics.

After testing these factors separately as predictors of attainment, we also tested them together to investigate which ones are the most important in predicting academic outcomes in Year 11 when still controlling for the influences of individual student, familial and HLE characteristics. It was found that the two factors 'emphasis on learning' and 'positive behaviour climate' together significantly predicted the majority of Year 11 academic attainment measures, but also academic progress.

Summary table of the effects of Year 9 views of schools on Year 11 benchmark indicators

Year 9 views of schools	Year 11 Achieved 5 A*-C		Year 11 Achieved 5 A*-C English and maths		Year 11 EBacc	
Fixed effects (continuous)	**OR**	**Sig**	**OR**	**Sig**	**OR**	**Sig**
Emphasis on learning	5.95	***	2.51	*	3.00	*
Behaviour climate	3.12	***	2.32	***	1.94	*
Headteacher qualities		ns		ns		ns
School environment		ns		ns		ns
Valuing pupils	2.44	***	1.67	*		ns
School/Learning resources		ns		ns		ns
Teacher discipline and care	2.27	*		ns		ns
Teacher support	1.69	*		ns		ns

* p<0.05, ** p<0.01, *** p<0.001

Views in Year 11

When testing the factors related to students' experiences and views in Year 11, we found that significantly higher total GCSE scores and better grades in GCSE English were obtained by students who reported that 1) their teachers had a strong focus on learning; 2) in their schools the relationships between students and teachers were good in terms of trust, respect and fairness; 3) there was a high level of monitoring by their teachers; 4) their teacher provided more feedback. The same factors were significant predictors of overall academic progress and progress in English. 'Positive relationship' and 'formative feedback' were both significant predictors of better GCSE grades in maths and also of academic progress in maths during secondary school. The results point to the importance of school and teaching experiences in both KS3 and KS4 in shaping academic attainment at GCSE level.

It is interesting to note that the latest report on PISA 2012 results shows that students in England generally have more favourable views of their schools (in terms of positive climate for learning) and teachers (and their relationships with teachers) than the students from other OECD countries (Wheater et al., 2013). The EPPSE analyses point to the importance of students' perspectives.

Homework

Again, after control for individual, family and HLE influences, the daily time spent on homework, as reported by students in Year 9 and Year 11, were important and strong predictors of better academic attainment and progress in both KS3 and KS4. The strongest effects were noted for those who reported spending 2-3 hours doing homework on a typical school night. Thus, for example, students who reported in Year 9 spending between 2 and 3 hours on homework on an average weeknight were almost 10 times more likely to achieve 5 A*-C (OR=9.97) than students who did not spend any time on homework. A similarly strong result was found for the time spent on homework reported in Year 11 (OR=9.61). Moderate to strong positive effects of time spent on homework were found for total GCSE score, specific GCSE grades and the benchmark indicators, but also on overall academic progress and progress in specific subjects.

Spending more time on homework is likely to increase students' study skills and opportunities to learn. It may also be influenced by and provide an indicator of self-regulation. Homework is likely to reflect secondary schools' policies, teachers' expectations and the academic emphasis in the school as well as encouragement from parents to take school work seriously. These results show that independent study and effort by students are important contributors to academic success at GCSE over and above the important role of all the other background influences and prior attainment.

Implications

The latest findings in KS4 are generally in line with those found in the most recent EPPSE analyses of Year 9 outcomes at the end of KS3. The latest findings cover outcomes at GCSE that have very important consequences for students' subsequent further higher education and employment opportunities. They highlight a number of features of school experience that can be addressed in school improvement policies intended to promote better outcomes for secondary school students. They also point to the potential role of using survey data and other ways to tap into the student 'voice' in assessing the quality of their educational experiences. The aspects about secondary school experience identified here show the importance to school leaders and teaching staff of focusing on enhancing the quality of teaching and learning, student support, positive relationships, improving the behavioural climate of the school, ensuring students feel valued, and promoting a high quality physical environment and learning resources. These aspects should be viewed as key features for school self-evaluation and planning for improvement as well as for external evaluation.

Policy makers are increasingly interested in student progression in judging school performance. Indeed, schools are now required to publish information on progression in their school, not just on academic attainment.

Overall, the latest results confirm and extend earlier EPPSE findings. The life chances of some children are shaped by important individual, family, home and school experiences from an early age. There is no level playing field at the start of school or in later phases. These early effects of disadvantage emerge at a young age and their influences continue to shape students' later educational outcomes through subsequent phases of their educational careers. It is widely recognised that England has a very large equity gap in achievement in international comparisons and that life chances and social mobility are highly stratified. However, some influences can help to ameliorate the effects of disadvantage. Positive pre-school effects remain evident, while secondary school experiences are also relevant. There are important and probably reciprocal associations between academic and social-behavioural development.

Disadvantage remains a complex and multi-faceted concept. The longitudinal EPPSE research indicates that disadvantage is by no means captured by one simple indicator such as the FSM status of a student. This has important implications for funding to tackle disadvantage. Poverty, in terms of FSM status, does not embrace the full range of characteristics which are shown in this report to shape students' academic outcomes. The concept of multiple disadvantage is important and the challenges facing schools, parents and communities, in promoting better outcomes for students from disadvantaged homes and contexts remain strongly evident (related to neighbourhood and school composition influences).

Educational influences (including pre-school) have an important part to play in supporting those 'at risk' and can promote better outcomes by ameliorating the adverse effects of disadvantage. But the EPPSE data shows that equity gaps emerge early for all outcomes (cognitive/academic and social-behavioural) and remain strongly evident across different phases of education.

Taken together, the EPPSE research indicates that no single educational influence acts as a 'magic bullet' that can overcome disadvantage. However, parental actions that provide a better home learning environment and also supportive educational environments (pre-school, primary and secondary school) can make a difference to children and young people's academic and other important educational outcomes and so can help to improve life chances. The findings confirm that pre-school effects last and have particular relevance for policy making. The academic effectiveness of the primary school, and later of the secondary school, attended also predicted students' attainment and progress. Those fortunate to attend more academically effective or higher quality schools receive a significant boost in terms of GCSE outcomes at age 16. There are also clear implications for practitioners about the role of students' secondary school experiences that can support school improvement strategies in KS3 and KS4.

1 Introduction

The Effective Pre-school, Primary and Secondary Education project (EPPSE 3-16+) is a large-scale, longitudinal study funded by the Department for Education (DfE). The Effective Provision of Pre-school Education (EPPE) project was originally designed to investigate the influence of early childhood provision in promoting young children's cognitive/academic and social development during pre-school and into early primary education.

The EPPE project was the first study of pre-schools in Europe to adopt an educational effectiveness design based on sampling children from a range of different pre-school settings (centres). It used a mixed methods educational effectiveness design to study children and their pre-school settings. The project was extended to follow the original sample through their later years in primary school and subsequently through their secondary school education. These extensions were intended to explore whether any pre-school effects persist across later phases of education and also sought to examine primary school and secondary school influences on academic and social-behavioural outcomes.

In the first stage of the project, children were initially tracked from pre-school to the start of primary school. In addition to the pre-school sample, children who had not attended any pre-school setting were also sampled (referred to as the 'home' group). Measures of the quality of the 141 pre-school centres that the sample attended were recorded from five regions across England. The centres were representative of six types of provision: nursery classes, playgroups, local authority day nurseries, private day nurseries, nursery schools and integrated centres (for details on the characteristics of these centres see Sammons et al., 2002; 2003).

The sample was then followed up to the end of Key Stage 1 (KS1) in primary school (age 7 plus years). Results of analyses of children's cognitive/academic and social-behavioural outcomes in KS1 were reported by Sammons et al. 2004b and 2004c. The research then continued to track the original sample to the end of KS2 (age 11) (Sammons et al., 2007a; 2007b; 2008a; 2008b; Sylva et al., 2010). This phase of the research was designed to explore the continuing pre-school influences and the effects of primary school.

Subsequently, the project (EPPSE 3-14) focused on the same sample of students' development in KS3 (age 14). Analyses examined the influences of pre-school, primary school and secondary school on these students' academic attainment, their social-behavioural development and their dispositions at the end of Year 9, as well as on their progress between KS2 and KS3 (Sammons et al., 2011a; 2011b; 2011c).

The final stage, EPPSE 3-16+ explores the potential effects of pre-schools, primary schools and secondary schools on the same students' outcomes at the end of compulsory schooling in Year 11. This report focuses on the analyses of EPPSE students' academic outcomes measured by their General Certificate of Secondary Education (GCSE) results at the end of Year 11. EPPSE 3-16+ follows the practice of the previous phases of the project and continues to use a mixed methods approach (combining qualitative and quantitative methods) and an educational effectiveness design, including detailed statistical analyses of effectiveness and in-depth case studies of individual students and families (Sammons et al., 2005; Siraj-Blatchford et al., 2006; Sylva et al., 2010).

Aims

The aims of this report are to:

- Investigate the relationships between students' academic attainment in KS4 (Year 11, age 16) and individual student, family and home learning environment (HLE) characteristics.

- Model students' academic attainment in Year 11, and their progress between KS2 and KS4 (Year 6 to Year 11). It should be noted that in the progress analyses, prior attainment in National Assessment tests taken at the end of primary education (Year 6, KS2) was included as a baseline in the statistical models.

- Explore the continuing influence of pre-school experience, particularly in terms of attendance, quality and academic effectiveness on students' later academic outcomes.

- Examine the combined impact of gender, parental qualification levels and the home learning environment (HLE) and pre-school characteristics.

- Investigate the influence of primary school academic effectiveness on later secondary school academic attainment and progress, when individual student, family and home learning environment (HLE) characteristics have been taken into account.

- Investigate the influence of secondary school academic effectiveness and quality on EPPSE students' academic attainment and progress, when individual student, family and home learning environment (HLE) characteristics have been taken into account.

- Explore the influences of student reported experiences of secondary school on their academic attainment and progress when individual student, family and HLE characteristics have been taken into account.

Analyses strategy

A range of statistical techniques are employed including simple descriptive and correlation analyses and more complex approaches such as multilevel (hierarchical) modelling, used to examine the influence of different characteristics in predicting students' academic attainment and progress. This report focuses on GCSE results in terms of total scores and subject specific grades, as well as on the benchmark measures of achievement of 5 or more GCSE/GNVQs at grades A*-C and the English Baccalaureate (EBacc). Age standardised National Assessment data at the end of Year 6 in English and maths were used as measures of prior attainment in analyses studying progress between KS2 and KS4. In addition, exploratory and confirmatory factor analysis has been used to identify underlying dimensions of the HLE in KS3 and to derive measures of students' experiences of secondary school based on self-report questionnaire surveys.

Multilevel (hierarchical) regression models were used to study the influence of various individual student, family, HLE and neighbourhood characteristics as predictors of variation in students' Year 11 academic outcomes. These models were extended to explore the effects of various pre-school, primary and secondary school influences on later academic attainment and progress between KS2 and KS4. Earlier analyses in the pre-school phase of the research enabled the calculation of value added estimates (residuals) of individual pre-school centre effects for the students who had attended a pre-school centre (for details see Sammons et al., 2002). These value added measures of centre effectiveness have been included in subsequent analyses of students' educational outcomes in the longitudinal follow-up, including the GCSE results in Year 11 of secondary school to establish whether the effectiveness of the pre-school originally attended continues to shape later academic attainment.

To examine the potential impact of primary school, measures of primary school academic effectiveness in English, maths and science were derived from independent value added analyses of student progress for three successive full cohorts of children in English primary schools (2002-2004) using National Assessment data sets matched between KS1 and KS2 over three years (see Melhuish et al., 2006a; 2006b). The impact of secondary school academic effectiveness was explored using DfE contextual value added (CVA) indicators constructed using national data sets for all secondary schools. Additional data on secondary school quality was added to the EPPSE data sets based on various Ofsted inspection judgements.

As well as developing statistical models for student attainment in Year 11, further analyses of students' academic progress were conducted to model the changes in EPPSE students' outcomes from Year 6 (end of KS2, age 11) to Year 11 (in KS4, age 16). These analyses were used to explore how individual, family, HLE, neighbourhood and various educational (pre-school, primary and secondary school) influences shape students academic progress in secondary education.

Structure of the report and analyses

This report is divided into seven sections. This first section has introduced the EPPSE 3-16+ study and the aims of the research on GCSE outcomes in Year 11. Section two provides the background information concerning the characteristics of the EPPSE 3-16+ sample and investigates the extent of the equity gap in attainment for different groups of students in their GCSE results. The group differences reported in Section 2 do not control for other influences. They are 'raw' univariate attainment differences in GCSE outcomes, whereas the results reported in later sections are based on analyses using multilevel models and are calculated 'net' of the influence of other predictors.

Section three examines the extent to which different individual student, family and HLE background characteristics account for variations in students' GCSE results. The 'net' influence of different background characteristics on students' attainments is explored. These analyses identify the unique (net) contribution of particular characteristics to variation in students' academic outcomes, while other influences are controlled. Thus, for example, the influence of family socio-economic status (SES) is established while taking into account the influence of parents' qualification levels, income, ethnicity, birth weight, HLE etc. Results are reported in effect sizes (ES), a statistical measure of the relative strength of different predictors or in odds ratios (OR), representing the odds of achieving certain benchmark performance indicators given certain characteristics relative to the odds of the reference group. In addition, estimates shown in tables illustrate differences in terms of total GCSE score or grades in GCSE English or GCSE maths. It is of policy interest to establish the nature and strength of such background influences individually and collectively, as they are relevant to issues of equity and social inclusion.

The fourth section explores the continued influence of pre-school, primary and secondary school experience on students' academic attainment at the end of Year 11. As shown in previous reports, pre-school experience gave children a better start to primary school in terms of higher academic attainment and improved social-behavioural outcomes. Lack of pre-school experience, particularly for more vulnerable groups of young children, was found to be a further disadvantage (Sammons et al., 2002; 2003). The effect of pre-school attendance was, in these earlier analyses, supplemented with other measures of pre-school centre influence, namely the observed quality of pre-school provision (measured by the ECERS-R and ECERS-E scales – see Sylva et al., 2006) and pre-school centre effectiveness (measured by value added residual estimates based on cognitive/academic progress during the pre-school period). These pre-school measures proved to be significant predictors of later academic attainment for the EPPSE sample measured at the end of primary school.

In this report, we explore the potential lasting effects of attending pre-school on academic attainment in secondary school. Similarly, the predictive influence of measures of primary school academic effectiveness[15] on students' later academic outcomes in Year 11 is also explored. In addition, the analyses establish whether certain groups of students are more sensitive to the academic effectiveness of the primary school they had attended than other students. The predictive influences of measures of secondary school academic effectiveness[16] and quality measured by Ofsted inspection judgements are also studied.

Section five shows the results of the analyses that examine the predictive influences of students' self-views and views of their school on the various measures of academic outcomes in Year 11.

Section six presents the results of analyses focused on students' academic progress from the end of Year 6 in primary school to the end of Year 11 in secondary school. Value added multilevel analyses of students' academic progress between KS2 and KS4 have been conducted; these analyses controlled for prior attainment (at the end of Year 6) in analysing progress over time. They are used to complement the contextualised models of attainment to establish how far background characteristics and educational measures of pre-schools and primary schools also predict progress between KS2 and KS4. Section seven discusses the findings and presents the main conclusions.

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[15] These were value added academic effectiveness measures for primary schools that were calculated independently using National Assessment data for all primary schools in England linking KS1 and KS2 results (Melhuish et al., 2006a; 2006b).

[16] These were KS2-KS4 CVA academic effectiveness measures for secondary schools provided by the DfE.

2 Characteristics of the sample at the end of Year 11

The present study relies on the original EPPE sample. The original sampling procedure is fully described in the EPPE Technical Paper 1 (Sylva et al., 1999). Briefly, six English Local Authorities (LAs) in five regions were selected to participate in the research with young children age 3 years plus drawn from six main types of pre-school provision: nursery classes, playgroups, private day nurseries, Local Authority (LA) day nurseries, nursery schools and integrated (i.e., combined centres that integrate education and care) centres. In order to enable comparison of centre and type of provision effects, the project was designed to recruit approximately 500 children, 20 in each of 20-25 centres, from the various types of provision. In some LAs, certain forms of provision were less common and other forms more typical. Within each LA, centres of each type were selected by stratified random sampling and, due to the small size of some centres in the project (i.e. rural playgroups) more of these centres were sampled than originally proposed, bringing the pre-school centre sample total to 141 centres. In all, 2,857 children were recruited in the pre-school sample. An additional sample of 315 'home' children (those who had not attended a pre-school centre) was recruited at entry to primary school, for comparison with those who had attended a pre-school centre, bringing the total sample to 3,172.

Since the start of the study in 1997, the EPPE students have been assessed at various ages on their cognitive/academic and social-behavioural development. This report refers to two time points at which students completed academic assessments at the end of Year 6 (age 11) and at the end of Year 11 (age 16).

This section provides descriptive statistics for the sample at the end of Year 11. Details of the main findings of the analyses conducted on students' attainment and progress up to the end of KS3 (Year 9) can be found in Sammons et al. (2011a).

Table 2.1 -Table 2.3 provide a brief summary of the characteristics of the EPPSE 3-16 sample for which we have been able to match valid academic General Certificate of Secondary Education (GCSE) data at the end of Year 11. We have valid academic data for over nine out of ten (94%) of the 'live' sample (n=2582 out of 2744) or over eight out of ten (81%) of the original sample (n=2582 out of 3172).

For this report, we have two types of academic data:

1) Continuous data - total GCSE and equivalents point score, grade achieved in full GCSE English, grade achieved in full GCSE maths, and total number of full GCSE entries

2) Dichotomous data - achieved 5 or more GCSE/GNVQs at grades A*-C, achieved 5 or more GCSE and equivalents at grades A*-C including GCSE English and maths and achieved the English Baccalaureate.

Data for continuous and dichotomous measures are presented separately.

Continuous measures

In terms of gender, the sample with valid academic data was almost equally split between males (51%) and females (49%). The majority of the students (75%) were of White UK heritage, while young people of Bangladeshi heritage represented the smallest ethnic group (1%).

Regarding family structure, less than one in five of the young people (15%) were from large families (defined as having 3 or more siblings when recruited to the study), while more than half of the sample had one or two siblings (63%). Table 2.1 also shows the distribution of the early years HLE index, which is a measure of the home learning environment in the early years (see Appendix 1; Melhuish et al., 2008; Sammons et al., 2002; 2003; 2004a). A number of measures collected using a parent interview at entry to the study contributed to the early years HLE index. These measures were based on the frequency of engagement in specific activities involving the child such as, teaching the alphabet, reading to the child, listening to the child read, taking the child to the library etc. (as reported by the parents at interview). Over four out of ten (43%) of the adolescents had experienced a good or very good home learning environment in the early years. Less than one in ten (9%) of the current sample had a very poor early years HLE. In the present sample, less than one in ten (9%) of the adolescents had not attended any type of pre-school (the 'home' group) before entering primary school.

Table 2.1: Selected characteristics of sample with valid academic continuous data - Part 1

Background characteristics	Total GCSE score N=2746		GCSE English N=2630		GCSE maths N=2620		No. of GCSE entries N=2682	
	N	%	N	%	N	%	N	%
Gender								
Male	1405	51.2	1326	50.4	1329	50.7	1366	50.9
Female	1341	48.8	1304	49.6	1291	49.3	1316	49.1
Total	2746	100.0	2630	100.0	2620	100.0	2682	100.0
Ethnicity								
White European heritage	94	3.4	87	3.3	87	3.3	88	3.3
Black Caribbean heritage	108	3.9	102	3.9	102	3.9	103	3.8
Black African heritage	47	1.7	45	1.7	44	1.7	46	1.7
Any other ethnic minority heritage	65	2.4	63	2.4	63	2.4	64	2.4
Indian heritage	59	2.2	57	2.2	56	2.1	58	2.2
Pakistani heritage	144	5.2	139	5.3	139	5.3	140	5.2
Bangladeshi heritage	29	1.1	28	1.1	28	1.1	29	1.1
Mixed heritage	153	5.6	138	5.3	138	5.3	141	5.3
White UK heritage	2045	74.5	1969	74.9	1961	74.9	2011	75.0
Total	2744	100.0	2628	100.0	2618	100.0	2680	100.0
Number of siblings in the house (age 3/5)								
No siblings	537	19.6	513	19.5	511	19.5	522	19.5
1 sibling	986	35.9	953	36.2	942	36.0	969	36.1
2 siblings	727	26.5	705	26.8	703	26.8	716	26.7
3+ siblings	409	14.9	381	14.5	386	14.7	395	14.7
Missing	87	3.2	78	3.0	78	3.0	80	3.0
Total	2746	100.0	2630	100.0	2620	100.0	2682	100.0
Early Years HLE Index								
<13	251	9.6	228	9.1	231	9.3	239	9.4
14-19	583	22.3	553	22.1	554	22.2	569	22.3
20-24	641	24.5	613	24.5	614	24.6	626	24.5
25-32	834	31.9	812	32.4	807	32.3	821	32.1
>33	303	11.6	300	12.0	291	11.7	301	11.8
Total	2612	100.0	2506	100.0	2497	100.0	2556	100.0
Type of pre-school								
Nursery class	524	19.1	501	19.0	496	18.9	514	19.2
Playgroup	545	19.8	530	20.2	533	20.3	538	20.1
Private day nursery	433	15.8	428	16.3	418	16.0	432	16.1
Local authority day nursery	348	12.7	322	12.2	318	12.1	331	12.3
Nursery schools	473	17.2	457	17.4	461	17.6	465	17.3
Integrated (combined) centres	161	5.9	153	5.8	153	5.8	154	5.7
Home	262	9.5	239	9.1	241	9.2	248	9.2
Total	2746	100.0	2630	100.0	2620	100.0	2682	100.0

Table 2.2: Selected characteristics of sample with valid academic continuous data - Part 2

Background characteristics	Total GCSE score N=2746		GCSE English N=2630		GCSE maths N=2620		No. of GCSE entries N=2682	
	N	%	N	%	N	%	N	%
Mother's qualification level								
None	562	21.4	515	20.4	522	20.8	536	20.9
Vocational	392	14.9	374	14.8	378	15.1	384	14.9
16 Academic	1007	38.4	979	38.8	975	38.8	990	38.5
18 Academic	214	8.2	212	8.4	213	8.5	214	8.3
Degree or higher degree	411	15.7	405	16.1	389	15.5	409	15.9
Other professional	38	1.4	36	1.4	34	1.4	36	1.4
Total	2624	100.0	2521	100.0	2511	100.0	2569	100.0
Father's qualification level								
None	424	16.0	401	15.7	405	15.9	411	15.8
Vocational	302	11.4	296	11.6	297	11.7	300	11.5
16 academic	629	23.7	617	24.2	617	24.3	626	24.1
18 academic	189	7.1	182	7.1	182	7.2	186	7.2
Degree or higher degree	436	16.4	429	16.8	415	16.3	434	16.7
Other professional	28	1.1	25	1.0	24	0.9	25	1.0
Absent father	649	24.4	601	23.6	601	23.7	619	23.8
Total	2657	100.0	2551	100.0	2541	100.0	2601	100.0
Family highest SES (age 3/5)								
Professional non-manual	223	8.4	221	8.7	210	8.3	222	8.5
Other professional non-manual	658	24.8	647	25.4	637	25.1	651	25.0
Skilled non-manual	880	33.1	850	33.3	856	33.7	865	33.3
Skilled manual	403	15.2	379	14.9	384	15.1	391	15.0
Semi-skilled	352	13.3	327	12.8	324	12.8	338	13.0
Unskilled	65	2.4	59	2.3	59	2.3	62	2.4
Unemployed/not working	75	2.8	69	2.7	70	2.8	71	2.7
Total	2656	100.0	2552	100.0	2540	100.0	2600	100.0
FSM (Year 11)								
No Free School Meals (FSM)	2200	81.3	2130	82.1	2116	81.9	2159	81.6
Free School Meals (FSM)	507	18.7	463	17.9	467	18.1	486	18.4
Total	2707	100.0	2593	100.0	2583	100.0	2645	100.0
Family earned income (KS1)								
No earned salary	502	23.5	459	22.3	463	22.6	479	22.8
£ 2,500 – 17,499	449	21.0	435	21.1	437	21.3	444	21.2
£ 17,500 – 29,999	378	17.7	369	17.9	371	18.1	373	17.8
£ 30,000 – 37,499	253	11.8	248	12.0	249	12.1	250	11.9
£ 37,500 – 67,499	411	19.2	406	19.7	399	19.5	409	19.5
£ 67,500 – 132,000+	144	6.7	143	6.9	132	6.4	144	6.9
Total	2137	100.0	2060	100.0	2051	100.0	2099	100.0
SEN status (Year 11)								
No special provision	2048	78.3	2037	80.4	2025	79.9	2041	79.3
School action	296	11.3	287	11.3	287	11.3	294	11.4
School action plus	179	6.8	158	6.2	158	6.2	167	6.5
Statement of SEN	92	3.5	52	2.1	63	2.5	73	2.8
Total	2615	100.0	2534	100.0	2533	100.0	2575	100.0

Table 2.2 shows that, in terms of parents' qualification levels, less than a fifth (16-17%) of mothers and fathers had a degree or a higher degree. About a third (33%) of students originated from families characterised by high levels of socio-economic status[17] (SES). A higher percentage (48%) of student's parents were classified as skilled (either manual or non manual) and only a very small percentage (3%) were unemployed. Nearly a fifth (19%) of the students were eligible or receiving free school meals (FSM) in Year 11[18]. Almost half of the sample (44%) lived in families with low (below £17,500) or no earned income[19]. The majority (80%) of the students did not have any special educational (SEN) provision, while around 3% had a full SEN statement.

Dichotomous measures - performance benchmark indicators

Female students were more likely to have achieved 5 or more GCSE/GNVQs at grades A*-C (62%) than males (52%) as is seen in Table 2.3. Most of the individual ethnic groups in the sample are relatively small so results should be interpreted with caution. The majority were more likely to have achieved 5 or more GCSE/GNVQs at A*-C than not, except for Pakistani students who were less likely to have achieved at this level. Indian students (over 70%) showed the highest frequencies in terms of achieving 5 or more GCSE/GNVQs at grades A*-C.

The greater the family size is the lower the likelihood of achieving 5 or more GCSE at grades A*-C. A clear gradation pattern is shown for the relationship between early years HLE and whether students achieved 5 or more GCSE/GNVQs at grades A*-C, with students who experienced a more favourable early years HLE (highest scores) being more likely to have achieved 5 or more GCSE/GNVQs at grades A*-C. Students who had attended a private day nursery were the most likely to have achieved 5 or more GCSE/GNVQs at grades A*-C, while the students who had not attended any form of pre-school provision were the least likely to have achieved at this level (see Table 2.3).

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[17] Family SES was calculated by considering the highest SES status of the mother or the father.

[18] The FSM information collected with the EPPSE Year 11 Pupil Profile Questionnaire had a high percentage of missing values (39%). Therefore, this information was combined with the FSM information available from the National Pupil Database (NPD). Additionally, it is important to stress that the EPPSE FSM data represents the students who actually received FSM, while the NPD data indicates the students who are eligible to receive FSM. NPD 's definition of the FSM eligibility: "Pupils should be recorded as eligible (true) only if a claim for free school meals has been made by them or on their behalf by parents and either (a) the relevant authority has confirmed their eligibility and a free school meal is currently being provided for them, or (b) the school or the LEA have seen the necessary documentation (for example, an Income Support order book) that supports their eligibility, and the administration of the free meal is to follow as a matter of process. Conversely, if students are in receipt of a free meal but there is confirmation that they are no longer eligible and entitlement will be revoked, false should be applied."

[19] Based on data collected by parent questionnaires completed when students were in KS1 of primary school.

Table 2.3: Selected characteristics of sample with valid academic dichotomous data - Part 1

Background characteristics	Achieved 5 or more GCSE/GNVQs at grades A*-C N=2763					
	No		Yes		Total	
	N	%	N	%	N	%
Gender						
Male	682	48.2	733	51.8	1415	100.0
Female	511	37.9	837	62.1	1348	100.0
Total	1193	43.2	1570	56.8	2763	100.0
Ethnicity						
White European heritage	43	45.3	52	54.7	95	100.0
Black Caribbean heritage	55	50.5	54	49.5	109	100.0
Black African heritage	20	42.6	27	57.4	47	100.0
Any other ethnic minority heritage	29	43.9	37	56.1	66	100.0
Indian heritage	17	28.8	42	71.2	59	100.0
Pakistani heritage	81	55.9	64	44.1	145	100.0
Bangladeshi heritage	11	37.9	18	62.1	29	100.0
Mixed heritage	73	47.1	82	52.9	155	100.0
White UK heritage	862	41.9	1194	58.1	2056	100.0
Total	1191	43.1	1570	56.9	2761	100.0
Number of siblings in the house (age 3/5)						
No siblings	220	40.9	318	59.1	538	100.0
1 sibling	358	36.1	633	63.9	991	100.0
2 siblings	312	42.6	420	57.4	732	100.0
3 or more siblings	241	58.2	173	41.8	414	100.0
Missing	62	70.5	26	29.5	88	100.0
Total	1193	43.2	1570	56.8	2763	100.0
Early Years HLE Index						
0-13	175	68.4	81	31.6	256	100.0
14-19	309	52.9	275	47.1	584	100.0
20-24	291	45.0	355	55.0	646	100.0
25-32	283	33.8	555	66.2	838	100.0
33-45	46	15.1	258	84.9	304	100.0
Total	1104	42.0	1524	58.0	2628	100.0
Type of pre-school						
Nursery class	235	44.8	290	55.2	525	100.0
Playgroup	244	44.4	305	55.6	549	100.0
Private day nursery	86	19.8	348	80.2	434	100.0
Local authority day nursery	188	53.3	165	46.7	353	100.0
Nursery schools	192	40.6	281	59.4	473	100.0
Integrated (combined) centres	77	47.8	84	52.2	161	100.0
Home	171	63.8	97	36.2	268	100.0
Total	1193	43.2	1570	56.8	2763	100.0
Pre-school attendance						
Pre-school	1022	41.0	1473	59.0	2495	100.0
No pre-school	171	63.8	97	36.2	268	100.0
Total	1193	43.2	1570	56.8	2763	100.0

Table 2.4: Selected characteristics of sample with valid academic dichotomous data - Part 2

Background characteristics	Achieved 5 or more GCSE/GNVQs at grades A*-C N=2763					
	No		Yes		Total	
	N	%	N	%	N	%
Mother's qualification level						
None	393	68.7	179	31.3	572	100.0
Vocational	179	45.4	215	54.6	394	100.0
16 Academic	441	43.7	569	56.3	1010	100.0
18 Academic	59	27.6	155	72.4	214	100.0
Degree or higher degree	30	7.3	382	92.7	412	100.0
Other professional	6	15.8	32	84.2	38	100.0
Total	1108	42.0	1532	58.0	2640	100.0
Father's qualification level						
None	277	65.0	149	35.0	426	100.0
Vocational	105	34.7	198	65.3	303	100.0
16 academic	255	40.3	377	59.7	632	100.0
18 academic	50	26.5	139	73.5	189	100.0
Degree or higher degree	42	9.6	396	90.4	438	100.0
Other professional	8	28.6	20	71.4	28	100.0
Absent father	392	59.7	265	40.3	657	100.0
Total	1129	42.2	1544	57.8	2673	100.0
Family highest SES (age 3/5)						
Professional non manual	18	8.0	206	92.0	224	100.0
Other professional non manual	146	22.2	512	77.8	658	100.0
Skilled non manual	372	42.0	513	58.0	885	100.0
Skilled manual	256	63.2	149	36.8	405	100.0
Semi-skilled	239	66.9	118	33.1	357	100.0
Unskilled	51	75.0	17	25.0	68	100.0
Unemployed /not working	44	58.7	31	41.3	75	100.0
Total	1126	42.1	1546	57.9	2672	100.0
FSM at Year 11						
No Free School Meals (FSM)	815	36.9	1395	63.1	2210	100.0
Free School Meals (FSM)	360	70.0	154	30.0	514	100.0
Total	1175	43.1	1549	56.9	2724	100.0
Family earned income at KS1						
No earned salary	314	61.6	196	38.4	510	100.0
£ 2,500 – 17,499	232	51.4	219	48.6	451	100.0
£ 17,500 – 29,999	136	35.9	243	64.1	379	100.0
£ 30,000 – 37,499	77	30.4	176	69.6	253	100.0
£ 37,500 – 67,499	78	19.0	333	81.0	411	100.0
£ 67,500 – 132,000+	7	4.9	137	95.1	144	100.0
Total	844	39.3	1304	60.7	2148	100.0
SEN status at Year 11						
No special provision	641	31.3	1408	68.7	2049	100.0
School action	231	77.0	69	23.0	300	100.0
School action plus	157	87.2	23	12.8	180	100.0
Statement of SEN	87	91.6	8	8.4	95	100.0
Total	1116	42.5	1508	57.5	2624	100.0

Parental highest qualification levels were also related to the likelihood of achieving a higher number of GCSE grades at A*-C. The higher the qualification level of the mother or the father, the more likely students had achieved the benchmark level. Similar patterns can be seen for the measures of family salary and socio-economic status (see Table 2.4).

Students eligible or receiving FSM as well as students with special educational needs (SEN) were less likely to achieve 5 or more GCSE/GNVQs at grades A*-C (30% versus 63% for FSM versus no FSM).

Please see Appendix 2 for the sample's distributions across other dichotomous outcomes.

Academic assessments

To take account of development and age, the study uses different type of measures for academic outcomes at different time points:

- Year 6 National Assessment at KS2 English and maths /decimalised, standardised and normalised

- Year 11 Grade achieved in full GCSE English (also referred to as GCSE English)

- Year 11 Grade achieved in full GCSE maths (also referred to as GCSE maths)

- Year 11 Total GCSE and equivalents new point score

- Year 11 Total number of full GCSE entries

- Year 11 Achieved 5 or more GCSE/GNVQs at grades A*-C

- Year 11 Achieved 5 or more GCSE and equivalents at grades A*-C including GCSE English and maths

- Year 11 Achieved English Baccalaureate - A*-C passes in English, mathematics, 2 sciences, a humanity and a language.

National Assessment data were collected for the sample at the end of Year 6 and Year 11. In Year 6, the students were classified in 6 groups from working towards level 1, level 1 through to level 6. In addition to test levels, data were also collected on students' individual test scores within levels. This allowed the creation of more finely differentiated outcome measures (which are referred to as decimalised levels) for the multilevel analysis.

For students who scored high enough to attain a valid level for the National Assessment test taken, their decimalised score was calculated as follows

Decimalised score = level of test achieved + ([raw score - lowest valid raw score for corresponding level] / highest valid raw score possible for the level).

Furthermore, to ensure comparability over time, an internal age standardisation and normalisation procedure was applied to the decimalised data. This procedure takes account of age effects within one school year hence age of student does not feature as a significant predictor of attainment/progress although it was included in the models. The Year 6 scores presented in this report are internally standardised to a mean of 100 and a standard deviation of 15. Therefore, all students scoring better than 100 at a certain time point are scoring at or above the attainment level expected for their chronological age (belong to the upper half of the sample of that assessment, controlling for age effects). Due to the use of internally standardised attainment scores, the scores can only be used to investigate the progress or improvement of certain groups of students *relative* to the total EPPSE 3-16 sample, but cannot be used to show 'absolute' progress over time.

Data on GCSE results were obtained from the National Pupil Database (NPD) at the end of Year 11. The measures representing the grades achieved for English and maths were transformed into numerical values from symbolic letters ("A", "B" etc., see Table 2.5), while total GCSE score and number of entries were maintained in their original scales. No standardisation or normalisations were applied to these measures. Similarly, the dichotomous indicators were preserved with the original coding (0 for 'not achieved' and 1 for 'achieved').

Descriptive statistics of academic outcomes

Figure 2.1 - Figure 2.4 present the distributions of the total GCSE score, the grades achieved in full GCSE English and GCSE maths, and the total number of full GCSE and equivalents entries. Table 2.5 - Table 2.8 show the basic descriptive statistics for the Year 11 academic outcomes.

Figure 2.1: Distribution of total GCSE score in Year 11
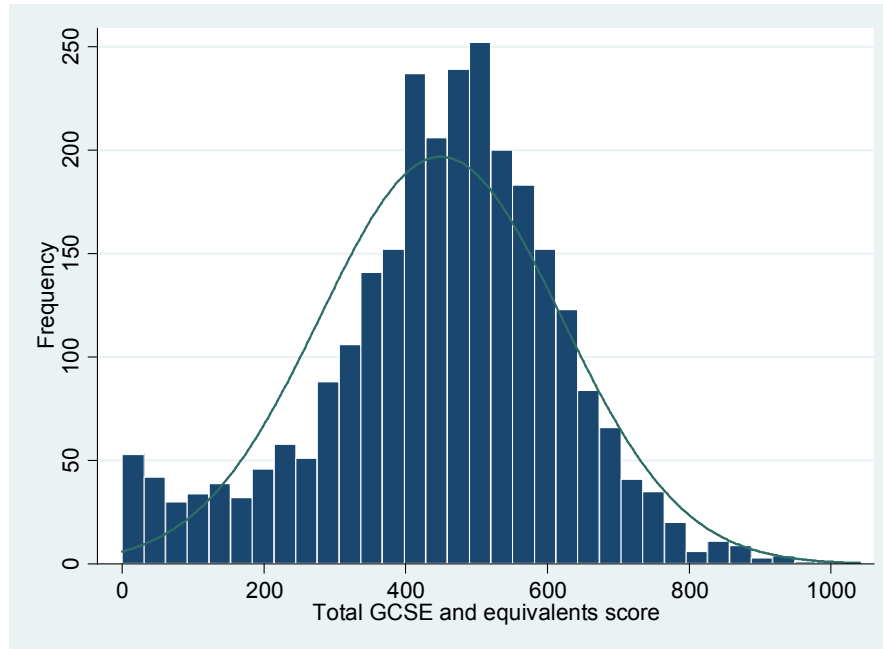
It can be seen in Figure 2.1 that the total GCSE score forms an approximately normal distribution.

Figure 2.2: Distribution of grade achieved in full GCSE English in Year 11
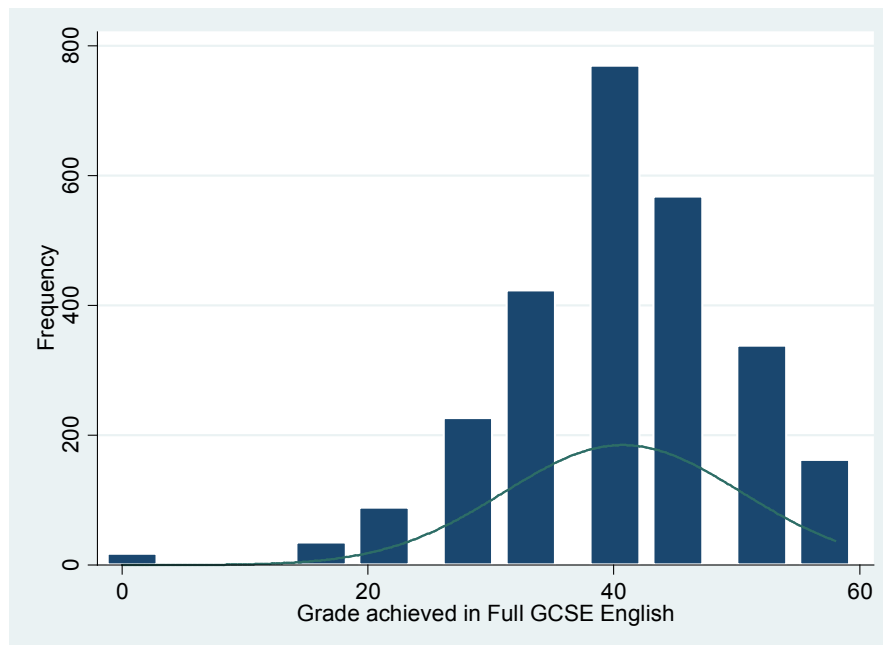
The grades achieved by students in GCSE English (see Figure 2.2) and GCSE maths (see Figure 2.3) also form approximate normal distributions, although there are fewer low grades, probably reflecting entry policies.

Figure 2.3: Distributions of grade achieved in full GCSE maths in Year 11
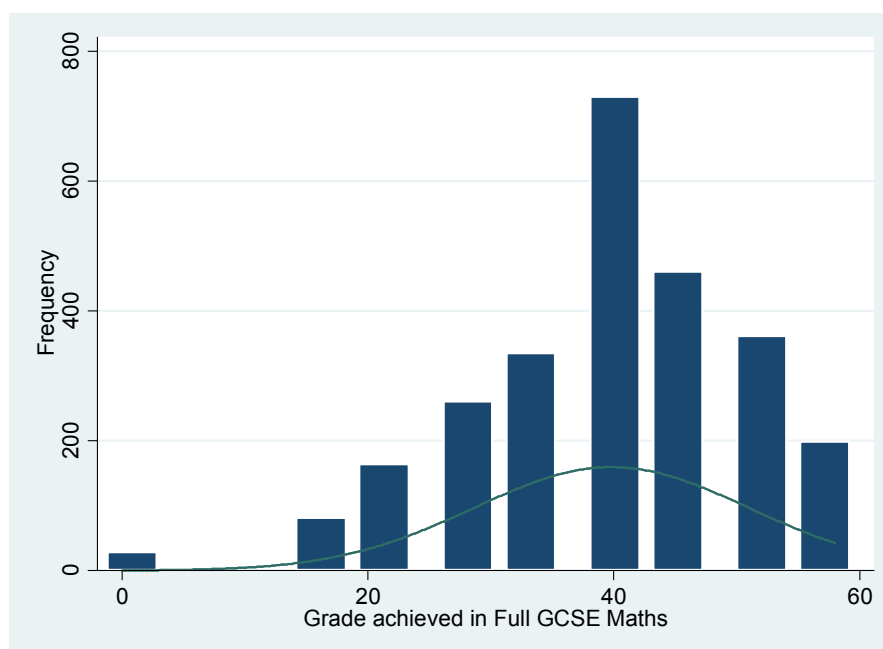
Table 2.5 shows around seven out of ten (70%) students gained a grade C or higher in GCSE English, with only one in twenty students (5%) being unable to attain a grade E or higher in GCSE English. Over six out of ten (67%) students gained a grade C or higher in GCSE maths, with just over one in ten students (11%) being unable to attain a grade E or higher in GCSE maths.

Table 2.5: Distributions of different measures of academic attainment in Year 11

Grade (Points value)	Grade achieved in full GCSE English		Grade achieved in full GCSE maths	
	N	%	N	%
A*(58)	162	6.2	199	7.6
A (52)	338	12.8	361	13.8
B (46)	568	21.6	461	17.6
C (40)	770	29.3	730	27.9
D (34)	423	16.1	335	12.8
E (28)	227	8.6	261	10.0
F (22)	89	3.4	164	6.3
G (16)	35	1.3	81	3.1
Ungraded (0)	18	0.7	28	1.1
Total	2630	100	2620	100

Figure 2.4 and Table 2.6 show that students were most likely to be entered for nine full GCSEs.

Figure 2.4: Distributions of total number of full GCSE entries in Year 11
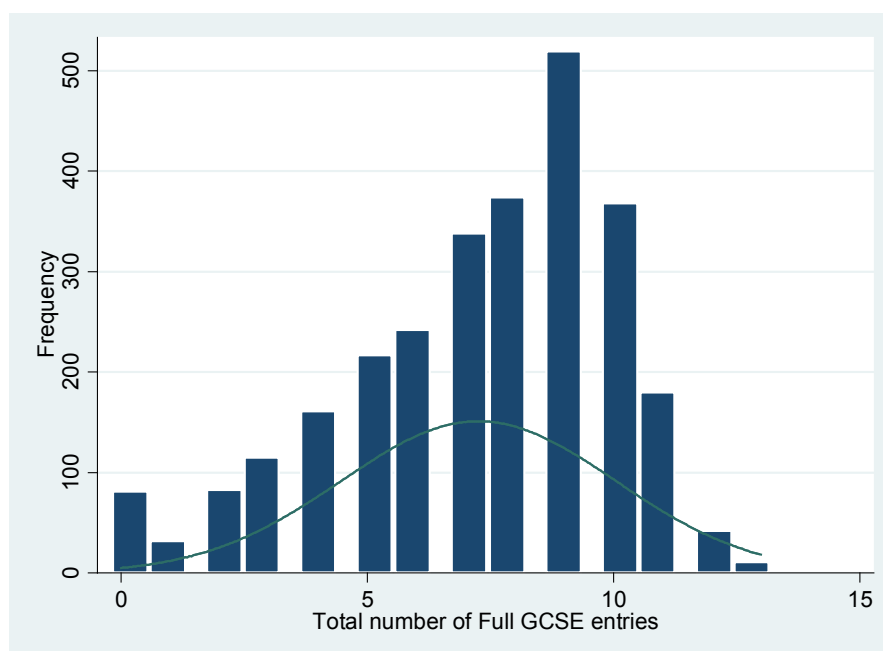
Table 2.6 shows that over half of the students (58%) were entered for between seven and ten full GCSEs, with less than one in ten students (8%) entered for more than ten full GCSEs. Just under a third of students (31%) were entered for less than seven full GCSEs and only three in one hundred (3%) students were not entered for any full GCSEs.

Table 2.6: Distribution of number of total number of full GCSE entries in Year 11

Total no. of Year 11 full GCSE entries	N	%
0	81	2.9
1	32	1.2
2	83	3.0
3	115	4.2
4	161	5.8
5	217	7.9
6	242	8.8
7	338	12.2
8	374	13.5
9	519	18.8
10	368	13.3
11	180	6.5
12	42	1.5
13	11	0.4
Total	2763	100

Table 2.7 shows that the mean average number of full GCSE entries was seven. The mean average points score achieved in GCSE English was 41 points, equivalent to achieving a grade C. The mean average points score achieved in GCSE maths was 40 points, equivalent to a achieving a grade C. The mean total GCSE and equivalents points score was 449, which is equivalent to 6 grade A and 3 grade B GCSEs (9 GCSEs entries being the modal value for total number of full GCSE entries).

Table 2.7: Descriptive statistics of continuous academic outcomes in Year 11

Continuous academic outcomes	N	Mean	SD	Min	Max
Total number of full GCSE entries	2763	7.3	2.8	0	13
Points achieved in full GCSE English grade	2630	40.7	9.7	0	58
Points achieved in full GCSE maths grade	2620	39.8	11.2	0	58
Total GCSE and equivalents score	2746	449.4	170.3	0	1040.5

The percentage of students achieving 5 or more A*-C in the EPPSE sample in Year 11 was very similar to the national figures. For example, the average percentage of students achieving 5 or more A*-C grades including English and mathematics for GCSEs in England (but excluding London) between 2009-2012 (55.42%)[20] was comparable to that for the EPPSE sample (56.3%) in the equivalent time period when the sample was in Year 11 (see Table 2.8).

Table 2.8: Descriptive statistics of benchmark indicators in Year 11

GCSE Benchmark indicators	No		Yes		Total	
	N	%	N	%	N	%
Achieved 5 or more GCSE/GNVQs at grades A*-C	1193	43.1	1570	56.8	2763	100.0
Achieved 5 or more GCSE and equivalents at grades A*-C including GCSE English and maths	1208	43.7	1555	56.3	2763	100.0
Achieved English Baccalaureate	2119	82.1	463	17.9	2582	100.0

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http://www.publications.parliament.uk/pa/cm201314/cmhansrd/cm130612/text/130612w0001.htm

Associations between students' attainment in different outcomes and over time

Correlations explore the associations between students' attainment on different outcomes and between measures of academic attainment over time[21]. As might be anticipated, students' grades in GCSE English and in GCSE maths were positively correlated (r=0.77 – see Table 2.9), indicating those who do well in English generally also do well in maths at the end of Year 11, while those who less well in one also tend to do poorly in the other. This correlation is higher than the equivalent correlation between English and maths test scores at the end of Year 9 (r=0.72 – see Table A3.2).

Table 2.9: Correlations between students' standardised academic outcomes (KS4 English and maths) and prior attainment (KS3 English and maths test score)

Academic outcomes	GCSE maths	KS3 English Test score	KS3 maths Test score
GCSE English	0.77 (N=2590)	0.80 (N=1070)	
GCSE maths			0.87 (N=1094)

The GCSE grades are not only associated with each other, but also show moderate to high correlations with prior attainment (see Table 2.9, Table 2.10 and Table 2.11).

Table 2.9 shows a stronger relationship was found between attainment in GCSE maths and Year 9 maths (r=0.87) than for attainment in GCSE English and Year 9 English (r=0.80).

Table 2.10: Correlations between students' standardised academic outcomes (KS4 English and maths) and prior attainment (KS3 English and maths Teacher Assessments)

Academic outcomes	KS3 English TA	KS3 maths TA
GCSE English	0.73 (N=2387)	
GCSE maths		0.83 (N=2394)

Table 2.11 shows that a stronger relationship was found between attainment in maths in Year 11 and Year 6 (r=0.76) than for attainment in English in Year 11 and Year 6 (r=0.69).

Table 2.11: Correlations between students' standardised academic outcomes (KS4 English and maths) and prior attainment (KS2 English and maths)

Academic outcomes	KS2 maths	KS2 English
GCSE English		0.69 (N=2431)
GCSE maths	0.76 (N=2346)	

At this stage, the high correlations between academic assessments at different time points indicate that the assessments are measuring similar aspects of attainment.

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[21] A correlation is a measure of statistical association that ranges from + 1 to -1. For correlations on earlier academic outcomes see Appendix 3.

The impact of earlier attainment as predictors for later attainment will be explored further in Section 6, which focuses on progress from KS2 to KS4. Of particular interest will be the 'net' influence of different student, background and HLE characteristics in Year 11, when controlling for prior attainment of the students, as this will indicate whether some groups make more or less progress relative to others during secondary school.

Differences in attainment for different groups of students

In this part of the report, academic attainment in Year 11 is examined for different student subgroups that are of particular interest. Previous EPPSE analyses have reported significant differences in academic outcomes for different groups at various time points (e.g., pre-school, entry to primary school, at the end of Year 1 and in various key stages of education) (Sammons et al., 2004b; 2004c; 2007a; 2008a; 2011a). These particular student groups refer to individual student, family and early years HLE characteristics that were also used as predictors for different aspects of the EPPSE students' social-behavioural development and dispositions (see Sammons et al., 2014a; 2014c).

The reported differences in this section represent the 'raw' differences in the average results for different student subgroups as there is no control for the influence of any other variables. This means, for example, if there are sizeable differences between individual ethnic groups, these differences could also be due, at least in part, to family socio-economic status (SES) or to language differences between the ethnic groups. Section 3 of this report provides more detailed statistical analyses of these patterns using multilevel models to explore the 'net' contribution of different characteristics and shows the strength of these predictors in terms of relevant effect sizes, controlling for other influences. Section 3 will also address the issue of change in 'net' contribution of different predictors over time in terms of the estimated effect sizes[22].

Gender

Even though at younger ages girls were found to score higher in academic attainment, at the end of KS3 (Year 9) this pattern of average results was found only for English. In Year 11, the results are differentiated based on the specific academic outcome of interest. Thus, for example, on average female students obtained a higher total GCSE points score, were entered for more full GCSEs and had better grades in GCSE English than male students (see Table 2.12 and Table 2.13). However, there are no statistically significant gender differences in the average grade achieved in full GCSE maths. Female students were also more likely to obtain 5 A*-C, 5 A*-C including English and maths and the EBacc (see Table 2.3, Table A2.1, and Table A2.2).

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[22] Effect sizes (ES) are a statistical measure of the relative strength of different predictors.

Table 2.12: Means of Year 11 total GCSE score and number of full GCSE entries by various background characteristics

Background Characteristics	Total GCSE score			Total no. of full GCSE entries		
	N	Mean	SD	N	Mean	SD
Gender						
Male	1405	427.6	172.5	1415	7.0	2.8
Female	1341	472.3	165.0	1348	7.6	2.7
Total	2746	449.4	170.3	2763	7.3	2.8
Ethnicity						
White European heritage	94	446.8	183.4	95	7.3	3.1
Black Caribbean heritage	108	465.9	204.1	109	6.6	2.9
Black African heritage	47	444.9	162.1	47	7.3	2.8
Any Other Ethnic Minority heritage	65	427.6	152.7	66	7.3	2.8
Indian heritage	59	522.4	175.4	59	8.1	3.0
Pakistani heritage	144	469.5	179.7	145	6.5	2.7
Bangladeshi heritage	29	536.7	148.1	29	7.8	2.4
Mixed heritage	153	427.0	192.0	155	6.9	3.2
White UK heritage	2045	446.4	165.5	2056	7.4	2.7
Total	2744	449.4	170.4	2761	7.3	2.8
Mother's highest qualification level						
None	562	385.7	193.6	572	5.8	2.8
Vocational	392	441.4	167.6	394	7.2	2.7
16 Academic	1007	452.5	156.8	1010	7.2	2.6
18 Academic	214	494.6	139.2	214	8.3	2.3
Degree or Higher degree	411	527.5	128.9	412	9.2	1.9
Other professional	38	481.1	190.8	38	8.2	3.1
Total	2624	452.1	168.3	2640	7.3	2.8
FSM (Year 11)						
No Free School Meals (FSM)	2200	464.7	159.2	2210	7.6	2.6
Free School Meals (FSM)	507	381.6	197.1	514	5.7	2.9
Total	2707	449.2	170.1	2724	7.3	2.8
SEN status (Year 11)						
No Special Provision	2048	495.0	138.0	2049	8.1	2.2
School Action	296	372.9	157.3	300	5.8	2.5
School Action Plus	179	276.1	167.9	180	4.5	2.5
Statement of SEN	92	227.9	175.4	95	3.4	2.8
Total	2615	456.8	163.4	2624	7.4	2.7
Early Years HLE Index						
<13	251	398.0	194.1	256	5.6	2.9
14-19	583	428.3	180.2	584	6.9	2.7
20-24	641	438.5	170.0	646	7.1	2.8
25-32	834	466.8	154.4	838	7.8	2.6
>33	303	522.7	131.8	304	8.7	2.1
Total	2612	451.1	169.3	2628	7.3	2.8
Pre-school attendance						
Pre-school	2484	454.8	167.7	2495	7.4	2.7
No pre-school	262	397.8	185.8	268	5.9	3.0
Total	2746	449.4	170.3	2763	7.3	2.8

Ethnicity

Students of mixed heritage obtained the lowest average total GCSE score, while students of Bangladeshi heritage had the highest average results; however the differences in mean are small and not statistically significant. Consistent with findings from previous years, students of Pakistani heritage obtained on average the lowest grades in GCSE English and maths, almost equivalent to a grade C at GCSE (see Table 2.13).

Parents' qualification level

Mother's highest qualification level proved to be a strong predictor of students' academic results at earlier time points (from entry to pre-school until the end of Year 9) in the EPPSE research. At the end of Year 11, mother's qualification level is still significantly associated with each of the GCSE academic outcomes studied. Students whose mothers have a degree or higher degree showed the highest average for total GCSE score, average number of full GCSE entries and the highest average grades achieved in GCSE English and GCSE maths, equivalent to at least a grade B (see Table 2.12 and Table 2.13). The lowest average attainment was found for students whose mothers have no qualifications and the differences were statistically significant when comparison were made with all other qualification categories (see Table 2.12 and Table 2.13). The average attainment for students whose mothers have no qualifications is equivalent to a grade D in GCSE English and GCSE maths.

Free school meals (FSM)

Students' eligibility for free school meals (FSM) provides an indicator of low family income (although it is recognised that not all students take up their entitlement). Table 2.13 shows that students who are eligible and/or receive FSM had lower average academic attainment compared with those who are not. On average, FSM students achieved one grade lower in GCSE English and in GCSE maths than non-FSM students (e.g., the equivalent of a grade D compared to a grade C). Students with FSM were also less likely to achieve 5 A*-C, 5 A*-C including English and maths and the EBacc (see Table 2.3, Table A2.1 and Table A2.2). This pattern of results is in line with that found at younger ages indicating that social disadvantage continues to show a statistically significant association with academic attainment.

Special educational needs (SEN)

As might be expected, students identified in secondary school records as having any type of SEN showed on average significantly lower academic attainment at the end of Year 11. Those identified with a full SEN statement had the lowest average results in terms of total GCSE points score, maths (equivalent to a grade E) and, on average, were entered for the lowest number of full GCSE exams (see Table 2.12 and Table 2.13).

Table 2.13: Means of Year 11 grades in GCSE English and GCSE maths by various background characteristics

Background Characteristics	Grade achieved in full GCSE English			Grade achieved in full GCSE maths		
	N	Mean	SD	N	Mean	SD
Gender						
Male	1326	39.1	9.9	1329	39.8	11.2
Female	1304	42.4	9.2	1291	39.8	11.2
Total	2630	40.7	9.7	2620	39.8	11.2
Ethnicity						
White European heritage	87	40.9	10.2	87	41.0	11.4
Black Caribbean heritage	102	40.6	7.7	102	39.0	10.1
Black African heritage	45	41.0	10.7	44	40.7	10.3
Any Other Ethnic Minority heritage	63	40.0	9.6	63	41.6	9.4
Indian heritage	57	44.3	8.6	56	44.3	12.3
Pakistani heritage	139	38.6	8.5	139	38.0	11.5
Bangladeshi heritage	28	42.1	10.2	28	40.6	12.9
Mixed heritage	138	41.2	10.9	138	40.3	11.4
White UK heritage	1969	40.8	9.7	1961	39.7	11.2
Total	2628	40.7	9.7	2618	39.8	11.2
Mother's highest qualification level						
None	515	35.3	9.4	522	33.8	11.4
Vocational	374	40.4	8.7	378	38.6	10.3
16 Academic	979	40.1	8.7	975	39.4	10.1
18 Academic	212	43.7	8.2	213	43.5	9.5
Degree or Higher degree	405	49.1	6.9	389	48.9	7.7
Other professional	36	45.1	11.4	34	46.5	8.1
Total	2521	41.0	9.6	2511	40.0	11.1
FSM (Year 11)						
No Free School Meals (FSM)	2130	41.9	9.2	2116	41.1	10.6
Free School Meals (FSM)	463	35.4	10.1	467	33.7	11.9
Total	2593	40.7	9.7	2583	39.8	11.2
SEN status (Year 11)						
No Special Provision	2037	42.8	8.2	2025	42.1	9.6
School Action	287	34.1	8.7	287	32.2	11.4
School Action Plus	158	30.0	10.7	158	28.0	11.2
Statement of SEN	52	30.6	9.6	63	26.5	13.3
Total	2534	40.8	9.4	2533	39.7	11.1
Early Years home learning environment (HLE) Index						
<13	228	36.2	9.5	231	35.1	12.0
14-19	553	38.6	9.3	554	37.8	11.4
20-24	613	39.9	9.5	614	39.2	10.8
25-32	812	42.4	9.2	807	41.3	10.7
>33	300	47.1	7.5	291	45.9	8.6
Total	2506	40.9	9.6	2497	40.0	11.2
Pre-school attendance						
Pre-school	2391	41.2	9.6	2379	40.3	10.9
No pre-school	239	36.0	9.5	241	34.7	12.1
Total	2630	40.7	9.7	2620	39.8	11.2

Early years home learning environment (HLE)

The strong positive and statistically significant impact of the early years HLE on academic outcomes has been documented at earlier time points for the EPPSE sample. At the end of Year 11, the early years HLE index still shows a strong linear relationship with EPPSE students' average academic attainment. On average, students who experienced a good or very good home learning environment in the early years achieved higher total GCSE point scores, higher grades in GCSE English and GCSE maths, and were entered for a higher number of full GCSEs.

Pre-school attendance

The positive effects of attending a pre-school have been identified in the EPPSE research up to the end of Year 9. When analysing the raw differences in Year 11 academic attainment, those students who had attended any pre-school obtained statistically significant higher average outcomes in terms of total GCSE points score, number of full GCSE entries and individual GCSE grades (equivalent to a grade C for GCSE English and GCSE maths compared with a grade D, the average grade achieved by the 'home' group, who did not attend any pre-school). Students who had attended pre-school were also more likely to achieve 5 A*-C, 5 A*-C including English and maths and the EBacc (see Table 2.3, Table A2.1 and Table A2.2).

The raw differences presented above should be considered with considerable caution because of the special characteristics of certain subgroups (for example, disadvantaged students are over-represented in the group that had not attended a pre-school). To improve the interpretation, further analyses are required to separate the 'net' pre-school effects from those related to background characteristics. Later in this report, Section 4 investigates the impact of attendance, quality and effectiveness of pre-school in more detail, controlling for the influence of differences in students' background characteristics.

3 Students' academic attainment at the end of Year 11 in secondary school

The influence of different individual student, family and home learning environment characteristics as predictors of GCSE results

Key findings

- Both mothers' and fathers' (to a lesser extent) highest qualification levels strongly predicted academic attainment at the end of Year 11.
- Older students (Autumn born) were more likely to obtain a higher total GCSE score, better grades in GCSE English and maths, & were more likely to have achieved 5 A*-C including English & maths than younger students (Summer born).
- Females obtained higher total GCSE scores, higher grades in GCSE English, were entered for more GCSEs, and were more likely to achieve 5 A*-C overall, 5 A*-C including English and maths and the EBacc than male students.
- Students whose parents reported early behavioural/health problems gained lower GCSE results (on all continuous measures) and were less likely to achieve 5 A*-C than students whose parents reported no early behavioural/health problems.
- FSM students obtained significantly lower results than non-FSM students and were also less likely to achieve 5 A*-C or 5 A*-C including English and maths.
- Students from higher income households gained higher total GCSE scores & higher grades in GCSE English & in GCSE maths than students whose parents had no earned salary. Salaries above £67,500 per annum were associated with an average increase of one full GCSE entry and an increased likelihood of achieving 5 A*-C or the EBacc.
- Students whose parents were classified in the highest SES group continued to show significantly higher attainment levels.
- The early years HLE remained a strong net predictor of better academic attainment at age 16 (total GCSE score, GCSE English & GCSE maths & total number of GCSE entries). Students with high early years HLE scores were three times more likely to achieve both 5 A*-C or 5 A*-C including English & maths.
- Medium & high levels of 'academic enrichment' in KS3 significantly predicted higher total GCSE scores, better grades in GCSE English and in GCSE maths, a higher number of full GCSE entries and increased the probability of achieving 5 A*-C, 5 A*-C including English and maths, and the EBacc. A high level of 'parental interest' predicted a higher probability of achieving 5 A*-C including English and maths.
- Students who grew up in disadvantaged neighbourhoods had significantly poorer Year 11 academic attainment in terms of GCSE outcomes.

This section presents the results of contextualised multilevel analyses establishing the patterns of relationships between various individual student, family and HLE characteristics and students' academic attainment at the end of Year 11. Background details concerning the students' earlier childcare experiences, health, family and HLE during the pre-school period were obtained from parental interviews conducted when students entered the EPPE study and from three parent questionnaires completed by the parents when students were in KS1 and KS2 of primary school education and in KS3 of secondary school education.

As potentially influencing background characteristics, the following measures have been used in the analyses:

- Individual student characteristics (i.e. gender, birth weight, number of siblings, early developmental problems, early behavioural problems, early health problems, ethnicity).

- Family characteristics (i.e., SES, parent's qualification levels, family income[23]).

- The early years HLE - parents reported how often they read to the child, taught the child the alphabet, played with letters and numbers, taught songs and nursery rhymes, painted and drew etc. (see Appendix 1 for details of these measures).

- Parental HLE activities during KS1 such as the frequency of reading to the child, taking the child out to educational visits, computing activities, play, etc. (see Appendix 1 for details of these measures).

- KS2 HLE included activities such as computing, playing, reading etc. (see Appendix 1 for details of these measures).

- KS3 HLE reflected activities like parental support, involvement and supervision, computing and reading (see Appendix 1 for details of these measures).

Null models

In order to control for potential secondary school influences and to take account of the clustering in the data, multilevel analyses were used to partition the variance in the continuous academic outcomes that is attributable to the schools (Level 2) and the individual students (Level 1). This method models the effects of clustering in the data (because students are nested in schools) and is widely recognized as essential in studying school influences (Creemers, Kyriakides & Sammons, 2010; Goldstein, 1995; 2003; Teddlie & Reynolds, 2000).

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[23] Marital status at KS2 was also included in initial analysis, but did not prove to be significant.

Table 3.1 - Table 3.4 show the null models for total GCSE scores, grades achieved in full GCSE English and in full GCSE maths, and their total number of full GCSE entries. The intra-school correlations (ICC) for all four of these academic outcomes show that there is significant school level variation (approximately 20-51%), so pursuing the analyses with multilevel models is essential to avoid bias in estimating the effects of the various predictors being modelled.

Table 3.1: Null model for total GCSE score in Year 11

Model statistics	Total GCSE score		
	Coefficient	SE	Sig
Intercept	441.17	5.44	***
Variance-school level	10735.01	1196.29	***
Variance-individual level	20932.92	661.64	***
Total variance	31667.93		
Number of students	2746		
Number of schools	732		
Intra-school correlation (ICC)	0.3390		

* p<0.05, ** p<0.01, *** p<0.001

Table 3.2: Null Models for grade achieved in full GCSE English in Year 11

Model statistics	GCSE English		
	Coefficient	SE	Sig
Intercept	41.52	0.30	***
Variance-school level	26.67	3.22	***
Variance-individual level	70.90	2.23	***
Total variance	97.57		
Number of students	2630		
Number of schools	683		
Intra-school correlation (ICC)	0.2733		

* p<0.05, ** p<0.01, *** p<0.001

Table 3.3: Null Models for grade achieved in full GCSE maths in Year 11

Model statistics	GCSE maths		
	Coefficient	SE	Sig
Intercept	40.35	0.32	***
Variance-school level	25.57	3.74	***
Variance-individual level	102.54	3.21	***
Total variance	128.11		
Number of students	2620		
Number of schools	689		
Intra-school correlation (ICC)	0.1996		

* p<0.05, ** p<0.01, *** p<0.001

Interestingly, half (50%) of the variance for total number of full GCSE entries is attributable to the school level (see Table 3.4). This shows that the secondary schools EPPSE students attended were very different in terms of how many GCSE exams they entered their students for. This may reflect differences in intake and in school policies.

Table 3.4: Null Models for total number of full GCSE entries in Year 11

Model statistics	Total no. of full GCSE entries		
	Coefficient	SE	Sig
Intercept	7.12	0.10	***
Variance-school level	4.53	0.39	***
Variance-individual level	4.45	0.14	***
Total variance	8.98		
Number of students	2763		
Number of schools	737		
Intra-school correlation (ICC)	0.5050		

* p<0.05, ** p<0.01, *** p<0.001

The null models for the dichotomous academic outcomes present the variances only at the school level and are provided solely as an illustration (Table 3.5 -Table 3.7).

Table 3.5: Null Models for achieving 5 A*-C in Year 11

Model statistics	Achieved 5 A*-C		
	Coefficient	SE	Sig
Intercept	0.37	0.07	***
Variance-school level	1.23	0.23	
Number of students	2763		
Number of schools	737		

* p<0.05, ** p<0.01, *** p<0.001

Table 3.6: Null Models for achieving 5 A*-C including English and maths in Year 11

Model statistics	Achieved 5 A*-C including English and maths		
	Coefficient	SE	Sig
Intercept	0.31	0.06	***
Variance-school level	0.63	0.14	*
Number of students	2763		
Number of schools	737		

* p<0.05, ** p<0.01, *** p<0.001

Table 3.7: Null Models for achieving EBacc in Year 11

Model statistics	EBacc		
	Coefficient	SE	Sig
Intercept	-1.99	0.12	***
Variance-school level	2.28	0.46	***
Number of students	2582		
Number of schools	717		

* p<0.05, ** p<0.01, *** p<0.001

Individual measures

The relative strength of the associations between individual level predictors and various Year 11 academic outcomes are shown in Table 3.8 and Table 3.9. Most of the predictors that are statistically significant are common to all academic measures. Thus, ethnicity, number of siblings and early behavioural problems statistically significantly predicted total GCSE scores, grades in GCSE English and in GCSE maths, as well as whether students achieved 5 A*-C including English and maths and their total number of full GCSE entries. Age, measured in terms of months, significantly predicted total GCSE scores, grades in GCSE English and in GCSE maths and their probability of obtaining 5 A*-C including English and maths. The relative strength of different predictors is indicated by effect sizes (ES) in Table 3.8 and by odd ratios (OR) in Table 3.9.

Age

None of the academic outcomes were age standardised. Therefore, in the contextualised models it was necessary to control for the student's age. A statistically significant age within the year group effect was found for total GCSE score, grades in GCSE English and in GCSE maths and whether students achieved 5 A*-C including English and maths (see Table 3.8 and Table 3.9). Older students were more likely to have obtained a higher total GCSE points score, better grades in GCSE English and maths, and were more likely to have achieved 5 A*-C including English and maths than younger students. This links with results in earlier phases of education and points to the importance of term of birth effects.

Gender

Female students gained higher total GCSE scores, higher grades in English and were entered for more full GCSEs than males (see Table 3.8). On average, female students obtained 26 points more for their total GCSE score, and about 3 points more (or half a grade) for grades in GCSE English. Female students were also more likely to achieve 5 A*-C overall, 5 A*-C including English and maths and the EBacc (see Table 3.9). The fact that female students do better than males in GCSE English is consistent with results in Year 9, but also with other studies focused on GCSE outcomes (Ofsted, 2013). Additionally, at earlier time points, in pre- and primary school girls showed statistically significantly higher attainment in maths than males. However, in secondary school in Year 9 and Year 11, this difference is no longer statistically significant.

Ethnicity

When compared with White UK students and controlling for the influences of other characteristics, Pakistani and Bangladeshi students obtained statistically significant and higher total GCSE scores, grades in maths and entered more full GCSEs (see Table 3.8,

Table A4.1, Table A4.3 and Table A4.5). For example, students of Pakistani heritage on average obtained total GCSE score of almost 50 points more than students of White UK heritage. Students of Black Caribbean heritage also got better total GCSE point scores and higher grades in GCSE English and in GCSE maths than EPPSE students of White UK heritage. Consistent with results in Year 9, Indian students had better results in GCSE maths, but in GCSE English as well, when compared with White UK students. Indian students also were more than twice as likely (2.28:1) to have achieved 5 A*-C including English and maths as White UK students (see Table 3.9). Analyses using the GCSE results for the whole 2012 cohort of students in England showed very similar patterns of results. For example, non-White British students obtained better results than White British students in maths (Ofsted, 2013). We can conclude that despite the relatively small numbers of ethnic minorities in the EPPSE sample, their results are likely to reflect national patterns fairly closely.

Early developmental, behavioural and health problems

Students whose parents reported early behavioural or health problems at entry to the study obtained lower Year 11 academic attainment results and entered fewer full GCSEs than students where no early behavioural or health problems were reported. Students who were identified with early developmental, behavioural or health problems were less likely to achieve 5 A*-C than students without these problems (0.60:1).

Family size

On average, students from larger families (3 siblings or more) obtained total GCSE scores 23 points lower, lower grades in English (ES=-0.28) or maths (ES=-0.17), were entered for fewer GCSEs and were less likely to achieve 5 A*-C or 5 A*-C including English and maths than students from smaller families (OR=0.62; OR=0.69) (see Table 3.8 and Table 3.9).

Family measures

The following family characteristics had statistically significant net effects as predictors of Year 11 academic attainment: mother's age (when child entered the study at age 3/5), eligibility for FSM (Year 11), family salary (collected using a parent questionnaire during KS1), parents' highest SES (when child entered the study at age 3/5) and parents' qualification levels (when child entered the study at age 3/5).

Mother's age at age 3/5

Mother's age was found to be a positive predictor for academic attainment in terms of grades in GCSE English, grades in GCSE maths and whether the students achieved 5

A*-C and the EBacc (see Table 3.8 and Table 3.9). Students whose mothers were older obtained better GCSE results and were more likely to achieve 5 A*-C and the EBacc than students with younger mothers (see Table 3.9). The effect sizes were weak but slightly higher for English (ES=0.15) than for maths (ES=0.10). The odds ratios for the dichotomous outcomes were also similar (OR=1.33; OR=1.39).

Free school meals (FSM)

FSM, a marker for low income, was a negative predictor of academic attainment in Year 11. Students eligible or receiving FSM obtained significantly lower results than students who were not eligible. The effects were similar for the total GCSE points score (ES=-0.32), GCSE English (ES=-0.31) and GCSE maths (ES=-0.37, see Table 3.8). These results are very similar to the ones found in Year 9, when English, maths and science were studied. In terms of total point scores, students eligible for FSM obtained on average 42 points less than students who were not eligible for FSM in Year 11. The weakest effect of Year 11 FSM was found for the total number of full GCSE entries (ES=-0.23). A negative probability of achieving 5 A*-C was also found for FSM; students who were eligible for FSM in Year 11 being less likely to achieve 5 A*-C (OR=0.61) or 5 A*-C including English and maths (OR=0.51, see Table 3.9). Jesson, Gray and Tranmer (1992) studied the GCSE results of students in Nottinghamshire and concluded that students in receipt of free school meals were less successful than their school mates who were not in receipt of this benefit. The same result was found nationally on the latest attainment data (Department for Education, 2013).

Income

Family salary data was collected from parents in KS1 and thus, does not reflect current salary levels. This measure points to relative difference in salary. In terms of household salary, the results indicated that students in households with higher incomes obtained higher total GCSE scores and higher grades in GCSE English and in GCSE maths than students whose parents had no earned salary (most of whom would be on benefits) (see Table 3.8).

Students from families with salaries between £37,500 and £66,000 gained on average almost 35 points in their total GCSE scores (equivalent to a GCSE grade D or the difference between achieving an A* rather than a grade F for a single GCSE), or 2 points in GCSE English and in GCSE maths (equivalent to a third of a grade i.e. 6 points separate grades) when compared with students from families with no earned salaries. Family salaries higher than £67,500 per annum were associated with an average increase of one full GCSE entry. Table 3.9 shows the same group of students were more likely to achieve 5 A*-C (OR=3.94) or the EBacc (OR=4.04).

Table 3.8: Summary findings from contextualised models for Year 11 academic outcomes[24]

Background characteristics	Total GCSE score	Total GCSE entries	GCSE English	GCSE maths
Individual student measures	ES	ES	ES	ES
Age	0.14		0.13	0.14
Gender	0.19	0.11	0.38	
Ethnicity	0.76 (B)[†]	0.58 (B)	0.55 (B)	0.53 (I)[‡]
Birth weight		-0.39		
Early behavioural problems	-0.29	-0.30	-0.17	-0.27
Early health problems	-0.12	-0.12	-0.14	-0.16
Number of siblings	-0.17	-0.33	-0.28	-0.17
Family measures				
Mother's age (age 3/5)			0.15	0.10
FSM (Year 11)	-0.32	-0.23	-0.31	-0.37
Family salary (KS1)	0.29	0.52	0.41	0.28
Parents' highest SES (age 3/5)	-0.31	-0.58	-0.53	-0.66
Mothers' highest qualifications level (age 3/5)[25]	0.47	0.31	0.70	0.57
Fathers' highest qualifications level (age 3/5)[26]		0.25	0.33	0.40
Parents' highest qualifications level (age 3/5)	0.59	0.36	0.80	0.74
HLE measures				
Early years HLE	0.36	0.51	0.51	0.45
KS1 HLE enrichment outings (medium)				0.11
KS1 HLE educational computing (medium)	0.11	0.13		
KS2 HLE educational computing (medium)		0.13	0.10	0.15
KS3 HLE computer (high)		0.15		
KS3 HLE academic enrichment (high)	0.47	0.43	0.48	0.47

[†]B=Bangladeshi heritage; [‡]I=Indian heritage

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[24] ES are based on the models that included the combined measure of parental qualification levels. When multiple categories are significant, the highest ES is presented.

[25] This measure was tested in different models than the models that included the combined measure.

[26] This measure was tested in different models than the models that included the combined measure.

Family SES

Family SES was computed for different time points: at entry to the study (age 3/5), KS1, KS2 and KS3. Even though each of these alternative measures of family SES were significant predictors of academic outcome, the best and most robust predictor was the family SES collected at age 3/5 when interviewing the parents. This measure also had the highest response rate. Therefore, the contextualised models reported are based on this predictor.

When compared with the 'professional non-manual' category (representing the highest possible SES category), most of the other categories significantly predicted lower grades in GCSE English and in GCSE maths (see Table A4.3 and Table A4.5 in Appendix 4). Statistically significant effects on total GCSE score were found for students whose parents belong to the 'skilled manual' (ES=-0.31) and 'semi-skilled' (ES=-0.30) categories (see Table A4.1 in Appendix 4). Students whose parents were categorised as 'unskilled' were on average entered in one fewer full GCSE exam than students whose parents were from the highest SES group (see Table A4.7).

Students whose parents belong to the 'skilled manual' (OR=0.59), 'semi-skilled' (OR=0.58) and 'unskilled' (OR=0.42) categories were also less likely to achieve 5 A*-C including English and maths (see Table A4.1).

Overall, these results reveal that students whose parents were in employment classified as the highest SES group ('professional non-manual') when they were in the early years continued to show significantly higher attainment levels, net of the influence of income, HLE and qualifications. Nonetheless, qualification was a stronger predictor of academic outcomes than either income or family SES (see below).

Parent's highest qualification level

In the current analyses, parents' qualification levels collected at age 3/5 was tested in two ways: 1) as individual measures for mother's and father's qualification levels and 2) as a combined measure of parents' highest qualification level. When, tested as individual measures, mother's highest qualification level was a significant and positive predictor of total GCSE score (ES=0.47), grades in GCSE English (ES=0.70) and in GCSE maths (ES=0.57), and the total number of GCSEs students were entered for (ES=0.31, see Table 3.8). Students whose mothers were more qualified were also significantly more likely to have achieved 5 A*-C (OR=3.14) and 5 A*-C including English and maths (OR=4.11) than students whose mothers did not have any qualifications (see Table 3.9). Similarly, students whose fathers had a degree or higher degree obtained significantly better grades in GCSE English (ES=0.33) and in GCSE maths (ES=0.40), were entered for a higher number of GCSEs (ES=0.25) and were more likely to achieve both 5 A*-C (OR=2.48) and 5 A*-C including English and maths (OR=2.07) and the EBacc (OR=3.16)

than students whose fathers do not have any qualifications. It can be seen that when testing individual measures of parents' qualification levels, mother's qualification level was a somewhat stronger predictor than father's qualification level.

Analyses using the combined measure that was calculated by taking into account the highest qualification level of either parent showed that students whose parents have a higher degree achieved significantly higher total GCSE scores (ES=0.59), better grades in GCSE English (ES=0.80) and in GCSE maths (ES=0.74) and were entered for a higher total number of GCSEs (ES=0.36) than students whose parents did not have any qualifications. Similarly, students with highly qualified parents were significantly more likely to achieve the benchmark indicators 5 A*-C (OR=3.58) and 5 A*-C including English and maths (OR=3.92) and the EBacc (OR=2.83).

Early years home learning environment (early years HLE)

Measures of the home learning environment were obtained from parents' responses at four time points: at entry to the study, KS1, KS2 and KS3. The early years HLE measure is based on the frequency of specific activities involving the child (i.e., teaching the child the alphabet, playing with letters and numbers, library visits, reading to the child, teaching the child songs or nursery rhymes – see Appendix 1) as reported by parents when children were recruited to the study during the pre-school period. These measures were combined to form an overall early years HLE index with scores that could vary between 0 (very low early years HLE) and 49 (very high early years HLE).

The early years HLE index was tested and found to still be a strong net predictor of better academic attainment at age 16 after controlling for other background characteristics (e.g., parents' highest SES, family salary and parents' highest qualification levels). For total GCSE score and grades in GCSE English and in GCSE maths, only the two highest early years HLE categories (25-32 and 33-45) were found to be statistically significant predictors when compared with the lowest HLE category (0-13).

For the top early years HLE category, the following statistically significant effects 'net' of other individual student and family characteristics were obtained: total GCSE score (ES=0.36), grades in GCSE English (ES=0.51) and in GCSE maths (ES=0.45). For the total number of GCSE entries, all categories of early years HLE were statistically significant, the effect size of the highest group being largest (ES=0.51 - see Table A4.7 and Table 3.8). Similarly, students with high early years HLE scores were three times more likely to achieve the benchmark measures of both 5 A*-C (OR=3.61) or 5 A*-C including English and maths (OR=2.90, see Table 3.9).

These results confirm findings at younger ages and show that the early years HLE remains highly important for later secondary school academic outcomes even at age 16.

<div align="center">Table 3.9: Contextualised models for Year 11 benchmark indicators[27]</div>

Background Characteristics	Achieved 5 A*-C	Achieved 5 A*-C English and maths	EBacc
Individual student measures	OR	OR	OR
Age		1.04	
Gender	1.45	1.24	1.74
Ethnicity		2.28(I)[‡]	
Developmental problems	0.68	0.67	
Behavioural problems	0.65	0.63	
Health problems	0.63		
Number of siblings	0.62	0.69	
Family measures			
Mother's age (age 3/5)	1.33		1.39
FSM (Year 11)	0.61	0.51	
Family salary (KS1)	3.94	1.95	4.04
Parents' highest SES (age 3/5)	0.50	0.59	0.41
Mothers' highest qualifications level (age 3/5)[28]	3.14	4.11	
Fathers' highest qualifications level (age 3/5)[29]	2.48	2.07	3.16
Parents' highest qualifications level (age 3/5)	3.58	3.92	2.83
HLE measures			
Early years HLE	3.61	2.90	
KS1 HLE enrichment outings (medium)		1.39	
KS1 HLE educational computing (medium)	1.36		0.51 (high)
KS3 HLE academic enrichment (high)	2.80	2.60	3.89
KS3 HLE parental interest (high)		1.34	

<div align="right">[‡]I=Indian heritage</div>

KS1 HLE

As the HLE during the pre-school period was shown to have a strong impact on children's academic attainment during pre-school, parents were again surveyed about their interactions with their child at home during KS1 (age 6-7 years). Parents reported on activities such as the frequency of reading to/with the child, taking the child out on educational visits, computing activities, sport activities, dance, etc (see Appendix 1). It

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[27] OR are based on the models that included the combined measure of parental qualification levels.

[28] This measure was tested in different models than the models that included the combined measure.

[29] This measure was tested in different models than the models that included the combined measure.

should be noted that the KS1 HLE measures were collected by questionnaire and thus the data are not directly comparable to the measure of early years HLE collected via face-to face-interviews.

The individual KS1 HLE measures have been aggregated to form four factors[30] representing different parental activities during KS1: 'home computing', 'one-to-one interaction', 'expressive play' and 'enrichment outings' (see Appendix 1 and Sammons et al., 2008a; 2008b). All four factors were tested in models that controlled for the individual student and family characteristics, but also for early years HLE. The early years HLE remained a stronger predictor even when KS1 HLE measures were included.

Only two KS1 HLE factors were statistically significant additional predictors of academic outcomes at the end of Year 11 (see Table 3.8). The 'enrichment outings' factor was a statistically significant predictor of grades in GCSE maths (ES=0.11), but only at moderate level (see Table A4.5). Likewise, only moderate levels of 'educational computing' were significantly associated with a higher total GCSE score (ES=0.11 – see Table A4.1) and a higher number of GCSE entries (ES=0.13 – see Table A4.7). A high computer usage significantly predicted a decreased probability of obtaining the EBacc (OR=0.51 – see Table 3.9). Moderate levels of 'enrichment outing' activities in KS1 significantly increased the probability of achieving 5 A*-C at the end of Year 11 (OR=1.36 – see Table 3.9).

These results are different from the ones obtained in Year 9, where both moderate and frequent outings during KS1 were significant predictors of attainment in English, but not predictors of maths. It seems that KS1 enrichment activities, such as outings, may have lasting effects on overall academic attainment even up to Year 11.

KS2 HLE

The HLE seems to be interestingly related to academic attainment, remaining an important predictor that needs to be continually investigated. At KS2, another questionnaire was sent to parents who were asked to state their level of involvement in different learning activities at home. The parents reported on activities such as the frequency of internet usage, taking the child out for physical activities and educational visits, computing activities, teaching the child different subjects. Four KS2 HLE factors were extracted from the individual items 'parent-child educational computing', 'parent-child interactive learning processes', 'individual child activities' and 'computer games' (see Appendix 1). These factors were tested with respect to their influence on academic

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[30]Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to identify latent factors.

attainment at the end of Year 11. The models controlled for early years HLE and the specific KS1 HLE factors that were statistically significant.

Only 'parent-child educational computing' was a statistically significant predictor of academic attainment in Year 11. Thus, medium levels of computer usage for educational purposes predicted better grades in GCSE English (ES=0.10) and in GCSE maths (ES=0.15), and a higher total number of full GCSE entries (ES=0.13), but the effects were relatively weak (see Table 3.8). As shown in previous years, it seems that just an optimal level of home computing is good for academic attainment.

KS3 HLE

KS3 HLE measures incorporate information sourced not just from the parent, but from the students themselves. This way we were able to take account of the likely increased independence of adolescents from parents at age 14 and the young person's own potential influence exerted over their HLE.

Individual items were submitted to factor analysis and five factors were extracted: 'learning support and resources', 'computer use', 'parental interest in school', 'academic enrichment' and 'parental academic supervision' (see Appendix 1). These factors were tested with respect to their influence on academic attainment at the end of Year 11. The models controlled for early years HLE and the specific KS1 HLE and KS2 HLE factors that were statistically significant.

Medium and high levels of 'academic enrichment' in KS3 significantly predicted higher total GCSE scores (ES=0.47), better grades in GCSE English (ES=0.48) and in GCSE maths (ES=0.47), and a higher total number of full GCSE entries (ES=0.43). Medium and high levels of 'academic enrichment' in KS3 also significantly increased the probability of achieving 5 A*-C (OR=2.80), 5 A*-C including English and maths (OR=2.60) and EBacc (OR=3.89). A high level of 'parental interest' predicted a higher probability of achieving 5 A*-C including English and maths (OR=1.34). Students who reported high levels of 'computer use' were entered for a higher number of full GCSEs (ES=0.15) than those who reported low computer usage at age 14.

The impact of neighbourhood characteristics and school composition

We have already shown the individual student, family and HLE characteristics from different time points that continued to significantly predict students' academic attainment at age 16. Next, we analysed whether a broader context like the neighbourhood environment had any influence on students' attainment in Year 11. The neighbourhood measures were based on where the EPPSE children lived while they were in pre-school

and primary school, and so the indicators do not necessarily reflect later residential moves.

Various measures of neighbourhood environment were added to the full contextualised models predicting academic outcomes. Neighbourhood characteristics from census statistics included percentage of White British citizens in the neighbourhood, level of crime, level of unemployment and percentage of residents with limiting long-term illness. Additional measures from the National Pupil Database (NPD) included the Index of Multiple Deprivation (IMD), the percentage of students at school level receiving free school meals (FSM) and the Income Deprivation Affecting Children Index (IDACI). Measures of neighbourhood safety were derived from the KS1 parent questionnaire.

These neighbourhood measures were tested individually after control for individual student, family and HLE characteristics to avoid potential collinearity issues (see Table 3.10 for the correlations between different measures). The continuous measures of neighbourhood disadvantage were centred to the grand mean.

Table 3.10: Correlations between different measures of neighbourhood disadvantage (n=3110)

Neighbourhood characteristics	% of White British citizens	Level of Crime	Level of Unemployment	% Residents with Limiting Long Term Illness	IDACI
IMD 2004	-.525***	.734***	.914***	.450***	.915***
% of White British citizens		-.399***	-.359***	.011	-.478***
Level of Crime			.604***	.264***	.674***
Level of Unemployment				.510***	.842***
% Residents with Limiting Long-Term Illness					.418***

*** p<0.001

Index of Multiple Deprivation (IMD)

The first of the neighbourhood disadvantage measurements, IMD is a nationwide index combining weighted measures of levels of crime, barriers to housing, living environment, education and skills training, health deprivation and disability, employment and income. The greater the IMD score, the greater the level of neighbourhood deprivation. The index is divided into Local Authority (LA) and Super Output Area (SOA), where SOAs are defined as areas smaller than wards, frequently nested in wards, and of broadly consistent population size. For the purposes of analysis, the 2004 IMD scores were assigned to each child on the basis of their pre-school home address (using postcode)

being used to identify the appropriate SOA (for further details of the IMD see Noble et al., 2004; 2008).

Students' academic outcomes at the end of Year 11 were significantly predicted by neighbourhood disadvantage as measured by IMD scores. The effect sizes are slightly larger than the ones obtained in Year 9. The higher the multiple deprivation index scores, the lower the academic results in Year 11, with the highest effect being on the total number of GCSE entries (ES=-0.28; see Table 3.11).

Income Deprivation Affecting Children Index (IDACI)

The Income Deprivation Affecting Children Index (IDACI) represents the percentage of children that live in families that are income deprived in each SOA. The overall IMD does not include the IDACI as the children are already captured in the Income Deprivation Domain (see Noble et al., 2004; 2008).

The IDACI is a negative predictor of students' academic outcomes in Year 11 (see Table 3.11 and Table 3.12). Students who had grown up in a neighbourhood characterised by economically deprived families tend to do worse academically in Year 11, after control for their own background characteristics including family SES, HLE and income. The effect sizes of IDACI are small but statistically significant for all the academic outcomes.

Table 3.11: Contextualised models for Year 11 academic outcomes - Neighbourhood measures

Fixed effects (continuous)	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
	ES	Sig	ES	Sig	ES	Sig	ES	Sig
IMD		ns	-0.28	***		ns	-0.17	**
IDACI	-0.15	*	-0.20	**	-0.15	**	-0.16	**
% White British		ns	-0.19	*	-0.20	**	-0.15	*
Crime	-0.15	*	-0.24	***		ns	-0.12	*
Unemployment		ns	-0.25	***		ns	-0.12	*

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Table 3.12: Contextualised models for Year 11 benchmark indicators - Neighbourhood measures

Fixed effects (continuous)	Year 11 Achieved 5 A*-C		Year 11 Achieved 5 A*-C English and maths		Year 11 EBacc	
	OR	Sig	OR	Sig	OR	Sig
IMD	0.99	*	0.99	*		ns
IDACI	0.39	**	0.35	***	0.32	*
% White British	0.99	**	0.99	*	0.99	*
Crime	0.85	*	0.84	**		ns
Unemployment		ns		ns		ns

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Percentage of White British

The percentage of White British citizens in the neighbourhood was also a significant and negative predictor of students' academic attainment. A higher percentage of White British residents in the neighbourhood predicted significantly lower academic attainment at the end of Year 11 in terms of grades in GCSE English and in GCSE maths and students being entered for a lower number of total full GCSE entries (see Table 3.11 and Table 3.12).

Level of crime

The level of crime in a neighbourhood was another significant predictor of academic outcomes in Year 11, but not for all measures. A neighbourhood characterised by a higher level of crime negatively and significantly predicted total GCSE scores (ES=-0.15), their total number of GCSE entries (ES=-0.24) and their grade in GCSE maths (ES=-0.12). A higher level of crime also predicted lower probabilities in achieving 5 A*-C (OR=0.85) or 5 A*-C including English and maths (OR=0.84). The associations of crime levels with results in English were not statistically significant (see Table 3.11 and Table 3.12).

Level of unemployment

The level of unemployment in a neighbourhood was a negative predictor of academic outcomes in Year 11. A neighbourhood characterised by a higher level of unemployment negatively and significantly influenced total number of GCSE entries (ES=-0.25) and their grade in GCSE maths (ES=-0.12). The effect of unemployment levels on Year 11 students' grades in GCSE English, their total GCSE score and their likelihood of achieving 5 A*-C, achieving 5 A*-C including English and maths or achieving EBacc were not statistically significant (Table 3.11 and Table 3.12).

Neighbourhood safety

The indicator of neighbourhood safety was based on EPPSE students' parents' own perceptions derived from the KS1 parent questionnaire. The results of the relationships between the views on neighbourhood safety and students' later academic outcomes are presented in Table 3.13 and Table 3.14. A high level of neighbourhood safety was a significant predictor of students achieving higher total GCSE scores, higher grades in GCSE maths and having a higher probability of achieving 5 A*-C when compared with low levels of neighbourhood safety. Again, effects are weak but consistent.

This subsection has shown that characteristics of the neighbourhood where children lived while they were at pre-school continued to predict their later attainment in GCSE results in Year 11 of secondary school. The influences on GCSE results are slightly different from the influences on Year 9 academic results. For grades in GCSE English, only two features of the neighbourhood (% White British and the IDACI) were found to be statistically significant predictors whereas more neighbourhood measures were found to be statistically significant predictors for Year 9 English Teacher Assessment (TA) levels. In contrast, all of the neighbourhood measures that were tested were found to be significant predictors of students' grades in GCSE maths.

Table 3.13: Contextualised models for Year 11 academic outcomes - Neighbourhood safety

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Neighbourhood safety (compared with low safety)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Medium low safety	0.06		0.06		0.06		0.08	
Medium high safety	0.01		0.09		-0.00		0.01	
High safety	0.15	*	0.12		0.08		0.13	*
Number of students	2497		2510		2343		2535	
Number of schools	610		614		573		675	
Intra-school correlation (ICC)	0.3024		0.3028		0.0690		0.0412	
% Reduction student variance	15.2		11.3		20.8		18.7	
% Reduction school variance	28.3		62.2		84.4		86.0	
% Reduction total variance	19.7		37.0		38.2		32.1	

* p<0.05, ** p<0.01, *** p<0.001

Table 3.14: Contextualised models for Year 11 benchmark indicators - Neighbourhood safety

Fixed effects	Year 11 Achieved 5 A*-C		Year 11 EBacc	
Neighbourhood safety (compared with low safety)	OR	Sig	OR	Sig
Medium low safety	1.22		1.71	*
Medium high safety	1.19		1.40	
High safety	1.48	*	1.22	
Number of students	2429		2255	
Number of schools	601		584	
% Reduction school variance	83.0		77.9	

* p<0.05, ** p<0.01, *** p<0.001

School level FSM

Another measure that might reflect both family and neighbourhood characteristics is the school level percentage of students eligible to receive free school meals (FSM). The percentage of FSM students at secondary school level was a statistically significant predictor of academic attainment in Year 11. This represents a compositional school measure and reflects the overall social economic status of the students attending these schools. A higher percentage of students eligible for or receiving FSM at school level significantly predicted lower grades in GCSE English (ES=-0.18 – see Table A4.3), fewer full GCSE entries (ES=-0.55 – see Table A4.7) and a lower probability of students achieving 5 A*-C (OR=0.98 – see Table A4.9).

Summary of the impact of neighbourhood characteristics and school composition

It seems that the importance of neighbourhood characteristics in predicting academic attainment increases slightly during secondary school. In primary school the EPPE research found that neighbourhood measures were not statistically significant predictors of children's attainment when the early years HLE was taken into account. However, even when early years HLE was controlled for in these models for secondary school attainment, neighbourhood disadvantage has been a significant predictor, although relatively weak, for the same students at age 14 and age 16. This suggests that the neighbourhood context becomes more important in shaping students' educational outcomes as they grow older. This is likely to reflect students' greater involvement in activities outside the home and with their peer group in the local area as they move into early adolescence.

These findings link with the Bronfenbrenner's ecological model (1994) that suggests that proximal influences (e.g., child/family) have stronger effects than more distal ones like school and neighbourhood, but that all contribute to shape development.

The intra-school correlations also point to statistically significant school level variations in student attainment outcomes at age 16 controlling for the influences of student, family, HLE and neighbourhood influences. The strongest school effects are on total GCSE score (see Table A4.1) and total number of GCSE entries (see Table A4.7). These two outcomes are linked and often reflect school policies (e.g., to allow higher number of subjects to be studied or alternatively to cap the number of GCSE entries at 8 or 9 or to focus students' energies on a more limited number of subjects). The effects on grades in GCSE English and in GCSE maths may well reflect subject department effects in addition to possible school influences (Sammons, Thomas, & Mortimer, 1997).

4 The impact of pre-school, primary school and secondary school on students' academic attainment at the end of Year 11

Key findings

Pre-school influences

- Measures of the quality and effectiveness of the pre-school attended continued to predict students' later academic attainment at the end of Year 11.

- Students who had attended a high quality pre-school setting went on to obtain better GCSE results in terms of total GCSE score, grades in GCSE English and in GCSE maths, and were also more likely to achieve 5 A*-C including English and maths than students who had not attended pre-school.

- There was some evidence that pre-school quality showed a stronger effect for males than females when predicting grades in GCSE maths. Similarly, for students of low-qualified parents only high quality pre-school was a significant predictor of grades in GCSE maths.

- Higher levels of pre-school effectiveness (in terms of promoting pre-reading) predicted more GCSE exam entries, better grades in GCSE English and in GCSE maths and a higher probability of achieving 5 A*-C including English and maths.

Primary school influences

- Students who had attended an academically effective primary school had significantly better grades in GCSE maths and were almost twice as likely to achieve the EBacc as students who had attended a low academically effective primary school after controlling for student, family HLE and neighbourhood influences.

Secondary school influences

- An indicator of overall academic effectiveness at secondary school (the DfE CVA measure) significantly and positively predicted students' academic attainment in terms of total GCSE score, but not the specific subject grades or the benchmark indicators.

- Students who had attended a secondary school rated as 'outstanding' in terms of the 'quality of learning' or 'learners' attendance' got higher grades in GCSE English and in GCSE maths and were more likely to achieve 5 A*-C and 5 A*-C including English and maths than students who had attended secondary schools characterised as 'inadequate' in their learning quality.

So far the analyses have shown that various individual student and family background characteristics as well as measures of the students' HLE and neighbourhood remain significant predictors of the students' academic attainment in Year 11. The effects of individual student, parent and HLE characteristics are still in line with similar effects found at the end of primary school (KS2) and earlier in secondary school (KS3). The general pattern of results is also in line with findings from other studies that have focused on background predictors of GCSE outcomes (Jesson et al., 1992; Ofsted, 2013; Strand, 2008; 2014).

Continuing the tradition of previous EPPSE reports, we have further investigated the extent to which measures of students' pre-school experiences continue to predict academic outcomes in Year 11. In addition, measures of primary school and secondary school influence are also tested. Taking into account the effects of individual student, family, HLE and neighbourhood characteristics, various measures of pre-school quality and effectiveness, primary school and secondary school academic effectiveness, and secondary school quality, were tested as predictors of the variation in students' GCSE results.

The impact of pre-school experience on Year 11 academic attainment

In order to investigate any possible continued effects of pre-school on students' later academic attainment in Year 11, we considered four aspects of pre-school experience:

- attendance at a pre-school centre compared with no pre-school

- pre-school duration

- pre-school quality

- pre-school effectiveness.

As in previous sections of this report, the findings from these analyses are presented in terms of effect sizes (ES) and odds ratios (OR).

The continuing impact of pre-school attendance on later academic attainment at the end of KS4

Having attended any pre-school centre continued to show a statistically significant effect on academic attainment at the end of Year 11. Students who had attended any pre-school centre obtained higher total GCSE scores (ES=0.31), were entered for more full GCSE exams (ES=0.21), got better grades in GCSE English (ES=0.23) and in GCSE maths (ES=0.21), and had a higher probability of achieving 5 A*-C including English and maths (OR=1.48) when compared with students who had not attended pre-school, the 'home' group. These results indicate an overall benefit for pre-school taking into account the effects of differences in individual, family, HLE and neighbourhood characteristics.

Table 4.1: Contextualised models for Year 11 academic outcomes: Pre-school attendance

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Pre-school (compared with no pre-school)	0.31	***	0.21	*	0.23	*	0.21	*
Number of students	2497		2510		2343		2535	
Number of schools	610		614		573		675	
Intra-school correlation (ICC)	0.3024		0.3015		0.0644		0.0418	
% Reduction student variance	15.5		11.4		20.8		18.8	
% Reduction school variance	28.6		62.5		85.5		85.8	
% Reduction total variance	19.9		37.2		38.5		32.2	

* p<0.05, ** p<0.01, *** p<0.001

Table 4.2: Contextualised models for Year 11 benchmark indicators: Pre-school attendance

Fixed effects	Achieved 5 A*-C English and maths	
	OR	Sig
Pre-school (compared with no pre-school)	1.48	*
Number of students		2753
Number of schools		735
% Reduction school variance		43.6

* p<0.05, ** p<0.01, *** p<0.001

The continuing impact of pre-school type and duration on later academic attainment at the end of KS4

The EPPSE sample was originally drawn from 141 individual pre-school centres from a range of providers. Pre-school type covered local education authority nursery classes, voluntary playgroups, private day nurseries, local authority day nurseries, local education authority nursery schools and local authority combined centres that combined care and education (Sylva et al., 2008). These pre-school types differ on the adult-child ratios, levels of staff qualifications, resources, (paid or free access) and parental involvement. Type of pre-school was tested separately and it was identified as a significant predictor of Year 11 academic attainment. However, when we controlled for other measures of pre-school experience such as the duration in months a child had attended pre-school or the quality of the centre attended, pre-school type was no longer a significant predictor of later GCSE attainment. This supports earlier findings in primary school which indicated that quality and duration of pre-school experience were more important than type of pre-school attended.

The amount of time in months a student had spent in pre-school showed continued effects on Year 11 academic outcomes. Table 4.3 shows that the highest effect sizes were obtained for spending between 2 and 3 years (24-36 months) in pre-school. Students who had attended pre-school for this long obtained higher total GCSE scores (ES=0.38), better grades in GCSE English (ES=0.28) and in GCSE maths (ES=0.30),

and were entered for more GCSE exams (ES=0.24). There were also indications of stronger positive effects for 3+ years (>36 months) on total GCSE score (ES=0.38), but the pattern was less clear for other GCSE measures. Pre-school duration was not a significant predictor of any of the GCSE benchmark indicators.

Table 4.3: Contextualised models for Year 11 academic outcomes: Pre-school duration

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Pre-school duration (compared with no pre-school)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
0-12 months	0.18		0.13		0.21	*	0.23	*
12-24 months	0.25	*	0.16		0.13		0.15	
24-36 months	0.38	***	0.24	*	0.28	**	0.30	**
>36 months	0.38	**	0.13		0.19		0.24	*
Number of students	2424		2437		2285		2470	
Number of schools	592		596		557		654	
Intra-school correlation (ICC)	0.2986		0.2834		0.0663		0.0389	
% Reduction student variance	16.2		11.1		22.4		19.7	
% Reduction school variance	30.5		65.5		85.4		87.0	
% Reduction total variance	21.1		38.6		39.6		33.1	

* p<0.05, ** p<0.01, *** p<0.001

The continuing impact of pre-school centre quality on later academic attainment at the end of KS4

Pre-school quality was measured with two different scales ECERS-R and ECERS-E (Sylva et al., 1999; 2006). Previous EPPSE analyses have found that the ECERS-E measure, which focuses on the education aspects of pre-school, predicted the most consistent positive effects upon academic attainment at younger ages. In this set of analyses, both the ECERS-E and ECERS-R measures were tested. The sample was divided into groups of students whose pre-school experience could be classified as ranging from no quality (i.e., the 'home' group) through low, medium and high quality, based on individual pre-school centres' ECERS-E/R scores. The distribution of ECERS-E groups in the present sample was as follows: no pre-school (10%), low quality (14%), medium quality (53%) and high quality (22%). A very similar distribution was found for the ECERS-R measure.

The pattern of findings for the effects of pre-school quality was very similar regardless of whether the quality measurement was the ECERS-E or ECERS-R (see Table 4.4, Table 4.5, Table 4.6 and Table 4.7). Students who had attended high quality pre-schools obtained better GCSE results (total GCSE score, grades in GCSE English and in GCSE maths) and were more likely to have achieved 5 A*-C including English and maths than students who had not attended pre-school. There were also a number of positive effects for low and medium quality. Overall, high quality pre-school showed the most consistent pattern but again all pre-schools compared with none were beneficial in terms of predicting GCSE outcomes.

Table 4.4: Contextualised models for Year 11 academic outcomes: Pre-school quality ECERS-E

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Pre-school quality (compared with no pre-school)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Low quality	0.36	***	0.24	*	0.22	*	0.20	*
Medium quality	0.27	**	0.20	*	0.19	*	0.20	*
High quality	0.37	***	0.20		0.31	**	0.26	**
Number of students	2497		2510		2343		2535	
Number of schools	610		614		573		675	
Intra-school correlation (ICC)	0.3029		0.3020		0.0618		0.0409	
% Reduction student variance	15.6		11.3		20.7		18.7	
% Reduction school variance	28.4		62.4		86.1		86.1	
% Reduction total variance	19.9		37.1		38.6		32.2	

$* p<0.05, ** p<0.01, *** p<0.001$

Table 4.5: Contextualised models for Year 11 benchmark indicators: Pre-school quality ECERS-E

Fixed effects	Achieved 5 A*-C English and maths	
Pre-school quality (compared with no pre-school)	OR	Sig
Low quality	1.48	
Medium quality	1.40	
High quality	1.69	*
Number of students		2753
Number of schools		735
% Reduction school variance		45.8

$* p<0.05, ** p<0.01, *** p<0.001$

Table 4.6: Contextualised models for Year 11 academic outcomes: Pre-school quality ECERS-R

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Pre-school quality (compared with no pre-school)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Low quality	0.30	**	0.18		0.20		0.17	
Medium quality	0.29	**	0.25	**	0.22	*	0.24	**
High quality	0.35	***	0.13		0.25	*	0.20	*
Number of students	2497		2510		2343		2535	
Number of schools	610		614		573		675	
Intra-school correlation (ICC)	0.3005		0.3008		0.0631		0.0436	
% Reduction student variance	15.4		11.4		20.6		18.9	
% Reduction school variance	29.1		62.6		85.8		85.2	
% Reduction total variance	20.0		37.3		38.4		32.1	

$* p<0.05, ** p<0.01, *** p<0.001$

Table 4.7: Contextualised models for Year 11 benchmark indicators: Pre-school quality ECERS-R

Fixed effects	Achieved 5 A*-C English and maths		EBacc	
Pre-school quality (compared with no pre-school)	OR	Sig	OR	Sig
Low quality	1.36		1.81	
Medium quality	1.42		2.55	*
High quality	1.69	*	1.75	
Number of students		2753		2255
Number of schools		735		584
% Reduction school variance		47.3		77.9

* p<0.05, ** p<0.01, *** p<0.001

The continuing impact of pre-school centre effectiveness on later academic attainment at the end of KS4

Measures of pre-school centre effectiveness were calculated separately for 'pre-reading' and 'early number concepts' for all 141 pre-school centres in the study. These measures were the residuals from multilevel value added models predicting academic attainment (at the end of pre-school) of children who had attended a pre-school centre, controlling for their prior attainment at entry to the study and their background characteristics. More effective pre-schools were those in which children had made more progress than predicted by the statistical models (Sammons et al., 2002). These measures of pre-school centre effectiveness proved to be significant predictors of students' subsequent academic attainment in primary school (KS1 and KS2) and then later in secondary school (KS3). Therefore, it was expected that these measures might continue to shape students' attainment later on in KS4 as well.

In order to establish whether the effectiveness of the pre-school setting a child had attended showed any continuing impact on their later attainment at the end of KS4, further multilevel analyses were conducted. In these analyses, pre-school centre effectiveness in promoting young children's progress in 'pre-reading' was tested as a potential predictor for total GCSE score, grades in GCSE English, total number of GCSE entries, and whether the students achieved 5 A*-C, 5 A*-C including English and maths and the EBacc. Pre-school centre effectiveness, in terms of promoting young children's progress in 'early number concepts', was also tested as a predictor for total GCSE score, grades in GCSE maths, total number of GCSE entries and whether the students achieved 5 A*-C, 5 A*-C including English and maths and the EBacc.

Table 4.8: Contextualised models for Year 11 academic outcomes: Pre-school effectiveness (Pre-reading)

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English	
Pre-school effectiveness - pre-reading (compared with no pre-school)	ES	Sig	ES	Sig	ES	Sig
Low effectiveness	0.32	**	0.19		0.18	
Medium effectiveness	0.32	***	0.20	*	0.22	*
High effectiveness	0.27	**	0.25	*	0.31	**
Number of students	2497		2510		2343	
Number of schools	610		614		573	
Intra-school correlation (ICC)	0.3016		0.3006		0.0628	
% Reduction student variance	15.4		11.3		20.7	
% Reduction school variance	28.8		62.6		85.9	
% Reduction total variance	19.9		37.2		38.5	

* p<0.05, ** p<0.01, *** p<0.001

Pre-school effectiveness (pre-reading) was a statistically significant and positive predictor of total number of full GCSE entries, grade in GCSE English and whether students achieved 5 A*-C including English and maths (see Table 4.8 and Table 4.9). Higher levels of pre-school effectiveness were associated with more GCSE entries (ES=0.25), better grades in GCSE English (ES=0.31) and a higher probability of achieving 5 A*-C including English and maths (OR=1.73). There was no clear pattern for the EBacc or for total GCSE score.

Table 4.9: Contextualised models for Year 11 benchmark indicators- Pre-school effectiveness (Pre-reading)

Fixed effects	Achieved 5 A*-C English and maths		EBacc	
Pre-school effectiveness - pre-reading (compared with no pre-school)	OR	Sig	OR	Sig
Low effectiveness	1.32		2.81	*
Medium effectiveness	1.48	*	1.83	
High effectiveness	1.73	*	2.20	
Number of students	2753		2255	
Number of schools	735		584	
% Reduction school variance	44.2		76.1	

* p<0.05, ** p<0.01, *** p<0.001

Table 4.10: Contextualised models for Year 11 academic outcomes- Pre-school effectiveness (Early number concepts)

Fixed effects	Total GCSE score		Total GCSE entries		GCSE maths	
Pre-school effectiveness - early number concepts (compared with no pre-school)	ES	Sig	ES	Sig	ES	Sig
Low effectiveness	0.30	**	0.29	**	0.22	*
Medium effectiveness	0.25	**	0.17		0.16	
High effectiveness	0.48	***	0.23	*	0.35	***
Number of students	2497		2510		2535	
Number of schools	610		614		675	
Intra-school correlation (ICC)	0.2979		0.3024		0.0389	
% Reduction student variance	15.6		11.5		18.9	
% Reduction school variance	30.2		62.4		86.8	
% Reduction total variance	20.6		37.2		32.5	

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

The patterns and strengths of the relationships between pre-school effectiveness (early number concepts) and students' later Year 11 academic outcomes also suggest that there were positive and significant effects for students' grades in GCSE maths (ES= 0.35) and their total GCSE score (ES= 0.48 - see Table 4.10). However, no clear patterns emerged for the GCSE benchmark indicators (see Table 4.11).

Table 4.11: Contextualised models for Year 11 benchmark indicators- Pre-school effectiveness (Early number concepts)

Fixed effects	EBacc	
Pre-school effectiveness - early number concepts (compared with no pre-school)	OR	Sig
Low effectiveness	2.77	*
Medium effectiveness	2.05	
High effectiveness	1.80	
Number of students		2255
Number of schools		584
% Reduction school variance		77.6

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

The continuing pre-school effects for different groups of students

A topic of particular interest is whether pre-school experience has differential effects for particular groups of students, specifically those more vulnerable in terms of the risk of low attainment. In terms of 'risk', key characteristics were identified as having an impact on attainment: the student's gender, the level of their parents' highest qualification and the early years HLE. Each of these was considered in relation to pre-school attendance, pre-school quality, and pre-school effectiveness. However, we are presenting only the statistically significant and noteworthy results.

The combined impact of pre-school experience and gender

Differential effects of pre-school provision on gender have been an important objective of our study. Previous analyses showed that at earlier ages, boys benefited more than girls in attending a pre-school (Sylva et al., 2010). It is therefore helpful to investigate whether similar influences continue to exist in Year 11.

Results showed that for total GCSE score, attending any type of pre-school (regardless of the quality) had a beneficial effect for both male and female students (see Figure 4.1 or see Table A6.1 in Appendix 6). However, there is no clear evidence of a quality gradient for male or female students in terms of total GCSE score outcomes. The results confirm significant effects of attending any pre-school for this outcome irrespective of gender.

Figure 4.1: The combined impact of gender and pre-school quality on total GCSE score
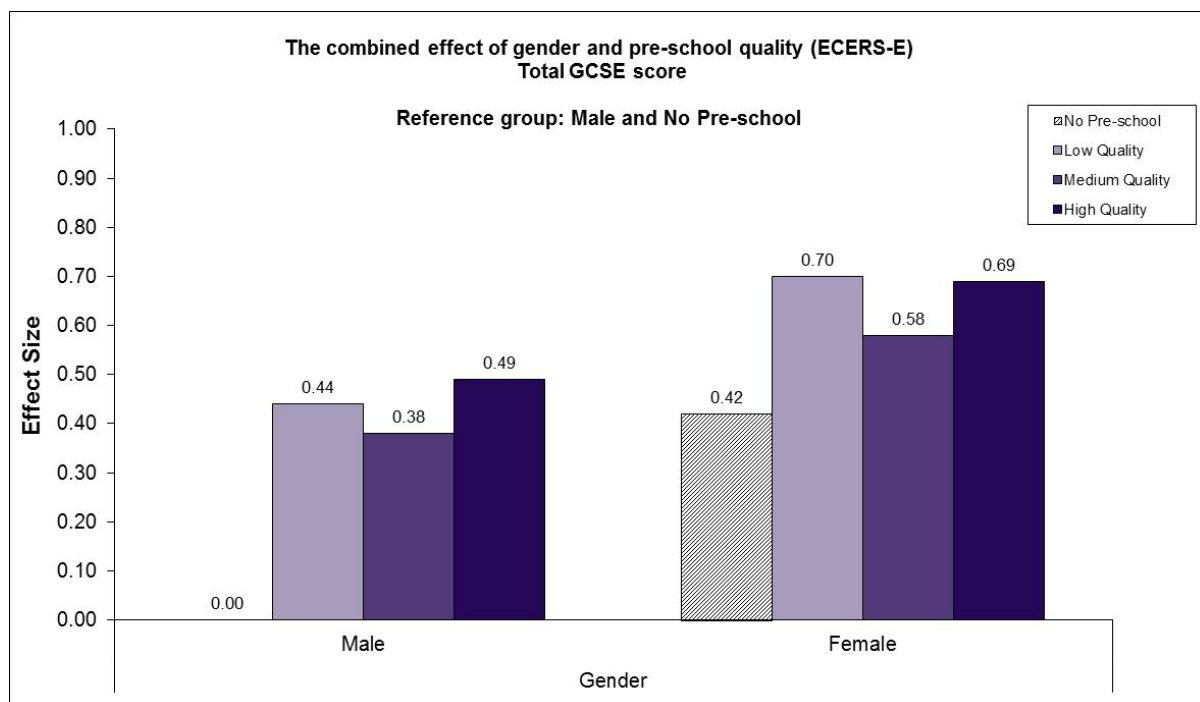
For grades in GCSE English, there were combined effects of both gender and pre-school reflecting an overall pre-school effect rather than a quality gradient. However, for male students there was a clear gradation of the effects based on the pre-school provision's quality with only the high quality pre-schools (ES=0.36) having a significant effect (see Figure 4.2 or Table A6.2 in Appendix 6). These findings suggest that male students' attainment in GCSE English may be more sensitive to the quality of pre-school they attended. This is in line with findings at younger ages in primary school. By contrast, the results confirm that female students benefit from any pre-school experience when compared with none, irrespective of quality.

Figure 4.2: The combined impact of gender and pre-school quality on GCSE English

The combined effect of gender and pre-school quality (ECERS-E)
Full GCSE English

Reference group: Male and No Pre-school
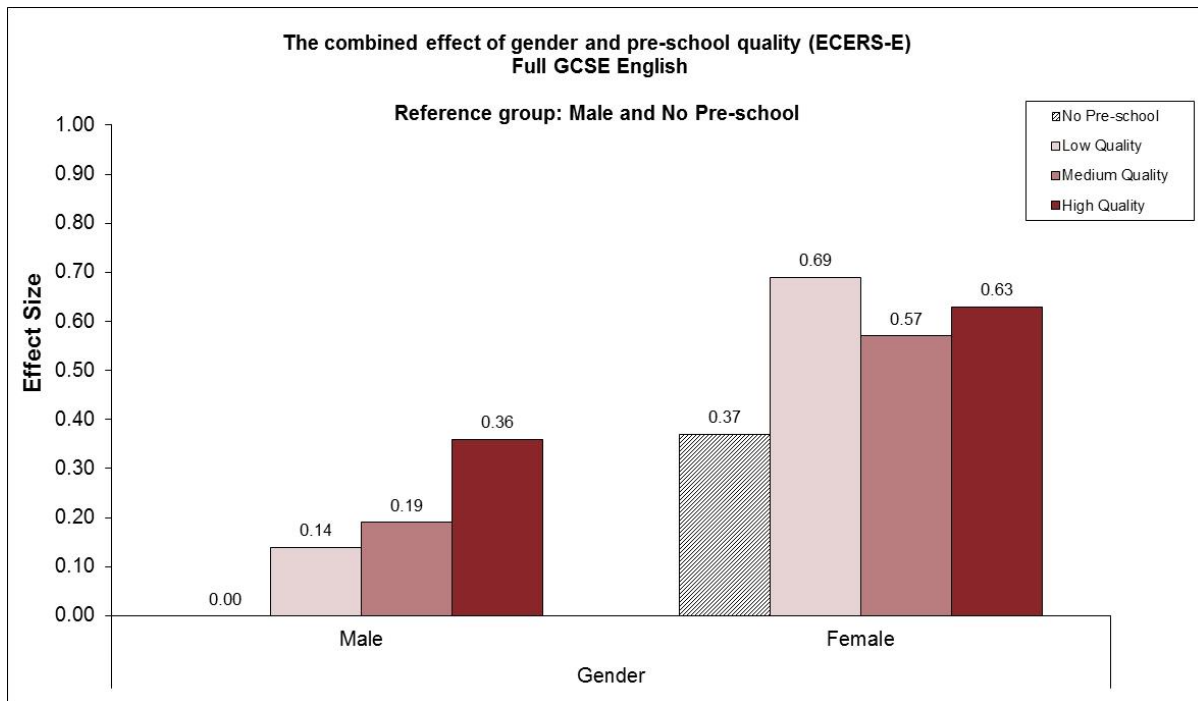
For grades in GCSE maths, we found evidence of pre-school quality effects for male students, with those who had attended a medium and high quality pre-school obtaining significantly higher grades than those who had not attended any pre-school provisions (ES=0.33 for medium quality; ES=0.41 for high quality - see Figure 4.3 or Table A6.3 in Appendix 6). The quality gradient for male students is distinct, whereas for female students, pre-school effects are weaker and do not show a clear quality gradient.

Figure 4.3: The combined impact of gender and pre-school quality on GCSE maths

The combined effect of gender and pre-school quality (ECERS-E)
Full GCSE maths

Reference group: Male and No Pre-school
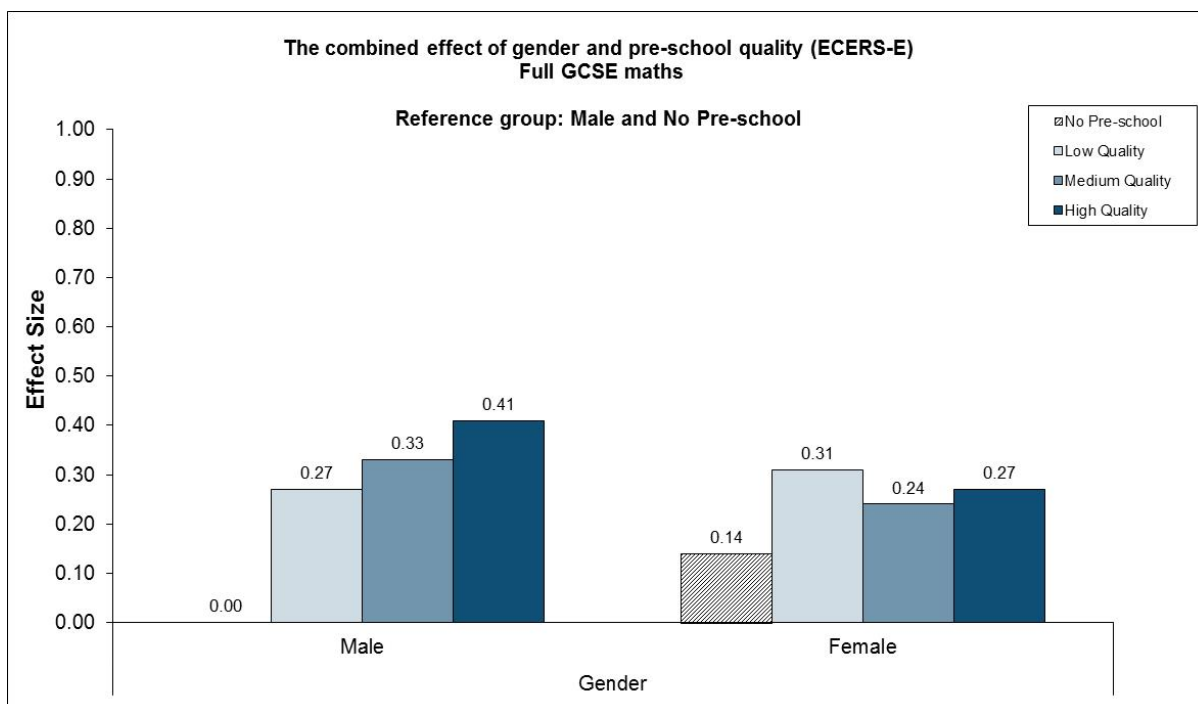
The combined impact of pre-school experience and parent's highest qualification level

The sample was divided into two groups based on the highest qualification of the parents: students with lower qualified parents versus students with more qualified parents. The parents who had 'no qualification', 'vocational' or '16 academic' qualification levels were categorised as lower qualified. Thus, if both of the parents were in any of these 3 groups the 'Parent's highest qualification level' was set to low qualified. Conversely, if at least one of the parents had a qualification higher than '16 academic' then the 'Parent's highest qualification level' was set as moderate/high. Joint measures were created between parents' highest qualification and pre-school attendance, pre-school quality and pre-school effectiveness. The combined terms were then entered separately into the contextualised models predicting Year 11 academic attainment.

With regard to the effect of past pre-school attendance, pre-school continues to be a statistically significant predictor of GCSE results for students with both low and higher qualified parents. The highest effect sizes were found for students who had attended a pre-school and had higher qualified parents (see Table A6.4, Table A6.5 and Table A6.6 in Appendix 6).

For total GCSE score, there was no evidence that quality made a statistically significant difference to the size of the pre-school effect for students from different parental qualification groups (see Table A6.4 in Appendix 6). However, for grades in GCSE English and in GCSE maths, there was some evidence that the quality of earlier pre-school experiences predicted differences in grades after controlling for individual student, family, HLE and neighbourhood influences (see Figure 4.4 and Table A6.5 for GCSE English; see Figure 4.5 and Table A6.6 for GCSE maths). Thus, for students of low qualified parents who had attended a high quality, there were significant effects for grades in GCSE English (ES=0.35) and in GCSE maths (ES=0.25). For students whose parents had moderate to high qualification levels, a clear pre-school quality gradient was evident for grades in GCSE English (see Figure 4.4 and Table A6.5). However, the same pattern did not show for grades in GCSE maths for this group (see see Figure 4.5 and Table A6.6). Rather, any pre-school experience, irrespective of quality, showed a benefit when compared to none.

Figure 4.4: The combined impact of parents' highest qualification and pre-school quality on GCSE English

The combined effect of parents' highest qualification and pre-school quality (ECERS-E)
Full GCSE English

Reference group: Low Qualification and No Pre-school
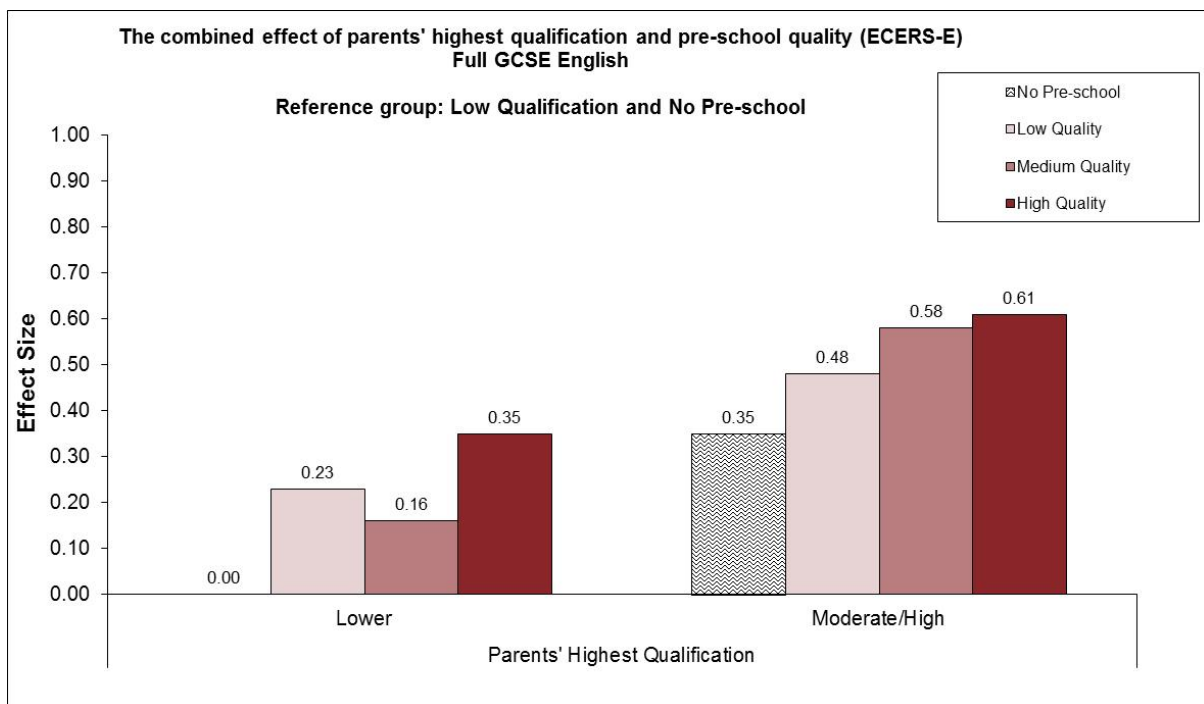
Figure 4.5: The combined impact of parents' highest qualification and pre-school quality on GCSE maths

The combined effect of parents' highest qualification and pre-school quality (ECERS-E)
Full GCSE maths

Reference group: Low Qualification and No Pre-school
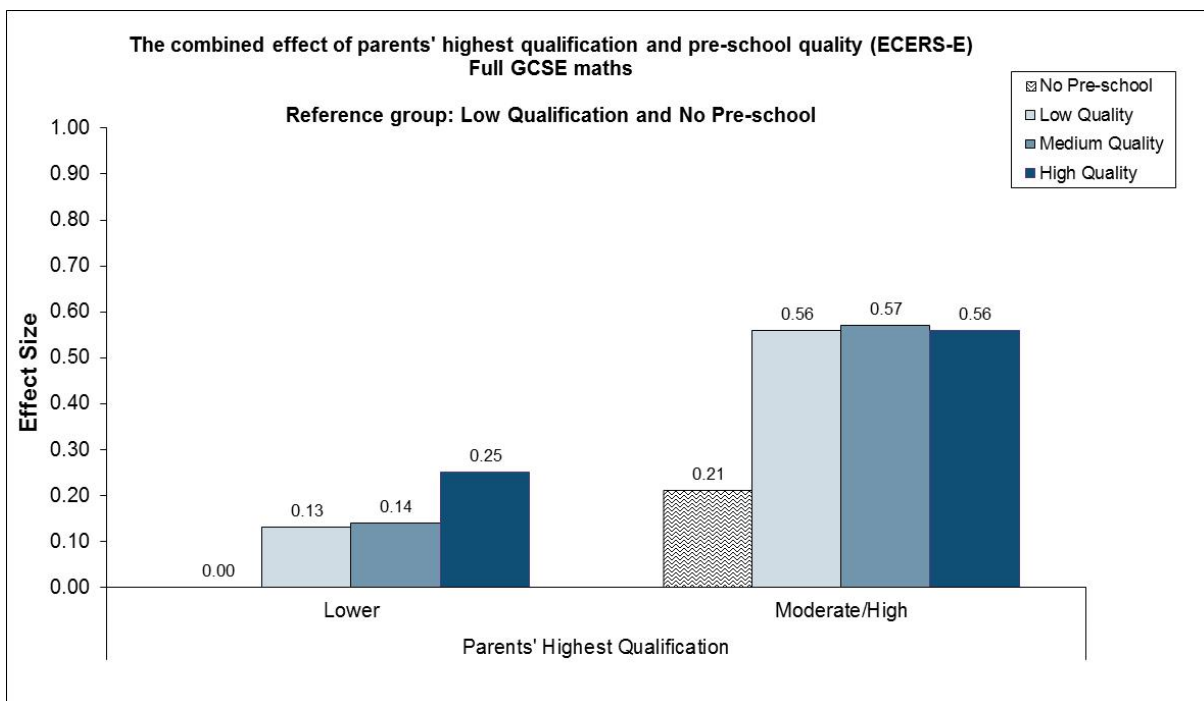
These results reinforce the fact that parents' qualification levels remained a strong predictor of better English and maths attainment in the long term.

Given that the previous EPPSE analyses have demonstrated modest effects for the quality and effectiveness of pre-school experience, but strong effects for the early years HLE on later academic attainment, their joint effects were investigated. For this analysis,

the early years HLE index was regrouped into three categories representing low, medium and high early years HLE scores. Next, combined terms were created between early years HLE and pre-school attendance, pre-school quality (measured by ECERS-E) and pre-school effectiveness. These joint measures were then entered in the contextualised models that controlled for individual and family characteristics.

However, no clear patterns were identified when early years HLE and the different measures of pre-school experiences were studied.

Overall, these additional analyses suggest that for some groups of students (males and those whose parents had lower qualification levels), there are differential effects related to the quality of pre-school provision. High quality pre-schools were more beneficial than lower quality and no pre-school experiences. These influences continued to shape attainment up to age 16. For other groups, the main conclusion is that any pre-school continues to give a benefit.

The impact of primary school academic effectiveness on Year 11 academic attainment

Earlier in the EPPSE study, measures were derived of the academic effectiveness of the primary school that students had attended. Value added effectiveness measures for primary schools were calculated using National Assessment data for all primary schools in England linking KS1 and KS2 results. Separate indicators were calculated for the different core curriculum subjects English, maths and science (Melhuish et al., 2006a; 2006b). These provided residual measures of the academic success of individual primary schools in promoting primary school students' academic progress. Measures related to the primary schools students attended were incorporated into the EPPSE data base. For each student, these measures provide indicators of the academic quality of their primary school.

The indicator of overall primary school academic effectiveness predicted students' attainment and progress in KS2 and continued to predict academic attainment in secondary school up to the end of Year 9 (KS3). Given this, further analyses were performed to investigate whether primary school quality continued to influence students' academic results later in KS4. To explore this hypothesis, primary school academic effectiveness measures were included in the multilevel models that predicted Year 11 academic outcomes. Both the primary school academic effectiveness residual indicators calculated for English and maths were used in predicting Year 11 GCSE outcomes. When predicting total GCSE score or number of entries, both measures of primary school academic effectiveness were tested. For grades in GCSE English and in GCSE maths, only the subject specific measure of primary academic effectiveness was tested.

In accord with results found at the end of KS3, the primary school academic effectiveness indicators were found to be statistically significant predictors of grades in

GCSE maths after control for student, family HLE and neighbourhood influences (see Table 4.12). Students who had attended a primary school that was more academically effective for maths had significantly better grades in GCSE maths (ES=0.25) than students who had attended a low academically effective primary school. Similarly, students who had previously attended a medium or highly academic effective primary school were almost twice as likely to achieve the EBacc as students who had attended a low academically effective primary school (OR=1.94 – see Table 4.13).

The 'missing' group (reported in Table 4.12, Table 4.13 and Table 4.14) largely included children attending academically and socially selective private primary schools, and it is likely these students went on to attend private secondary schools.

Table 4.12: Contextualised models for Year 11 academic outcomes- Primary school academic effectiveness

Fixed effects	GCSE maths			
Primary school effectiveness – maths (compared with low effectiveness)	Coefficient	SE	ES	Sig
Missing	1.33	0.70	0.15	
Medium effectiveness	1.15	0.56	0.13	*
High effectiveness	2.28	0.82	0.25	**
Number of students				2535
Number of schools				675
Intra-school correlation (ICC)				0.0420
% Reduction student variance				18.8
% Reduction school variance				85.7
% Reduction total variance				32.2

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 4.13: Contextualised models for Year 11 benchmark indicators- Primary school academic effectiveness

Fixed effects	EBacc			
Primary school effectiveness – maths (compared with low effectiveness)	Coefficient	SE	OR	Sig
Missing	0.94	0.30	2.56	**
Medium effectiveness	0.54	0.23	1.72	*
High effectiveness	0.66	0.31	1.94	*
Number of students				2255
Number of schools				584
% Reduction school variance				76.0

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 4.14: Contextualised models for Year 11 benchmark indicators- Primary school academic effectiveness

Fixed effects	EBacc			
Primary school effectiveness – English (compared with low effectiveness)	**Coefficient**	**SE**	**OR**	**Sig**
Missing	0.16	0.22	1.93	*
Medium effectiveness	0.51	0.30	1.17	
High effectiveness	0.66	0.29	1.67	
Number of students				2255
Number of schools				584
% Reduction school variance				76.5

* p<0.05, ** p<0.01, *** p<0.001

The impact of secondary school on Year 11 academic attainment

The majority of students attended a 'comprehensive' school in Year 11 (86%), while almost 4% were studying in an 'independent' school (see Table 4.15). As school type[31] is highly likely to influence students' attainment, this was tested as a predictor of GCSE results in contextualised models where other individual, family and home learning characteristics were also controlled for. Results showed that students who attended 'selective' secondary schools had significantly better total GCSE score, better grades in GCSE English and in GCSE maths and were entered for more full GCSE exams, were more likely to have achieved 5 A*-C, 5 A*-C including English and maths and the EBacc than students who attended 'comprehensive' schools (see Table 4.16 and Table 4.17).

Table 4.15: Distribution of Year 11 students in schools and Total number of full GCSE entries in Year 11

KS4 school type	Distribution of Year 11 students in schools		Total number of full GCSE entries	
	N	**%**	**Mean**	**SD**
Comprehensive	2372	85.9	7.3	2.5
Selective	55	2.0	10.5	1.2
Modern	29	1.1	8.4	1.8
Other maintained	106	3.8	1.1	1.3
Independent	199	7.2	8.7	2.0
Total	2761	100.0	7.3	2.8

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[31] Based on this typology, we cannot differentiate the secondary schools that became Academies. Additionally, Free Schools were not part of this analysis and the policy changes that have recently taken place are not reflected in this report.

Students from the 'other maintained' category had the lowest GCSE results when compared with students from 'comprehensive' schools[32] (see Table 4.16). Interestingly, students from 'independent' schools showed poorer GCSE results measured by the total GCSE score, but slightly better results for grades in GCSE maths. It should be noted that 'independent' schools are likely to be both socially and academically selective and that these contextualised models do not control for prior attainment. Further value added analyses in Section 6 provide a fairer comparison of secondary school type effects.

Table 4.16: Contextualised models for Year 11 academic outcomes - Secondary school type

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
KS4 Secondary school type (compared with Comprehensive)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Selective	0.43	*	0.74	***	0.72	***	0.81	***
Modern	-0.34		0.33		0.11		-0.23	
Other maintained	-2.43	***	-2.59	***	-0.95	***	-1.29	***
Independent	-1.44	***	-0.45		-0.05		0.31	***
Number of students	2497		2510		2343		2535	
Number of schools	610		614		573		675	
Intra-school correlation (ICC)	0.1920		0.1716		0.0595		0.0299	
% Reduction student variance	16.3		14.4		21.3		20.8	
% Reduction school variance	61.2		82.6		86.8		90.2	
% Reduction total variance	31.6		48.8		39.2		34.7	

$* \ p<0.05, ** \ p<0.01, *** \ p<0.001$

Table 4.17: Contextualised models for Year 11 benchmark indicators - Secondary school type

Fixed effects	Achieved 5 A*-C		Achieved 5 A*-C English and maths		EBacc	
KS4 Secondary school type (compared with Comprehensive)	OR	Sig	OR	Sig	OR	Sig
Selective	14.34	*	19.00	**	4.77	***
Modern	1.22		0.73		0.78	
Other maintained		n/a	0.01	***		n/a
Independent	1.52		0.79		0.86	
Number of students	2429		2753		2255	
Number of schools	601		735		584	
% Reduction school variance	83.2		57.9		77.3	

$* \ p<0.05, ** \ p<0.01, *** \ p<0.001$

n/a – not applicable as no cases achieved the benchmark indicator

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[32] It should be noted that many of the schools in the 'other maintained' category cater specifically for students with special educational needs (SEN) or behavioural or health problems.

The impact of secondary school academic effectiveness on Year 11 academic attainment

Previous analyses presented within this report showed that the academic effectiveness of the primary school predicts students' attainment in KS4 (particularly in maths) over and above the effects attributed to students' background. It is therefore important to establish whether secondary school academic effectiveness and educational quality also help to predict better student outcomes at age 16. In order to do this, national data sets have been used to obtain indicators of the level of secondary schools academic effectiveness and quality.

The secondary school academic overall effectiveness was represented by the contextual value added (CVA) score at the school level. This measure[33] was provided by the DfE[34] and was matched onto our dataset using the school identification number.

A mean CVA score was calculated based on KS2 to KS4 (KS2-4) CVA secondary school progress scores for four years from 2006 to 2009 for the secondary schools attended by students. This measure of overall secondary school academic effectiveness was added to the contextualised models that predicted Year 11 academic attainment when controlling for individual student, family, HLE and neighbourhood characteristics.

Secondary school academic effectiveness[35] was a significant predictor of total GCSE score but not of other measures (see Table 4.18). Students who attended highly academically effective secondary schools were more likely to obtain higher total GCSE scores than those who attended a low effective secondary school and effects were moderate (ES=0.42). It has to be noted that this measure reflects overall effectiveness rather than effectiveness in a specific subject and does not relate to specific academic outcomes in different subjects that are likely to reflect subject department effects. Earlier

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[33] At the student level, the CVA score was calculated as the difference between predicted attainment (i.e., the average attainment achieved by similar students) and real attainment in KS4. The predicted attainment was obtained by using multilevel modelling when controlling for students' prior attainment and adjusting for their background characteristics (i.e. gender, age, ethnicity, special educational needs, FSM, mobility etc.). For each school, all individual student scores were averaged and adjusted for the proportion of students attending the school in a specific year. This final averaged score represents the school level CVA and it is presented as a number based around 1000.

[34] However, DfE no longer uses this approach. A value added measure is used instead which compares progress, but does not take background into account. The pupil's value added score is based on comparing their exam performance with the median exam performance of other pupils with the same or similar prior attainment at KS2. The median value is the middle value - with half of the pupils having a capped point score at or below the median, and half at or above. A school's value added measure is a simple average (arithmetic mean) of the value added scores for all pupils in the school.

[35] The EPPSE CVA indicator is based on DfE CVA results for 4 successive years, covering the 4 EPPSE cohorts, 2006-2009 for all secondary schools attended by EPPSE students. The EPPSE results have an overall CVA averaged mean of 1004, which is close to the national CVA mean of 1000. The students in the sample (based on their secondary school's average CVA score) were divided into high, medium and low CVA effectiveness groups based on the average CVA score to 1 SD above or below the mean; nationally, approximately 10% of secondary schools are 1 SD above the mean and approximately 10% of secondary schools are 1 SD below the mean.

analyses on subject specific academic effectiveness measures at primary school indicated that this is relevant. It should be noted that total GCSE score shows a larger school effect (measured by the intra-school correlation).

Table 4.18: Contextualised models for Year 11 academic outcomes - Secondary school academic effectiveness

Fixed effects	Total GCSE score			
Secondary school academic effectiveness (compared with low)	Coefficient	SE	ES	Sig
Medium effectiveness	11.53	13.41	0.09	
High effectiveness	55.51	18.59	0.42	**
Number of students				2497
Number of schools				610
Intra-school correlation (ICC)				0.2967
% Reduction student variance				15.2
% Reduction school variance				30.2
% Reduction total variance				20.3

* p<0.05, ** p<0.01, *** p<0.001

The impact of secondary school quality on Year 11 academic attainment

The quality of secondary schools was measured by Ofsted school level inspection judgements. These judgements cover four dimensions at the school level:

- overall effectiveness

- achievement and standards

- personal development and well-being

- quality of provision.

Secondary schools were given grades from 1 to 4, where Grade 1 meant that the secondary school was 'outstanding'; Grade 2 – indicated that the secondary school was 'good'; Grade 3 – indicated that the secondary school was 'satisfactory'; Grade 4 – indicated that the secondary school was 'inadequate'. Since secondary schools are inspected in different years, we collected Ofsted inspection judgements from 2005 until 2010[36]. When a secondary school had several Ofsted inspection judgements, we considered the earliest one in time.

EPPSE analyses at KS3 had shown that two Ofsted inspection judgements were significant predictors of students' academic attainment in Year 9: the 'quality of pupils' learning and their progress' (pertaining to the 'achievement and standards' dimension)

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[36] These were downloaded from the Ofsted homepage http://www.ofsted.gov.uk/.

and the 'attendance of learners' (part of the 'personal development and well-being' dimension). These were also tested in the contextualised models that predicted academic attainment in Year 11, controlling for individual, family and HLE characteristics. Each inspection judgement was entered separately in the model in order to avoid potential collinearity.

The impact of the quality of pupils' learning and their progress on Year 11 academic attainment

Students attending secondary schools classified as 'outstanding' based on the 'quality of pupils' learning and their progress' on average had significantly better grades in GCSE English (ES=0.47) and in GCSE maths (ES=0.47), and were more likely to have achieved 5 A*-C (OR=3.04), 5 A*-C including English and maths (OR=2.74) and the EBacc (OR=5.44) than students from secondary schools characterised as 'inadequate' in their learning quality (see Table 4.19 and Table 4.20).

The results for GCSE English are very similar to those obtained in Year 9. Moreover, students who did not attend an 'inadequate' school in terms 'quality of pupil's learning and their progress' were entered for more full GCSE exams than students who attended schools judged as 'inadequate' (see Table 4.19).

Table 4.19: Contextualised models- Ofsted judgement of the quality of pupils' learning

Fixed effects	Total GCSE entries		GCSE English		GCSE maths	
The quality of pupils' learning (compared with inadequate)	ES	Sig	ES	Sig	ES	Sig
Outstanding	0.93	***	0.47	***	0.47	***
Good	0.54	***	0.13		0.15	
Satisfactory	0.42	***	0.09		0.12	
Missing	0.42	*	0.04		0.25	*
Number of students	2510		2343		2535	
Number of schools	614		573		675	
Intra-school correlation (ICC)	0.2930		0.0635		0.0383	
% Reduction student variance	11.7		21.0		19.0	
% Reduction school variance	64.1		85.8		87.1	
% Reduction total variance	38.2		38.7		32.6	

* p<0.05, ** p<0.01, *** p<0.001

Table 4.20: Contextualised models for Year 11 benchmark indicators - Ofsted judgement of the quality of pupils' learning

Fixed effects	Achieved 5 A*-C		Achieved 5 A*-C English and maths		EBacc	
The quality of pupils' learning (compared with inadequate)	OR	Sig	OR	Sig	OR	Sig
Outstanding	3.04	***	2.74	***	5.44	***
Good	1.40		1.06		2.64	*
Satisfactory	1.29		1.10		1.88	

Missing	1.84	*	0.93		1.74	
Number of students	2429		2753		2255
Number of schools	601		735		584
% Reduction school variance	83.7		50.8		80.2

Given earlier findings, it is not surprising to find a strong relationship between the overall quality of learning in a specific secondary school and learning outcomes of its students; an outstanding provision leading to higher levels of attainment. It should be remembered that these analyses controlled for the influence of student, family, HLE and neighbourhood influences. Those who attended secondary schools with missing Ofsted data (mostly selective independent schools) also showed better GCSE outcomes.

The impact of the learners' attendance on Year 11 academic attainment

Ofsted inspectors also rated secondary schools based on the level of attendance of their students. 'Learners' attendance' as rated by Ofsted inspectors was a statistically significant predictor of academic attainment in Year 11. Students from secondary schools rated as 'outstanding' for 'learners' attendance' got higher grades in GCSE English (ES=0.50) and in GCSE maths (ES=0.62) than students from secondary schools characterised as 'inadequate' in their overall attendance, controlling for other influences (see Table 4.21). Additionally, students from all the other categories of schools obtained better grades in GCSE maths at the end of Year 11 than students from 'inadequate' schools. The average number of full GCSE entries was also significantly different for schools judged as 'outstanding', 'good' or 'satisfactory' in terms of 'learners' attendance'. Students attending secondary schools rated as 'outstanding' for 'learners' attendance' were entered for significantly more full GCSEs than students from schools where attendance was assessed as being inadequate (ES=0.78) (see Table 4.21).

Table 4.21: Contextualised models for Year 11 academic outcomes - Ofsted judgement of Attendance of learners

Fixed effects	Total GCSE entries		GCSE English		GCSE maths	
Attendance of learners (compared with inadequate)	ES	Sig	ES	Sig	ES	Sig
Outstanding	0.78	***	0.50	***	0.62	***
Good	0.70	***	0.31	*	0.51	***
Satisfactory	0.53	***	0.19		0.43	***
Missing	0.49	**	0.16		0.52	***
Number of students	2510		2343		2535	
Number of schools	614		573		675	
Intra-school correlation (ICC)	0.2888		0.0665		0.0316	
% Reduction student variance	11.4		21.2		18.8	
% Reduction school variance	64.7		85.1		89.4	
% Reduction total variance	38.3		38.6		32.9	

The probabilities of achieving 5 A*-C and 5 A*-C including English and maths were significantly higher for students attending secondary schools rated as 'outstanding' for 'learners' attendance' (see Table 4.22).

Table 4.22: Contextualised models for Year 11 benchmark indicators- Ofsted judgement of Attendance of learners

Fixed effects	Achieved A*-C		Achieved A*-C English and maths	
Attendance of learners (compared with inadequate)	OR	Sig	OR	Sig
Outstanding	2.89	***	2.74	***
Good	2.17	**	1.97	**
Satisfactory	1.87	*	1.78	*
Missing	2.56	**	1.49	
Number of students		2429		2753
Number of schools		601		735
% Reduction school variance		86.3		49.4

* p<0.05, ** p<0.01, *** p<0.001

The relationship between overall attendance and academic outcomes is interesting, but not straightforward. The positive strong relationship might be due to the fact that secondary schools that offer high quality academic provision have stricter policies on attendance and therefore are better attended, or are better attended because of the very quality of the provision. Reciprocal effects may, in part help to account for these findings. They do indicate that attending a higher quality secondary school confers significant and sizeable benefits in promoting better GCSE outcomes.

5 Exploring the effects of students' experiences of secondary schools on KS4 attainment

Key findings

Experiences of schools in Year 9

- Students' perceptions of their schools' 'emphasis on learning', positive 'behaviour climate', 'environment' and 'learning resources' reported in Year 9 were significant and positive predictors of all continuous measures of Year 11 academic attainment. 'Valuing pupils' had small but positive effects on total GCSE score and GCSE English.

- Moreover, perceived 'emphasis on learning' and positive 'behaviour climate' predicted a higher likelihood of achieving 5 A*-C, 5 A*-C including English and maths and the EBacc.

Experiences of schools in Year 11

- Significantly higher total GCSE scores and better grades in GCSE English were obtained by students who reported in Year 11 that (1) their teachers had a strong focus on learning ('teacher professional focus'); (2) in their schools the relationships between students and teachers were good in terms of trust, respect and fairness ('positive relationships'); (3) there was a high level of monitoring by their teachers ('monitoring students'); and (4) their teacher provided more feedback ('formative feedback').

- 'Positive relationships' and 'formative feedback' were both significant predictors of better grades in GCSE maths.

Homework

- In KS3, it was found that spending more time on homework predicted better attainment in Year 9 and progress between KS2 and KS3. Interestingly, the daily time spent on homework, as reported by students in Year 9 continued to strongly predict better academic attainment in Year 11. The strongest effects were noted for those who reported spending 2-3 hours doing homework on a typical school night. Students who reported spending between 2 and 3 hours on homework on an average weeknight in Year 9 were almost 10 times more likely to achieve 5 A*-C than students who did not spend any time on homework, controlling for other influences (individual, family, HLE and neighbourhood).

- Similarly, moderate to strong effects were found for the time students reported they spent on homework in Year 11 for total GCSE score, specific GCSE subject grades and the benchmark indicators.

Experiences of school in Year 9

During Year 9, students completed two questionnaires about their personal and academic life during KS3 of secondary education. One questionnaire ('All about Me in School') focused on their views of academic life, including their perceptions of their own school, their teachers, headteachers and other students, but also on their general experiences as students in secondary education. Based on this survey, several indicators were created reflecting secondary school and teaching in KS3 (for details see Sammons et al., 2011d).

The second questionnaire ('All about me') explored in more detail the personal, familial and the broader social context of the students while in secondary education. Interesting domains like 'out of school' learning, the opportunities students have for additional 'after hours' learning experiences in school, time spent on homework, and students own academic self-concepts for different individual subjects were investigated.

Exploratory and Confirmatory Factor Analysis (EFA and CFA) revealed several factors related to views of school in Year 9 (see Sammons et al., 2011d). The items analysed were originally Likert-type scales that went from (1) strongly agree to (4) strongly disagree[37]. The factors were calculated using factor weights, were treated as continuous measures, were centred to the grand mean and were entered in the models predicting the various GCSE outcome measures separately (unless otherwise stated).

The Year 9 factors based on students' self-reported views of schools included:

- Emphasis on learning

- Behaviour climate

- Headteacher qualities

- School environment

- Valuing pupils

- School/Learning resources

- Teacher discipline and care

- Teacher support.

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[37] These item scores were reversed to facilitate interpretation such that a high score indicates a stronger response for each factor (see Sammons et al., 2011c for details).

In earlier analyses of attainment in Year 9, EPPSE found that these various school experiences were significant predictors of students' academic attainment, after controlling for individual student, family and HLE characteristics. It is thus, expected that the same factors might continue to influence later academic attainment at the end of Year 11.

The factors were tested as separate predictors of the GCSE outcome measures in multilevel models that also included various individual student, family, HLE, school and neighbourhood context characteristics (identified as significant and presented in Sections 2 and 3 of this report). A number of students' views of school factors were found to be statistically significant for each academic outcome. The results of the multilevel models are presented in Table 5.1 and Table 5.2.

Emphasis on learning

The factor 'emphasis on learning' describes students' perceptions of the importance their teachers attach to their students' learning, but also the students' expectations regarding their own attainment. A greater 'emphasis on learning' was a significant predictor of better attainment in terms of GCSE results. Interestingly, the effect sizes are slightly higher than those found in equivalent analyses of attainment in Year 9. A greater 'emphasis on learning' predicted a higher total GCSE score (ES=0.36), better grades in GCSE English (ES=0.32) and in GCSE maths (ES=0.23), and being entered for a higher number of full GCSE entries (ES=0.26). In addition, it was a strong predictor of the GCSE benchmark indicators. For example, a greater 'emphasis on learning' increased the likelihood almost six fold of a student achieving 5 A*-C (OR=5.95), two and a half fold the likelihood of achieving 5 A*-C including English maths (OR=2.51) and three fold the likelihood of getting the EBacc (OR=3.00).

Behaviour climate

The factor 'behaviour climate' refers to students' perceptions of the specific (disruptive) behaviours that students notice around the school (e.g., the extent that students as a whole obey school rules, fighting, bringing knives or weapons into school). Higher scores on this factor reflect a more positive 'behaviour climate', in other words less negative behaviour. The results of the multilevel models predicting academic attainment indicated that all seven academic outcomes in Year 11 were significantly better for students who perceived their secondary schools' 'behaviour climate' as more positive than those who rated the 'behaviour climate' of their schools less favourably (see Table 5.1 and Table 5.2). The effect for GCSE maths was slightly larger (ES =0.41) than for GCSE English and total GCSE score (ES=0.34 for both). A more positive 'behaviour climate' also significantly predicted higher probabilities of achieving 5 A*-C (OR=3.12), achieving 5 A*-C including English and maths (OR=2.32) and the EBacc (OR=1.94).

These results are in accord with previous school effectiveness research that points to the importance of the school's overall 'behaviour climate' (see Creemers & Kyriakides, 2008; Rutter et al., 1979; Sammons, Thomas, & Mortimore, 1997; Scheerens & Bosker, 1997). These findings are also in line with international research that showed that a positive school behavioural climate was associated with higher academic achievement, healthier behavioural outcomes and better socio-emotional well-being generally (Brand et al., 2003; Hanson, Austin, & Zheng, 2011; Patton et al., 2006). Voight, Austin and Hanson (2013) showed that school climate can be used to differentiate successful from unsuccessful schools, even after controlling for student characteristics and resources.

Headteacher qualities

This factor refers to the visibility of the headteacher around the school, and perceptions of their interest in students' learning and their interventions to make students behave well. Although this factor did not predict academic attainment in Year 9, in Year 11 it was a weak but statistically significant positive predictor of total GCSE score (ES=0.14) and grades in GCSE English (ES=0.12). Perceived 'headteacher qualities' did not predict any of the GCSE benchmark measures.

School environment

The 'school environment' factor represents the perceived quality of the physical environment of the secondary school (i.e. attractive building, decoration of the classroom, level of cleanness of the toilets) but also the level of organisation. As expected, the way students perceived the learning environment in Year 9 was found to predict their academic attainment in Year 11. Thus, when the 'school environment' was perceived as pleasant and attractive, students obtained higher total GCSE scores (ES=0.15), better results in GCSE English (ES=0.12) and GCSE maths (ES=0.13) and were entered for more full GCSE exams (ES=0.19), although the effects were weak. Perceived 'school environment' did not predict the likelihood of achieving 5 A*-C or the EBacc.

Valuing pupils

Students' perceptions of the degree in which their teachers valued and respected them was a significant predictor of the Year 11 academic outcomes. Higher scores on this factor reflect higher perceived levels of respect and friendliness from the teachers. The more the teachers were perceived as valuing students' views and opinions, the higher the total GCSE score (ES=0.22), the better their grades in GCSE English (ES=0.15), the greater the total number of GCSE entries (ES=0.20), and the higher the probability of students achieving 5 A*-C (OR=2.44) and 5 A*-C including English and maths (OR=1.67). Although the factor 'valuing pupils' significantly predicted Year 9 attainment in maths, this factor did not predict results in GCSE maths.

While the relationships are positive and statistically significant, it is not possible to make causal connections between perceived teachers' attitudes and students' attainment because the directionality of relationships may be reciprocal. Students with higher attainment may have more positive perceptions of their teachers. Additionally, teachers who value their students could also put more effort in the teaching and learning and therefore increase academic attainment. Regardless of the specific directionality, it is important for teachers to recognise that the way they relate and present themselves to their students may influence their academic outcomes. In Section 6, we control for students' prior attainment to see whether the various factors also predict progress from KS2 to KS4.

School/learning resources

The schools' capacity to offer good learning resources is likely to influence the way students learn and acquire new information. Amenities like good science labs, libraries and computer rooms were found to positively predict total GCSE score (ES=0.20), grades in GCSE English (ES=0.14) and in GCSE maths (ES=0.17). Higher scores on 'school/learning resources' meant that the students perceived that the school was well equipped with computers and technology and that there was enough time spent using these facilities. Students' perceptions of available 'school/learning resources' significantly predicted all continuous measures of academic attainment as well as the total number of GCSE exams students were entered for (ES=0.20 - see Table 5.1).

Table 5.1: Contextualised models for Year 11 academic outcomes -Year 9 views of school (tested separately)

Fixed effects (continuous)	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Year 9 views of school	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Emphasis on learning	0.36	***	0.26	***	0.32	***	0.23	***
Behaviour climate	0.34	***	0.41	***	0.34	***	0.41	***
Headteacher qualities	0.14	*		ns	0.12	*		ns
School environment	0.15	*	0.19	**	0.12	*	0.13	*
Valuing pupils	0.22	***	0.20	***	0.15	*		ns
School/Learning resources	0.20	***	0.20	***	0.14	*	0.17	**
Teacher discipline and care	0.14	*		ns		ns		ns
Teacher support	0.15	*	0.12	*		ns		ns

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Teacher discipline and care

The way students perceive their teachers' actions and intervention to maintain order and discipline in classrooms was a weak but significant predictor of total GCSE score

(ES=0.14) and was associated with more than double the likelihood of achieving 5 A*-C (OR=2.27).

Teacher support

This factor includes aspects of 'teacher support' that were related to help, positive feedback on work and teacher's availability to talk to the students privately. Students' perception of their teachers' support in KS3 was a significant positive but weak predictor of later attainment in terms of total GCSE score (ES=0.15), total number of GCSE entries (ES=0.12) and the probability of achieving 5 A*-C (OR=1.69).

Table 5.2: Contextualised models for Year 11 benchmark indicators –Year 9 views of schools (tested separately)

Fixed effects (continuous)	Achieved 5 A*-C		Achieved 5 A*-C English and maths		EBacc	
Year 9 views of school	OR	Sig	OR	Sig	OR	Sig
Emphasis on learning	5.95	***	2.51	*	3.00	*
Behaviour climate	3.12	***	2.32	***	1.94	*
Headteacher qualities		ns		ns		ns
School environment		ns		ns		ns
Valuing pupils	2.44	***	1.67	*		ns
School/Learning resources		ns		ns		ns
Teacher discipline and care	2.27	*		ns		ns
Teacher support	1.69	*		ns		ns

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Emphasis on learning and Behaviour climate

After testing each of the eight factors derived from the Year 9 student survey separately as predictors of GCSE results, we also tested them together to investigate which ones are the most important predictors. Due to existing correlations among these factors, the issue of multicolliniarity was carefully considered.

Similar to results in Year 9, where the two views of schools - 'emphasis on learning' and 'behaviour climate' - significantly predicted KS3 academic attainment in English, maths and science, these factors were also found to significantly predict later GCSE results when tested together. Attending a secondary school which placed a greater 'emphasis on learning' and had a more positive 'behaviour climate' – as they were perceived by students – showed positive effects on total GCSE score, and predicted better results in GCSE English and GCSE maths, a higher number of full GCSE exam entries, a higher likelihood of achieving 5 A*-C and a higher likelihood of achieving 5 A*-C including English and maths (see Table 5.3 and Table 5.4).

These results again point to the importance of the secondary school's 'behaviour climate' as an important feature of overall school effectiveness and this is in accord with the findings of previous research on secondary schools in England (e.g., Rutter et al., 1979; Sammons, Thomas & Mortimore, 1997).

Table 5.3: Contextualised models for Year 11 academic outcomes –Year 9 views of school (tested in the same model)

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Year 9 views of school	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Behaviour climate	0.27	***	0.37	***	0.27	***	0.37	***
Emphasis on learning	0.31	***	0.19	**	0.26	***	0.14	*
Number of students	1470		1474		1420		1531	
Number of schools	411		412		401		465	
Intra-school correlation (ICC)	0.2720		0.2115		0.0800		0.0296	
% Reduction student variance	29.0		22.6		32.4		26.8	
% Reduction school variance	48.3		79.7		84.4		91.0	
% Reduction total variance	35.6		51.4		46.6		39.6	

* $p<0.05$, ** $p<0.01$, *** $p<0.001$
ns=not statistically significant

Table 5.4: Contextualised models for Year 11 benchmark indicators –Year 9 views of schools (tested in the same model)

Fixed effects	Achieved 5 A*-C		Achieved 5 A*-C English and maths	
Year 9 views of school	OR	Sig	OR	Sig
Behaviour climate	2.77	***	2.19	***
Emphasis on learning	4.02	**	1.82	
Number of students		1444		1613
Number of schools		407		485
% Reduction school variance		75.5		21.5

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Experiences of school in Year 11

Another questionnaire ('Life in Year 11') was sent out to students in the spring term of Year 11. The questionnaire covered areas of interest including students' views/dispositions and aspirations, extended school activities, out of school activities, friendship, behaviour, and experiences of school and classroom life. In total, 1676 students completed the 'Life in Year 11' questionnaire.

The questionnaire contained a combination of existing scales or survey items and questions developed by the EPPSE team, and many of the items used in Year 11 were

also used at previous time points. The 'Life in Year 11' questionnaire incorporated the following scales:

- The Warwick-Edinburgh Mental Well-being scale (Stewart-Brown & Janmohamed, 2008).

- The General Academic self-concept scale (Marsh, 1990a; 1990b).

- The Resistance to Peer Influence scale (Steinberg & Monahan, 2007).

In addition, views of school items were adapted from the following surveys:

- The School Climate Assessment Instrument (Grosin & McNamara, 2001).

- The Lousiana ABC+ model (Teddlie & Stringfield, 1993).

Five factors were extracted from students' responses by using exploratory and confirmatory factor analyses (see Sammons et al., 2014b for further details):

- Teacher professional focus

- Positive relationships

- Monitoring students

- Formative feedback

- Academic ethos.

In line with the strategy adopted for the Year 9 views of school factors, multilevel models tested each of the Year 11 factors separately as a predictor of GCSE attainment while controlling for the influence of individual student, family, HLE, school and neighbourhood characteristics (described as significant predictors in Section 3). For each academic outcome a number of school factors were found to be statistically significant.

Due to the response rates in both Year 9 and Year 11, it was not considered appropriate to test the combined effects of KS3 and KS4 views of school measures simultaneously (as the numbers of students who answered both surveys was only 1237 or 45% of the total for whom GCSE outcome data were available).

The results of the multilevel models are presented in Table 5.5 and Table 5.6.

Teacher professional focus

Students who perceived that their teachers focused on learning and were competent obtained higher total GCSE scores (ES=0.22) and better Year 11 results in GCSE English (ES=0.21).

Positive relationships

The highest effect sizes were obtained for perceived 'positive relationships' (see Table 5.5 and Table 5.6). Students who perceived that the relationships between students and teachers in their schools were good in terms of trust, respect and fairness obtained significantly higher total GCSE scores (ES=0.38), better results in GCSE English (ES=0.33) and in GCSE maths (ES=0.28), were entered for a higher number of full GCSE exams (ES=0.17), and were more likely to have achieved 5 A*-C (OR=1.94) and 5 A*-C including English and maths (OR=1.78).

Table 5.5: Contextualised models for Year 11 academic outcomes –Year 11 views of school (tested separately)

Fixed effects (continuous)	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Year 11 views of school	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Teacher professional focus	0.22	***		ns	0.21	***		ns
Positive relationships	0.38	***	0.17	**	0.33	***	0.28	***
Monitoring students	0.14	*		ns	0.13	*		ns
Formative feedback	0.22	***		ns	0.22	***	0.14	**
Academic ethos		ns		ns		ns		ns

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Table 5.6: Contextualised models for Year 11 benchmark indicators –Year 11 views of schools (tested separately)

Fixed effects (continuous)	Achieved A*-C		Achieved A*-C English and maths	
Year 11 views of school	OR	Sig	OR	Sig
Teacher professional focus		ns		ns
Positive relationships	1.94	***	1.78	***
Monitoring students		ns		ns
Formative feedback		ns		ns
Academic ethos		ns		ns

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Monitoring students

Students who perceived a high level of monitoring by their teachers, obtained higher total GCSE scores (ES=0.14) and better results in GCSE English (ES=0.13), although the effects were weak.

Formative feedback

The 'formative feedback' factor reflects the perceived level of help to improve their work that students received from their teachers. Greater levels of teacher feedback predicted higher total GCSE scores (ES=0.22) and better results in GCSE English (ES=0.22) and in GCSE maths (ES=0.14).

The impact of time spent on homework on KS4 academic attainment

Students' self-reports of time spent on homework on a typical school night were a strong positive predictor of academic attainment in Year 9 and progress between KS2 and KS3. It was hypothesised that spending more time on homework might also predict later academic attainment in Year 11 as well. Similar to the results in Year 9, self-reported time spent on homework was also a strong significant predictor of GCSE results. Generally, the relationship between time spent on homework and academic outcomes showed a broadly linear pattern up to 2-3 hours a night.

Table 5.7 shows that the strongest positive effects of completing 2-3 hours homework a night were found for total GCSE score (ES=0.95), followed by GCSE maths (ES=0.80) and GCSE English (ES=0.76). Similarly, Table 5.8 shows that spending between 2-3 hours on homework in KS3 increased the probability that a student would later achieve 5 A*-C (OR=9.97) and 5 A*-C including English and maths (OR=4.65).

Table 5.7: Contextualised models for Year 11 academic outcomes - Year 9 Time spent on homework

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Year 9 Homework (compared with none)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Less than ½ hour	0.50	***	0.47	***	0.41	**	0.35	*
½ -1 hour	0.57	***	0.63	***	0.45	***	0.38	**
1-2 hours	0.62	***	0.68	***	0.50	***	0.50	***
2-3 hours	0.95	***	1.02	***	0.76	***	0.80	***
Over 3 hours	0.90	**	1.04	**	0.89	**	0.15	
Number of students	1469		1473		1420		1530	
Number of schools	414		415		404		467	
Intra-school correlation (ICC)	0.2548		0.2285		0.0845		0.0438	
% Reduction student variance	27.4		23.0		31.7		26.7	
% Reduction school variance	51.6		77.6		83.2		86.5	
% Reduction total variance	35.6		50.6		45.8		38.6	

* p<0.05, ** p<0.01, *** p<0.001

Studying for more than 3 hours significantly predicted students' gaining a higher total GCSE score and better grades in GCSE English. However, spending more than 3 hours

on homework a night, when in Year 9, did not offer extra benefits for grades in GCSE maths.

Table 5.8: Contextualised models for Year 11 benchmark indicators – Year 9 Time spent on homework

Fixed effects	Achieved 5 A*-C		Achieved 5 A*-C English and maths	
Year 9 Homework (compared with none)	OR	Sig	OR	Sig
Less than ½ hour	2.28	*	1.92	*
½ -1 hour	3.38	***	2.57	**
1-2 hours	3.30	***	2.96	***
2-3 hours	9.97	***	4.65	***
Over 3 hours	8.63	*	1.92	*
Number of students	1443		1611	
Number of schools	410		490	
% Reduction school variance	71.2		13.3	

* p<0.05, ** p<0.01, *** p<0.001

Students were again asked to report about the amount of time they spent on homework in Year 11. As expected, the relationship between self-reported time spent on homework and GCSE results was stronger as it was more likely that the content of the homework was more closely related to the materials covered in the Year 11 GCSE exams (see Table 5.9 and Table 5.10).

Table 5.9: Contextualised models for Year 11 academic outcomes –Year 11 Time spent on homework

Fixed effects	Total GCSE score		Total GCSE entries		GCSE English		GCSE maths	
Year 11 Homework (compared with none)	ES	Sig	ES	Sig	ES	Sig	ES	Sig
Less than 1 hour	0.67	***	0.66	***	0.58	***	0.55	***
1-2 hours	0.75	***	0.76	***	0.70	***	0.59	***
2-3 hours	0.98	***	0.87	***	0.85	***	0.88	***
Over 3 hours	1.39	***	1.26	***	1.14	***	0.89	***
Number of students	1369		1373		1327		1449	
Number of schools	424		426		414		489	
Intra-school correlation (ICC)	0.2679		0.2528		0.0665		0.0494	
% Reduction student variance	32.8		29.6		38.2		34.9	
% Reduction school variance	52.0		76.7		88.3		86.4	
% Reduction total variance	39.3		53.4		51.9		45.2	

* p<0.05, ** p<0.01, *** p<0.001

Table 5.10: Contextualised models for Year 11 benchmark indicators –Year 11 Time spent on homework

Fixed effects	Achieved 5 A*-C		Achieved 5 A*-C English and maths		EBacc	
Year 11 Homework (compared with none)	OR	Sig	OR	Sig	OR	Sig
Less than 1 hour	4.58	***	4.80	***	2.12	
1-2 hours	5.26	***	5.34	***	1.84	
2-3 hours	9.61	***	8.61	***	2.79	*
Over 3 hours	28.82^	***	8.92	***	4.05	*
Number of students		1347		1522		1240
Number of schools		422		510		409
% Reduction school variance		59.1		5.4		83.5

* p<0.05, ** p<0.01, *** p<0.001
^n<=61

An incremental pattern of gradation, similar to the one observed when exploring the effects of Year 9 homework can be observed. However, the effect sizes do not decrease for the 'over 3 hours' category. Spending more than 3 hours on homework in Year 11 is significantly associated with students' obtaining higher total GCSE scores (ES=1.39), better grades in GCSE English (ES=1.14) and in GCSE maths (ES=0.89), being entered for more GCSE exams (ES=1.26), and being more likely to have achieved 5 A*-C including English and maths (OR=8.92) and the EBacc (OR=4.05).

Time spent on homework was one of the strongest predictors of attainment even when students' background was controlled. Time spent on homework may reflect teachers' expectations and/or the schools' academic emphasis as well as a students' own motivation and engagement. Our findings are in line with previous research about the relationship between homework and academic achievement (Cooper et al., 2006; Gustafsson, 2013; Holmes & Croll, 1989; Strand, 2012).

It is likely that the time students spent on homework in KS3 is also associated with the time students spent on homework in KS4. The correlation was r=0.48. Time spent on homework is likely to increase opportunities to learn and also increase self study skills and independence as a learner. Further analyses in Section 6 also tests whether time spent on homework predicted greater progress between KS2 and KS4.

6 Exploring students' academic progress between Year 6 and Year 11

Key findings

Individual, family, HLE and neighbourhood characteristics

- Overall, there was evidence that students who were older for their year group, females, of Bangladeshi heritage, with higher family incomes, with higher qualified parents and who engaged in more KS3 HLE academic enrichment activities made greater progress between KS2 and KS4.

- There were also small negative effects on progress related to early behavioural or health problems and eligibility for FSM.

- Living in a neighbourhood with a higher percentage of White British citizens during the early years predicted poorer student progress in English. Progress in maths was significantly predicted by the IMD, the IDACI, as well as reported levels of crime, unemployment and neighbourhood safety.

Pre-school, primary and secondary school

- Pre-school attendance, and pre-school quality and effectiveness significantly predicted overall academic progress in terms of promoting a higher total GCSE score.

- Similarly, the CVA measure of secondary school academic effectiveness predicted the overall academic progress measured by total GCSE score.

- Measures of secondary school quality (Ofsted ratings) significantly predicted progress in specific GCSE subject grades, but not overall academic progress.

Experiences of schools in Year 9 and Year 11

- Year 9 student reports of a stronger 'emphasis on learning', a positive 'behaviour climate', teachers 'valuing pupils', a better 'school environment' and 'school/learning resources', more interested 'headteachers' and better 'teacher behavioural management' and 'teacher support' significantly predicted greater overall academic progress and subject specific progress in English and maths.

- Measures of Year 11 students' views of school, except for 'academic ethos', also predicted academic progress between KS2 and KS4.

Homework

- Results show that for the overall academic progress in terms of GCSE total points score and progress in English and maths, any time spent on homework reported in Year 9 and Year 11 were beneficial, taking into account other influences.

Previous EPPSE analyses have studied students' academic progress across different stages of their education. Thus, students' academic progress was investigated over the pre-school period, from age 3 years plus to primary school entry and over different key stages up to KS3 (Sammons et al., 2002; 2007a; 2008a; 2011a).

In this section, we explore the students' academic progress from the end of Year 6 at primary school (KS2) to the end of Year 11 at secondary school (KS4) using the same set of GCSE academic outcomes measures while controlling for Year 6 (KS2) National Assessment test scores as measures of prior attainment. The assessments at the end of Year 6 provide the baseline measures for these analyses of student progress across their time in secondary school (KS2-KS4)[38]. By controlling for prior attainment, the analyses show whether the same group of students are doing relatively better or worse in their later GCSE results than would be predicted by their earlier KS2 results.

The simple value added models control only for prior academic attainment at the end of Year 6 when predicting later GCSE results. The specific effect sizes are presented in Table 6.1, Table 6.2 and Table 6.3. Year 6 prior attainment is an important predictor for Year 11 attainment as shown by the percentage of total variance explained for each outcome. Prior attainment in maths accounted for nearly two thirds (62%) of the total variance in students' GCSE maths grade. Prior attainment in English accounted for over half (52%) of the total variance in the GCSE English grade. Year 6 English and maths scores together accounted for just almost a third (30%) of the total variance in total GCSE scores.

The variation in students' progress associated with their school is shown by the intra-school correlation (ICC), an overall indicator of potential differences in school effectiveness. It is possible that any variation between schools, in terms of progress, might reflect differences in teaching approaches and emphases between KS2 and KS4. The results indicated that between fourteen and thirty-eight per cent of the variation in progress is accounted for by the secondary schools the students attended (see Table 6.1, Table 6.2 and Table 6.3). This is quite a substantial proportion. The proportion is lower for grades in GCSE English and in GCSE maths, reflecting the likely impact of subject departments rather than just a school effect. The proportion of variance in progress for total GCSE score is larger.

Table 6.1, Table 6.2 and Table 6.3 show the estimates for the effects of prior academic attainment at the end of Year 6 when predicting total GCSE score and grades in GCSE English and in GCSE maths. Prior attainment in English and maths were strong and

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[38] Prior attainment measures were chosen for KS2 because national test scores were available (in KS3 only less differentiated teacher assessments were available). By controlling for attainment at the end of primary school it is possible to investigate progress across the whole of the period in secondary education, giving a clearer focus on the contribution of secondary schooling.

significant predictors of total GCSE score, each contributing with an increase of approximately 3 points on the final score.

Prior attainment in English was also a strong and significant predictor of grades in GCSE English, with an estimate of 0.42. The large ES was similar to that previously found in earlier EPPSE analyses of Year 9 outcomes. The estimate for the prior attainment in maths when predicting the GCSE grade in the same subject was also a strong and significant predictor, with an estimate 0.55 and an ES of 2.54. This ES was smaller than the one found in Year 9.

Table 6.1: Effects of prior attainment on Year 11 academic outcomes

Fixed effect	Total GCSE score			
	Coefficient	SE	ES	Sig
Year 6 English	3.06	0.24	0.78	***
Year 6 maths	3.18	0.24	0.81	***
Number of students	2484			
Number of schools	656			
Intra-school correlation (ICC)	0.3776			
% Reduction student variance	34.1			
% Reduction school variance	22.0			
% Reduction total variance	30.0			

* p<0.05, ** p<0.01, *** p<0.001

Table 6.2: Effects of prior attainment on Year 11 academic outcomes

Fixed effect	GCSE English			
	Coefficient	SE	ES	Sig
Year 6 English	0.42	0.01	2.02[39]	***
Number of students	2431			
Number of schools	632			
Intra-school correlation (ICC)	0.1710			
% Reduction student variance	45.3			
% Reduction school variance	70.0			
% Reduction total variance	52.1			

* p<0.05, ** p<0.01, *** p<0.001

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[39] ES=2.09 for Year 9.

Table 6.3: Effects of prior attainment on Year 11 academic outcomes

Fixed effect	GCSE maths			
	Coefficient	SE	ES	Sig
Year 6 maths	0.55	0.01	2.54[40]	***
Number of students	2436			
Number of schools	633			
Intra-school correlation (ICC)	0.1349			
% Reduction student variance	58.9			
% Reduction school variance	74.3			
% Reduction total variance	62.0			

* p<0.05, ** p<0.01, *** p<0.001

The construction of simple value added models does not take account of the influence of any of the individual student, family, HLE or neighbourhood measures found to be significant in the analyses of attainment presented in Sections 2 and 3 of this report. In other words they are not contextualised. This is in line with current Government approaches to the analysis of school performance. However, it is not in accord with CVA (contextualised value added measures) used previously by DfE that adopted more detailed models based on evidence from school effectiveness research. Such contextualised value added models seek to provide fairer 'like with like' comparisons by taking into account student intake differences. These contextualised value added models are presented next.

The impact of individual student, family, HLE, school composition and neighbourhood on KS2-KS4 academic progress

After the simple value added analyses, further contextualised value added analyses were undertaken to explore whether the individual student, family and HLE characteristics, found to be significant predictors of later academic attainment at the end of Year 11, also predicted differences in academic progress during secondary school.

Overall academic progress for total GCSE score

Table 6.4 indicates that more overall academic progress was made by:

- older students compared with younger students (ES=0.16)

- females compared with males (ES=0.25)

- students of Bangladeshi heritage[41] (ES=0.83) compared with students of White British heritage

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[40] ES=3.06 for Year 9.

- students' whose family's income was higher (ES=0.26) compared with students' whose families had no income

- students who have highly qualified parents (ES=0.39) compared with students whose parents had no qualifications

- students who experienced more learning opportunities in terms of KS3 HLE academic enrichment (ES=0.36).

Students made significantly less overall academic progress during secondary school education when their parents reported their child had one or more early behavioural (ES=-0.23) and health problems (ES=-0.11) in the pre-school period. In addition, students who were eligible or receiving FSM (ES=-0.20) in Year 11 made less progress.

It should be noted that these effects are all 'net' of the influence of other predictors in the model.

Progress in English

The findings indicated that more progress was made in English by:

- older students compared with younger students (ES=0.18)

- females compared with males (ES=0.27)

- students of Bangladeshi heritage[42] (ES=0.66) compared with students of White British heritage

- students with older mothers (ES=0.12) compared to students with younger mothers

- students' whose family's income was higher (ES=0.34) compared with students' whose families had no income

- students who have highly qualified parents (ES=0.59) compared with students whose parents had no qualifications

- students who were in the medium category of KS2 HLE educational computing (ES=0.10), or in the high category of KS3 HLE academic enrichment (ES=0.37), compared with students in the low HLE categories for these measures.

On the other hand, students made significantly less progress in English during secondary school if they:

- had parents who reported that their child had one or more early health problems in the pre-school period (ES=-0.12)

- came from a larger family (ES=-0.18)

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[41] There is only a small sample size of EPPSE students who are of Bangladeshi heritage.

[42] There is only a small sample size of EPPSE students who are of Bangladeshi heritage.

- were eligible or receiving FSM in Year 11 (ES=-0.17)

- were from lower SES families (ES=-0.29)

- were from schools that had a higher proportion of FSM students (ES=-0.18).

Progress in maths

Similar results were found for progress in maths during secondary school. More progress was made in maths by:

- older students compared with younger students (ES=0.20)

- females compared with males (ES=0.13)

- Bangladeshi students (ES=0.88) compared with students of White British heritage

- students with older mothers (ES=0.14) compared to students with younger mothers

- students' whose family's income was higher (ES=0.21) compared with students' whose families had no income

- students who have highly qualified parents (ES=0.42) compared with students whose parents had no qualifications

- students who were in the medium category of KS2 HLE educational computing (ES=0.13), or the high category of KS3 HLE academic enrichment (ES=0.45), compared with students in the low HLE categories for these measures.

Students made significantly less progress in maths during secondary school education if they:

- had parents who reported that their child had one or more early behavioural problems (ES=-0.18) or health problems (ES=-0.21) in pre-school

- were eligible or receiving FSM in Year 11 (ES=-0.28)

- were from lower SES families (ES=-0.42).

Table 6.4: Contextualised value added models for Year 11 academic outcomes

Background characteristics	Total GCSE score	GCSE English	GCSE maths
Individual student measures	ES	ES	ES
Age	0.16	0.18	0.20
Gender	0.25	0.27	0.13
Ethnicity	0.83 (B)[†]	0.66 (B)[†]	0.88 (B)[†]
Behavioural problems	-0.23		-0.18
Health problems	-0.11	-0.12	-0.21
Number of siblings		-0.18	
Family measures			
Mother's age at age 3/5		0.12	0.14
Year 11 FSM	-0.20	-0.17	-0.28
KS1 family salary	0.26	0.34	0.21
Parents' highest SES at age 3/5		-0.29	-0.42
Parents' highest qualifications level at age 3/5	0.39	0.59	0.42
HLE measures			
KS2 HLE educational computing (medium)		0.10	0.13
KS3 HLE academic enrichment (high)	0.36	0.37	0.45

[†]B=Bangladeshi heritage

The impact of neighbourhood on KS2-KS4 academic progress

The neighbourhood measures[43] described in Section 3 were also tested in the progress models for English and maths. Only the percentage of White British citizens in the neighbourhood was a significant predictor for progress in English (see Table 6.5). Progress in maths was significantly predicted by the IMD, the IDACI, as well as reported levels of crime, unemployment and neighbourhood safety (see Table 6.5 and Table 6.6).

Students from neighbourhoods characterised by higher levels of deprivation and/or crime made less progress in maths during secondary school taking into account prior attainment and other individual and family influences. These results differ from Year 9 and Year 6, when none of the neighbourhood measurements significantly predicted progress in maths between KS2 and KS3 or between KS1 and KS2. These measures however, are found to be important for the academic progress across the five years in secondary school. This may be due to the fact that adolescent students are probably more involved in activities outside the home and with their peer group, and this may be shaped by the neighbourhood they live in.

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[43] These measures reflect the neighbourhood environment in which the child lived while in pre-school and primary school and do not necessarily reflect the neighbourhood environment following later moves.

Table 6.5: Contextualised value added models for Year 11 academic outcomes –Neighbourhood measures

Fixed effects (continuous)	GCSE English		GCSE maths	
	ES	Sig	ES	Sig
IMD		ns	-0.21	***
IDACI		ns	-0.16	**
% White British	-0.20	**		ns
Crime		ns	-0.16	**
Unemployment		ns	-0.17	**

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

Table 6.6: Contextualised value added models for Year 11 academic outcomes –Neighbourhood safety

Fixed effects	Total GCSE score		GCSE maths	
Neighbourhood safety (compared with low safety)	ES	Sig	ES	Sig
Medium low safety	0.04		0.03	
Medium high safety	0.00		-0.03	
High safety	0.16	*	0.15	*
Number of students		2367		2354
Number of schools		590		619
Intra-school correlation (ICC)		0.3731		0.0778
% Reduction student variance		37.9		63.3
% Reduction school variance		27.9		87.6
% Reduction total variance		34.5		68.1

* p<0.05, ** p<0.01, *** p<0.001

The impact of pre-school and primary school experiences on KS2-KS4 academic progress

Similar to earlier EPPSE results found for academic progress between KS2 and KS3, pre-school and primary school measures did not predict the amount of academic progress students made in English and maths during their five years in secondary school. However, attending a pre-school significantly and positively predicted the overall academic progress between Year 6 and Year measured in terms of total GCSE score (see Table 6.7). Students who had attended a pre-school made more overall academic progress than students who had not attended any pre-school (ES=0.19). Additionally, students who had attended a high quality pre-school (measured by ECERS-R) also made more overall academic progress than the 'home' group (ES=0.25 - see Table 6.8)[44].

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[44] The pre-school quality measure ECERS-E and the pre-school effectiveness measure (pre-reading) were also tested and found as statistically significant but no clear trend in results was found (see Table 6.9).

Students who attended a highly effective pre-school in terms of promoting early number concepts made more overall academic progress than the 'home' group (ES=0.27 - see Table 6.10). Although only weak, these effects are consistent and suggest some lasting benefits on both attainment and progress from pre-school experiences that remain evident up to age 16.

Although the academic effectiveness of the primary school attended has been shown to predict better GCSE attainment (see Section 5), it was not found to predict progress during secondary school. In other words, attending a more effective primary school conferred an attainment boost that continued to be evident in both Year 9 and Year 11 attainment, it did not shape progress (the change in attainment). By contrast, though effects are weak, there are suggestions that attending a pre-school predicts both attainment and progress in terms of total GCSE score.

Table 6.7: Contextualised value added models for Year 11 academic outcomes –Attendance

Fixed effects	Total GCSE score	
Pre-school attendance	ES	Sig
Pre-school (compared with no pre-school)	0.19	*
Number of students		2367
Number of schools		590
Intra-school correlation (ICC)		0.3746
% Reduction student variance		37.9
% Reduction school variance		27.5
% Reduction total variance		34.4

* p<0.05, ** p<0.01, *** p<0.001

Table 6.8: Contextualised value added models for Year 11 academic outcomes –ECERS-R

Fixed effects	Total GCSE score	
Pre-school quality (compared with no pre-school)	ES	Sig
Low quality	0.18	
Medium quality	0.16	
High quality	0.25	*
Number of students		2367
Number of schools		590
Intra-school correlation (ICC)		0.3723
% Reduction student variance		37.8
% Reduction school variance		28.1
% Reduction total variance		34.5

* p<0.05, ** p<0.01, *** p<0.001

Table 6.9: Contextualised value added models for Year 11 academic outcomes –ECERS-E

Fixed effects	Total GCSE score	
Pre-school quality (compared with no pre-school)	**ES**	**Sig**
Low quality	0.23	*
Medium quality	0.15	
High quality	0.25	*
Number of students		2367
Number of schools		590
Intra-school correlation (ICC)		0.3747
% Reduction student variance		37.9
% Reduction school variance		27.5
% Reduction total variance		34.4

p<0.05, ** p<0.01, *** p<0.001

Table 6.10: Contextualised value added models for Year 11 academic outcomes: Pre-school effectiveness (Early number concepts)

Fixed effects	Total GCSE score	
Pre-school effectiveness -early number concepts (compared with no pre-school)	**ES**	**Sig**
Low effectiveness	0.23	*
Medium effectiveness	0.15	
High effectiveness	0.27	*
Number of students		2367
Number of schools		590
Intra-school correlation (ICC)		0.3731
% Reduction student variance		37.9
% Reduction school variance		27.9
% Reduction total variance		34.5

p<0.05, ** p<0.01, *** p<0.001

The impact of secondary school on KS2-KS4 academic progress

Secondary school type was a significant predictor or Year 11 academic attainment. The same measure was also tested in the contextualised value added models that predict the level of progress students made between KS2 and KS4. For total GCSE score, GCSE English and GCSE maths, students from the 'other maintained' schools category made less academic progress than the students from comprehensive schools (see Table 6.11). Those from 'independent' schools made significantly less progress in terms of total GCSE score, when account was taken of students' prior attainment in Year 6 and their background.

Table 6.11: Contextualised value added models for Year 11 academic outcomes –Secondary school type

Fixed effects	Total GCSE score		GCSE English		GCSE maths	
KS4 Secondary school type (compared with Comprehensive)	**ES**	**Sig**	**ES**	**Sig**	**ES**	**Sig**
Selective	-0.17		0.24		-0.08	
Modern	-0.41		0.00		-0.16	
Other maintained	-2.81	***	-1.45	***	-1.69	***
Independent	-1.45	***	-0.04		0.10	
Number of students		2367		2252		2354
Number of schools		590		561		619
Intra-school correlation (ICC)		0.2386		0.0572		0.0618
% Reduction student variance		39.3		50.4		63.9
% Reduction school variance		62.8		92.0		90.5
% Reduction total variance		47.3		61.7		69.2

* p<0.05, ** p<0.01, *** p<0.001

The impact of secondary school academic effectiveness on KS2-KS4 academic progress

EPPSE students who attended a highly academic effective secondary school in terms of the DfE CVA[45] KS2-4 indicator made significantly more overall academic progress than those from less effective secondary schools (ES=0.53, see Table 6.12). Again this takes into account individual, family background and neighbourhood influences and prior attainment in Year 6. This points to the relative importance of school effects. The effect on progress of going to a more academically effective secondary school is approximately twice the size of the gender effect on progress, for example.

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[45] The EPPSE CVA indicator is based on DfE CVA results for 4 successive years, covering the 4 EPPSE cohorts, 2006-2009 for all secondary schools attended by EPPSE students. The EPPSE results have an overall CVA averaged mean of 1004, which is close to the national CVA mean of 1000. The students in the sample (based on their secondary school's average CVA score) were divided into high, medium and low CVA effectiveness groups based on the average CVA score to 1 SD above or below the mean; nationally, approximately 10% of secondary schools are 1 SD above the mean and approximately 10% of secondary schools are 1 SD below the mean.

Table 6.12: Contextualised value added models for Year 11 academic outcomes –Secondary school academic effectiveness

Fixed effects	Total GCSE score	
Secondary school academic effectiveness (compared with low)	**ES**	**Sig**
Medium effectiveness	0.08	
High effectiveness	0.53	***
Number of students		2367
Number of schools		590
Intra-school correlation (ICC)		0.3648
% Reduction student variance		37.8
% Reduction school variance		30.4
% Reduction total variance		35.3

* p<0.05, ** p<0.01, *** p<0.001

The impact of secondary school quality on KS2-KS4 academic progress

In addition to the DfE CVA measure, Ofsted inspection data provided measures of school quality. Secondary schools' quality measured by Ofsted inspection judgements was also found to be a significant predictor of students' academic progress in secondary school.

Students attending secondary schools classified as 'outstanding' in terms of inspection judgements of the 'quality of pupils' learning' made significantly greater progress in English (ES=0.40) than students from secondary schools characterised as 'inadequate' in their learning quality. Students attending secondary schools rated as 'good' made significantly greater progress in maths (ES=0.23) than students from 'inadequate' schools (see Table 6.13).

Table 6.13: Contextualised value added models for Year 11 academic outcomes - Ofsted judgement

Fixed effects	GCSE English		GCSE maths	
The quality of pupils' learning (compared with inadequate)	ES	Sig	ES	Sig
Outstanding	0.40	**	0.20	
Good	0.18		0.23	*
Satisfactory	0.09		0.12	
Missing	0.04		0.20	
Number of students		2252		2354
Number of schools		561		619
Intra-school correlation (ICC)		0.0678		0.0795
% Reduction student variance		50.2		63.3
% Reduction school variance		90.4		87.3
% Reduction total variance		61.2		68.1

* p<0.05, ** p<0.01, *** p<0.001

Students who attended any secondary school that was rated higher than 'inadequate' in terms of the Ofsted judgement 'attendance of learners' also made more progress in maths (see Table 6.14).

Table 6.14: Contextualised value added models for Year 11 academic outcomes - Ofsted judgement

Fixed effects	GCSE maths	
Attendance of learners (compared with inadequate)	**ES**	**Sig**
Outstanding	0.28	*
Good	0.42	***
Satisfactory	0.34	**
Missing	0.36	**
Number of students		2354
Number of schools		619
Intra-school correlation (ICC)		0.0775
% Reduction student variance		63.3
% Reduction school variance		87.6
% Reduction total variance		68.2

* p<0.05, ** p<0.01, *** p<0.001

The impact of students' views of school on KS2-KS4 academic progress

The Year 9 views of school factors that were tested as separate predictors of Year 11 GCSE attainment (see Section 5) were also tested to establish their significance in predicting students' academic progress between KS2 and KS4. All measures of students' Year 9 views of school were found to be significant predictors of students' academic progress between KS2 and KS4. Thus, a stronger 'emphasis on learning', a positive 'behaviour climate', teachers 'valuing pupils', a better 'school environment' and 'school/learning resources', more interested 'headteachers' and better 'teacher behavioural management' and 'teacher support' were significant predictors of greater overall academic progress and subject specific progress in English and maths (see Table 6.15).

Additionally, even when tested together a stronger 'emphasis on learning' and a positive 'behaviour climate' significantly predicted the overall academic progress in total GCSE score and progress in English and maths between KS2 and KS4 (see Table 6.16). Similarly, all the Year 11 views of school measures, except for 'academic ethos', predicted overall academic and subject specific progress between KS2 and KS4 (see Table 6.17).

Table 6.15: Contextualised value added models for Year 11 academic outcomes –Year 9 views of school

Fixed effects	Total GCSE score		GCSE English		GCSE maths	
Year 9 views of school	ES	Sig	ES	Sig	ES	Sig
Emphasis on learning	0.33	***	0.27	***	0.24	***
Behaviour climate	0.22	**	0.25	***	0.23	***
Headteacher	0.15	*	0.14	*	0.12	*
School environment	0.17	**	0.17	**	0.15	*
Valuing pupils	0.31	***	0.19	***	0.23	***
School/Learning resources	0.24	***	0.16	**	0.18	**
Teacher behavioural management	0.26	***	0.17	**	0.21	***
Teacher support	0.23	***	0.21	***	0.13	*

* p<0.05, ** p<0.01, *** p<0.001

Table 6.16: Contextualised value added models for Year 11 academic outcomes –Year 9 views of school (tested in the same model)

Fixed effects	Total GCSE score		GCSE English		GCSE maths	
Year 9 views of school	ES	Sig	ES	Sig	ES	Sig
Behaviour climate	0.15	*	0.19	**	0.17	**
Emphasis on learning	0.30	***	0.23	***	0.19	**
Number of students	1405		1371		1422	
Number of schools	403		393		425	
Intra-school correlation (ICC)	0.3526		0.0555		0.0447	
% Reduction student variance	52.2		57.7		68.1	
% Reduction school variance	49.2		93.4		94.0	
% Reduction total variance	51.2		67.5		73.3	

* p<0.05, ** p<0.01, *** p<0.001

Table 6.17: Contextualised value added models for Year 11 academic outcomes –Year 11 views of school

Fixed effects	Total GCSE score		GCSE English		GCSE maths	
Year 11 views of school	ES	Sig	ES	Sig	ES	Sig
Teacher professional focus	0.28	***	0.27	***	0.22	***
Positive relationships	0.39	***	0.33	***	0.34	***
Monitoring students	0.21	***	0.19	**		ns
Formative feedback	0.23	***	0.22	***	0.20	***
Academic ethos		ns		ns		ns

* p<0.05, ** p<0.01, *** p<0.001
ns=not statistically significant

The impact of homework on KS2-KS4 academic progress

It has been already demonstrated that students' self-reports of time spent on homework positively and strongly predicted higher attainment in KS3 and better GCSE results in KS4. Therefore, it was important to test whether the Year 9 and Year 11 measures of the time students say they spent on homework significantly predict academic progress during secondary school, controlling for prior attainment and background and neighbourhood influences.

Results show that for the overall academic progress and progress in English, any time spent on homework reported in Year 9 was beneficial (see Table 6.18). This was also the case for the reported time spent on homework in Year 11 (see Table 6.19). Effects are strongest on total GCSE score and GCSE English for students who spent 2-3 or over 3 hours on homework a night.

For progress in maths from KS2 to KS4, there was a slight decrement in ES for spending more than 3 hours on homework in Year 9. This result was not found for progress in maths between KS2 and KS3. In Year 11, those spending more than 3 hours a night on homework showed no better outcomes than those spending 2-3 hours.

Table 6.18: Contextualised value models for Year 11 academic outcomes –Year 9 Time spent on homework

Fixed effects	Total GCSE score		GCSE English		GCSE maths	
Year 9 Homework (compared with none)	ES	Sig	ES	Sig	ES	Sig
Less than ½ hour	0.60	***	0.50	***	0.49	***
½ -1 hour	0.69	***	0.60	***	0.60	***
1-2 hours	0.73	***	0.62	***	0.63	***
2-3 hours	0.94	***	0.87	***	0.79	***
Over 3 hours	1.26	***	1.31	***	0.55	
Number of students	1403		1371		1423	
Number of schools	407		397		430	
Intra-school correlation (ICC)	0.3436		0.0570		0.0436	
% Reduction student variance	51.9		58.0		67.8	
% Reduction school variance	50.9		93.3		94.1	
% Reduction total variance	51.6		67.6		73.0	

* p<0.05, ** p<0.01, *** p<0.001

Table 6.19: Contextualised value added models for Year 11 academic outcomes –Year 11 Time spent on homework

Fixed effects	Total GCSE score		GCSE English		GCSE maths	
Year 11 Homework (compared with none)	ES	Sig	ES	Sig	ES	Sig
Less than 1 hour	0.60	***	0.57	***	0.49	***
1-2 hours	0.77	***	0.75	***	0.68	***
2-3 hours	1.05	***	0.95	***	1.03	***
Over 3 hours	1.46	***	1.17	***	0.98	***
Number of students	1320		1293		1346	
Number of schools	417		409		444	
Intra-school correlation (ICC)	0.3578		0.0450		0.0355	
% Reduction student variance	53.5		61.3		69.9	
% Reduction school variance	49.5		95.1		95.6	
% Reduction total variance	52.1		70.6		75.0	

* p<0.05, ** p<0.01, *** p<0.001

Overall, these results show that beyond their own individual, family and neighbourhood characteristics, students who put more time into studying showed strong and significant benefits in terms of both attainment in GCSE outcomes and importantly, made more academic progress given their starting point at entry to secondary school.

7 Discussion and conclusions

The findings within this report are based on studying the variation in students' academic attainment measured by GCSE results in Year 11. Findings can be compared with those from earlier points in time when equivalent analyses were conducted for the EPPSE sample using outcomes from when they were in pre-school, primary school (KS1 and KS2) and earlier in secondary school (KS3). The present analyses reveal marked differences between individual students in their overall attainment. In addition, there are significant differences in the attainment levels of different groups of students. While gender differences are fairly modest, they remain significant for most of the outcomes studied. There are much larger equity gaps evident in comparisons of the GCSE results achieved by different groups of students in terms of parents' qualification levels, family socio-economic status, family income and ethnic heritage. Such differences had previously been found earlier in the study, when the sample was aged 3+ and these differences continue to shape patterns of achievement that reflect wider social inequities across phases of education.

In order to increase our understanding of these group differences more detailed statistical analyses were conducted to tease out the net contributions of different individual student, family, HLE and neighbourhood characteristics. We have shown the strength of these in terms of net effect sizes. These help to reveal the more important predictors that shape academic attainment at age 16, and the progress students make over five years in secondary school.

The continued analysis of the EPPSE sample up to age 16 provides new evidence (as well as extending previous findings) about the continuing influence of individual, family and HLE influences. The analyses identify which background characteristics continue to predict students' attainment. The pattern of results is broadly in line with that found at younger ages. In addition, many of the drivers of variation in GCSE outcomes show similar influences on social-behavioural outcomes at this age (see the companion report Sammons et al., 2014a).

The latest findings point to the influence of a range of background characteristics such as gender, family SES, Free School Meal status or family income on GCSE outcomes. In addition, EPPSE has data on the HLE students experienced in their early years, and at older ages (KS1, KS2 and KS3), as well as parental qualifications. This enables a more detailed approach to exploring the influence of background characteristics, including the home, on students' attainment and progress. Our findings note that various influences from parents and parental support for learning in the home remain important in shaping students' academic achievement up to the end of KS4.

The key findings within this report are based on the quantitative analyses that test a range of measures to predict various key GCSE indicators of attainment. As with the analyses strategy adopted previously at earlier time points in this longitudinal study, we used multilevel statistical models to ascertain which characteristics were the best predictors of various key attainment outcomes at age 16. The EPPSE study uses a mixed method design. Therefore, although this report is based on quantitative analysis of large data-sets, elsewhere we have reported findings from qualitative case studies of individual children and families that are more educationally successful in overcoming disadvantage (see Siraj-Blatchford et al., 2011). These qualitative findings enabled us to develop a broader understanding of the way disadvantage and other experiences shape children's educational outcomes and experiences as they move through different phases of education and into adolescence.

This report has explored the role of pre-schools, primary schools, secondary schools in predicting Year 11 students' academic attainment and progress after controlling for individual student, family, HLE and neighbourhood background characteristics. In addition it reports on students' views and how these influence Year 11 outcomes.

The main findings are summarised below.

Raw differences in attainment for different student groups

Gender

In Year 11, on average females continue to obtain better results in GCSE English than males (with a difference of about half a grade). However, there were no significant gender differences in GCSE maths. Females also obtained higher total GCSE scores (Mean=472.3; Std. Deviation=165), were entered for more full GCSEs (Mean=7.6; Std. Deviation=2.7) than males and were more likely to achieve the various DfE benchmark indicators of performance like 5 A*-C, 5 A*-C including English and maths and the EBacc. At younger ages, girls had been found to have higher attainment in reading and English. They also had higher maths and science outcomes in primary school, but by age 14 and later at 16, these differences are no longer statistically significant.

Ethnicity

There was some evidence of ethnic differences in attainment, but due to low numbers for most ethnic origin subgroups in the EPPSE sample the results should be interpreted with caution. The differences found in average results by ethnic group are in line with those evident in other studies indicating higher attainment for some groups (e.g., those students of Indian or Bangladeshi heritage) and lower attainment for others (e.g., those students of Pakistani heritage) when compared with students of White UK heritage.

Family characteristics

There were marked differences in GCSE attainment related to parents' qualification levels when children were age 3/5. As might be anticipated, students with highly qualified

parents (degree level) had much higher attainment on average than those students whose parents had no qualifications. The differences were equivalent to 141 points for total GCSE score, 10 points in GCSE English, 13 points in GCSE maths (equal to two grades higher e.g., the difference between achieving a grade B instead of a grade D), and 4 extra full GCSE exam entries.

There were also large differences related to family socio-economic status (SES) between those students whose parents were from the professional non-manual category and those from lower SES categories. Moreover, students eligible for Free School Meals (FSM) had lower average attainment than students who were not eligible for FSM. The differences for FSM versus no FSM were around a full GCSE grade in size in GCSE English and GCSE maths.

The quality of the early years HLE showed a clear association with later differences in average GCSE results. The differences for GCSE English and GCSE maths were approximately 10 grade points, and for total GCSE score the difference was 125 points for those who had experienced a high versus low quality early years HLE. This again confirms earlier findings about the likely importance of parents providing a stimulating HLE in the early years.

The net impact of child, family and HLE characteristics on GCSE attainment in Year 11

The average group differences described above do not take into account the relative influence of other characteristics. Multilevel modelling provides more detailed results of the 'net' contribution of individual characteristics, whilst controlling for other predictors and so enables the identification of the 'strongest' net predictors. For instance, effects can distinguish differences in attainment for students with mothers who have degrees compared with those with no qualifications, net of the influence of other associated family and individual student level characteristics (e.g., family SES, income, HLE, age or gender). Results are reported in effect sizes (ES), a statistical measure of the relative strength of different predictors or in odds ratios (OR) representing the odds of achieving certain benchmark performance indicators given certain characteristics relative to the odds of the reference group (see Summary Tables).

Parents' highest qualification level, when children were age 3/5, was the strongest net predictor of better attainment in terms of grades in GCSE English (ES=0.69 - for degree versus no qualification; ES=0.80 - for higher degree versus no qualification) and GCSE maths (ES=0.65 - for degree versus no qualification; ES=0.74 - for higher degree versus no qualification) and achieving 5 A*-C including English and maths (OR=2.86 - for higher degree, OR=3.92 - for degree). All these comparisons are to parents with no qualifications (see Summary Tables).

Differences related to ethnicity were strong predictors of total GCSE score (ES=0.76 for students of Bangladeshi heritage). Family income, measured in KS1, showed larger

effects in terms of the likelihood of achieving 5 A*-C (OR=3.94 - for an income larger than £67000 when compared to no earned salary) and the EBacc (OR=4.04 - for an income larger than £67000 when compared to no earned salary).

There were also a number of additional strong/moderately strong effects for various family influences that are noted below:

- Total GCSE score: parents' highest qualification level, KS3 HLE academic enrichment and the early years HLE.

- GCSE grade in English: ethnicity, family SES, early years HLE, KS3 HLE academic enrichment and family income.

- GCSE grade in maths: family SES, ethnicity, KS3 HLE academic enrichment, early years HLE and Year 11 FSM.

- Total number of full GCSE entries: family SES, ethnicity, family salary, early years HLE and KS3 HLE academic enrichment.

- Achieving 5 A*-C: early years HLE, parents' highest qualification level, KS3 HLE academic enrichment and gender.

- Achieving 5 A*-C including English and maths: the early years HLE, KS3 HLE academic enrichment, ethnicity and family income.

- English Baccalaureate (EBacc): KS3 HLE academic enrichment, parents' highest qualification level and gender.

It should be noted that ethnicity was not a significant predictor of the overall benchmark indicators (i.e., achieving 5 A*-C or the EBacc), but it was for the other GCSE outcomes like the total GCSE score and subject grades. Students of Pakistani[46] and Bangladeshi[47] heritage obtained statistically significant and higher total GCSE scores, better grades in GCSE maths and were entered for more full GCSEs than students of White UK heritage when account was taken of the effects of all other significant predictors like SES, income etc.

Both FSM (a low income indicator; ES=-0.31) and family SES (ES=-0.49 – for unskilled versus professional non-manual) have moderate effects on grades in GCSE English, but the family SES effect was stronger for grades in GCSE maths (ES=-0.66 - for unskilled versus professional). The SES effects for grades in GCSE English were similar in size to the effects of the early years HLE (ES=0.51 - for high versus low) and KS3 enrichment HLE measure for English (ES=0.48 - for high versus low). Interestingly, the early years HLE had a stronger impact on all measures of students' GCSE results than the low income indicator, FSM.

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[46] This shows that for Pakistani students, their low raw scores are accounted for by background influences.

[47] There is only a small sample size of EPPSE students who are of Bangladeshi heritage.

Older students (for their age group e.g., Autumn born) showed better results although the effect was not strong. There were also small positive effects related to the age of the child's mother (at age 3/5); the older the mother the better the academic outcomes (grades in GCSE English and GCSE maths), but also the higher the likelihood of achieving overall benchmark indicators (5 A*-C and the EBacc) when compared with students whose mothers were younger.

These results broadly confirm patterns identified at younger ages indicating that differences in attainment related to individual student and family background influences emerge early (measured when children were recruited to the study) and remain fairly stable as students progress through primary and secondary school. Evidence for this conclusion was well established in previous research (Mortimore et al., 1988; Nuttall, 1990; Rutter & Madge, 1976; Tizard et al., 1988; Sammons, 1995), but EPPSE shows the important effects of the HLE that have been little studied elsewhere.

Neighbourhood Influences

A number of neighbourhood measures were tested as potential predictors of GCSE results from Year 11. These measures reflect the neighbourhood environment in which the child lived while in pre-school and primary school and do not necessarily reflect later neighbourhood environments resulting from moving house.

Previous research has suggested that contextual influences outside the family (such as 'place poverty' linked to living in a disadvantaged neighbourhood and school composition) can influence student attainment. Living in a disadvantaged area while in pre-school or primary school and attending a school with a higher representation of disadvantaged students may affect individual student and family aspirations and attitudes towards education, but also teacher expectations, classroom processes and school climate (Leckie, 2009; 2012; Sammons et al., 1997; Sampson, 2012).

Levels of neighbourhood disadvantage measured by the national indicators the Index of Multiple Deprivation (IMD - see Noble et al., 2004), and the Income Deprivation Affecting Children Index (IDACI – see Noble et al., 2008) were used as predictors of GCSE results from Year 11.

The IDACI was a significant and negative predictor of lower grades in GCSE English (ES=-0.15) and in GCSE maths (ES=-0.16), and also of lower likelihood of attaining the benchmark performance indicators (OR ranges between 0.32-0.39). This was not the case during the primary school years, possibly because neighbourhood influences increase as adolescents interact more with their peer group outside the home. Students who lived in more disadvantaged neighbourhoods in the early years had poorer attainment in GCSE outcomes, over and above their own and their family characteristics, although these neighbourhood effects are relatively small compared with those of the family.

Other neighbourhood measures were also studied. These included the level of unemployment, level of crime, percentage of White British residents and the percentage of residents with limiting long term illnesses. Except for the last measure, all these other indicators were significant negative predictors of different GCSE outcomes in Year 11, although the effects were fairly weak. Thus, for example the percentage of the population who were classed as White British was statistically significant with small negative effects for grades in GCSE English (ES=-0.20) and in GCSE maths (ES=-0.15) and the three benchmark indicators. The level of crime and unemployment recorded in a neighbourhood were both found to have small negative effects on attainment in maths and slightly stronger negative effects on the number of full GCSE entries. Similarly, parents' perceptions of higher levels of safety in their neighbourhood (measured by parental questionnaire during KS1) also showed small but positive effects on grades in GCSE maths, total GCSE score and achieving 5 A*-C (see Summary Tables).

School composition

There is some evidence that the 'social composition' of the school intake (as measured by the percentage of students entitled to free school meals, an indicator of poverty) predicts individual students' outcomes over and above their own FSM status. A higher percentage of students eligible for or receiving FSM measured at school level predicted significantly lower grades in GCSE English (ES=-0.18), fewer full GCSE entries (ES=-0.55) and a lower probability of achieving 5 A*-C (OR=0.98).

These findings are in line with research conducted by the DfE that has examined broader contextual influences when calculating the national Contextual Value Added (CVA) measure. The DfE's national CVA analyses of school performance have demonstrated that the school intake measure (% of FSM students) and neighbourhood measures such as the IMD and IDACI score predict poorer progress for students, even when individual student background measures are controlled.

Taken together the results indicate that attainment was lower for students who lived in more disadvantaged neighbourhoods compared with those living in more advantaged neighbourhoods, over and above their own and their family characteristics. The neighbourhood and school composition influences though relatively small become stronger as the EPPSE sample go through adolescence. The findings show the challenges faced in raising attainment in certain social contexts as recognised by research on schools in challenging circumstances (Muijs et al., 2004).

Pre-school

The EPPSE research was designed to follow up children recruited at pre-school into primary and later secondary school in order to identify the contribution of different educational influences on their later progress and development during various phases of education. In addition to investigating the effects of individual student, family, HLE and neighbourhood characteristics, further analyses sought to establish whether pre-school influences identified as significant predictors of attainment and progress in both cognitive/academic and social-behavioural outcomes at younger ages continued to show effects thirteen years later.

Four measures were tested: pre-school attendance (in comparison with the 'home' group); the duration (in months), the quality of the pre-school attended (as measured by the ECERS-R and ECERS-E rating scales – see Glossary) and the effectiveness of the pre-school attended in promoting better child outcomes at entry to primary school.

Attendance

Attending a pre-school was found to be a statistically significant predictor of higher total GCSE score (ES=0.31), more full GCSE entries (ES=0.21), better grades in GCSE English (ES=0.23) and GCSE maths (ES=0.21) and of a higher probability of achieving 5 A*-C including English and maths (OR=1.48) when compared with students from the 'home' (or no pre-school) group. Although relatively modest, these effects are still stronger than those found for 'age' (i.e. being Autumn rather than Summer born) or the effects of some home learning measures (i.e. KS1 and KS2 HLE or family composition). They indicate that attending a pre-school (versus not) still shapes academic outcomes in the longer term (see Summary Tables).

Duration

The amount of time in months (duration of attendance) that a student had spent in pre-school also showed continued effects on Year 11 academic outcomes. Students who had attended between 2 and 3 years (whether part-time or full-time) in pre-school obtained higher total GCSE scores (ES=0.38), better grades in GCSE English (ES=0.28) and in GCSE maths (ES=0.30), and were entered for more GCSE exams (ES=0.24) than those who had not attended any pre-school.

Quality

There was some evidence that the quality of pre-school also continued to predict better GCSE results (total GCSE score – ES=0.37; GCSE English – ES=0.31; GCSE maths – ES=0.36). Those who had attended a high quality setting were more likely to achieve 5 A*-C including English and maths (OR=1.69) than students who had not attended pre-school. Students who had attended high quality pre-schools showed the most consistent pattern. These quality effects were mostly fairly small although still statistically significant. This pattern shows broadly similar effects, but they are weaker than those found when students were in KS2 in primary school.

Effectiveness

The indicator of pre-school effectiveness in promoting pre-reading skills continued to predict academic attainment at the end of Year 11. Higher levels of pre-school effectiveness predicted more GCSE entries (ES=0.25), better grades in GCSE English (ES=0.31), and having a higher probability of achieving 5 A*-C including English and maths (OR=1.73).

The patterns of relationships between pre-school effectiveness (in terms of early number concepts) and students' later Year 11 academic outcomes also indicate positive and significant effects for grades in GCSE maths (ES=0.35) and total GCSE score (ES=0.48). However, no clear patterns for these predictors emerged for the various GCSE benchmark indicators.

Combined **effects**

Further analyses explored the joint effects of pre-school quality and gender. The results showed that males who had attended a medium (ES= 0.33) or a high quality (ES= 0.41) pre-school obtained significantly higher grades in GCSE maths than males who had not attended any pre-school at all. Similarly, we investigated the joint effects of pre-school quality and parental qualification levels. Results showed that students of low qualified parents who had attended a high quality pre-school obtained significantly better grades in GCSE English (ES= 0.35) and in GCSE maths (ES= 0.25) than students of low qualified parents who had not attended any pre-school. Additionally, a pre-school quality gradient was evident for grades in GCSE English for those students whose parents had moderate to high qualification levels when compared to students who had not attended a pre-school and whose parents had low qualification levels.

Summary table for Year 11 academic outcomes[48]

	Total GCSE score	Total GCSE entries	GCSE English	GCSE maths
Individual student measures	ES	ES	ES	ES
Age	0.14		0.13	0.14
Gender	0.19	0.11	0.38	
Ethnicity	0.76 (B)[†]	0.58 (B)	0.55 (B)	0.53 (I)[ǂ]
Birth weight		-0.39		
Early behavioural problems	-0.29	-0.30	-0.17	-0.27
Early health problems	-0.12	-0.12	-0.14	-0.16
Number of siblings	-0.17	-0.33	-0.28	-0.17
Family measures				
Mother's age at age 3/5			0.15	0.10
Year 11 FSM	-0.32	-0.23	-0.31	-0.37
KS1 family salary	0.29	0.52	0.41	0.28
Parents' highest SES at age 3/5	-0.31	-0.58	-0.53	-0.66
Mothers' highest qualifications level at age 3/5	0.47	0.31	0.70	0.57
Fathers' highest qualifications level at age 3/5		0.25	0.33	0.40
Parents' highest qualifications level at age 3/5	0.59	0.36	0.80	0.74
HLE measures				
Early years HLE	0.36	0.51	0.51	0.45
KS1 HLE outing (medium)				0.11
KS1 HLE educational computing (medium)	0.11	0.13		
KS2 HLE educational computing (medium)		0.13	0.10	0.15
KS3 HLE computer (high)		0.15		
KS3 HLE academic enrichment (high)	0.47	0.43	0.48	0.47
Pre-school measures				
Pre-school attendance	0.31	0.21	0.23	0.21
Pre-school duration	0.38	0.24	0.28	0.30
Pre-school quality	0.37	0.20	0.31	0.26
Pre-school effectiveness pre-reading	0.27	0.25	0.31	
Pre-school effectiveness early number concepts	0.48	0.23		0.35
Primary school measures				
Primary school academic effectiveness - maths				0.25
Secondary school measures				
Secondary school academic effectiveness	0.42			
Secondary school quality – the quality of pupils' learning		0.93	0.47	0.47
Secondary school quality – attendance of learners		0.78	0.50	0.62

B[†]=Bangladeshi heritage; I[ǂ]=Indian heritage

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[48] ES are based on the models that included the combined measure of parental qualification levels. When multiple categories are significant, the highest ES is presented.

Primary school influence

Previous EPPSE research has shown that the academic effectiveness of a child's primary school was a statistically significant predictor of better attainment and progress across KS2 for English and more strongly for maths. Other educational effectiveness research has shown that primary schools can continue to influence students' longer term academic outcomes at secondary school (Goldstein & Sammons, 1997; Leckie, 2009). Indeed, earlier EPPSE results from KS3 (in Year 9) show that measures of the primary school academic effectiveness significantly predicted their later academic attainment in maths and science three years after transferring to secondary school. The latest GCSE analyses show that primary school academic effectiveness continues to influence EPPSE students' later academic attainment up to the end of Year 11. Thus, students who had attended a primary school that was more academically effective for maths had significantly better grades in GCSE maths (ES=0.25) than students who had attended a low academically effective primary school. Similarly, students who had previously attended a medium or highly academically effective primary school were almost twice as likely to achieve the EBacc as students who had attended a low academically effective primary school (OR=1.94), after controlling for student, family HLE and neighbourhood influences (see Summary Tables).

Secondary school influences

Contextual Value Added (CVA) measures of the academic effectiveness of secondary schools attended by EPPSE students were obtained from the DfE. These were derived from the DfE's National Pupil Database (NPD). These CVA measures show the relative progress made by student intakes measured from KS2 to KS4 (across 5 years). In contrast to our primary school academic effectiveness measure that examined results in English, maths and science separately (Melhuish et al., 2006a; 2006b), we did not have subject specific results for these secondary school CVA indicators. The secondary school DfE based CVA combined measure of overall academic effectiveness significantly predicted students' academic attainment in terms of total GCSE score (ES=0.42), but not the specific subject grades or the benchmark indicators. It is likely that the total GCSE score is more susceptible to overall school level influences as also shown by the larger intra-school correlation. Subject grades are likely to be more shaped by departmental effectiveness (Sammons, Thomas & Mortimore, 1997).

Summary table for Year 11 benchmark indicators

	Achieved 5 A*-C	Achieved 5 A*-C English & maths	EBacc
Individual student measures	OR[49]	OR	OR
Age		1.04	
Gender	1.45	1.24	1.74
Ethnicity		2.28(I)[‡]	
Developmental problems	0.68	0.67	
Behavioural problems	0.65	0.63	
Health problems	0.63		
Number of siblings	0.62	0.69	
Family measures			
Mother's age at age 3/5	1.33		1.39
Year 11 FSM	0.61	0.51	
KS1 family salary	3.94	1.95	4.04
Parents' highest SES at age 3/5	0.50	0.59	0.41
Mothers' highest qualifications level at age 3/5	3.14	4.11	
Fathers' highest qualifications level at age 3/5	2.48	2.07	3.16
Parents' highest qualifications level at age 3/5	3.58	3.92	2.83
School level FSM	0.98		0.96
HLE measures			
Early years HLE	3.61	2.90	
KS1 HLE outing (medium)		1.39	
KS1 HLE educational computing (medium)	1.36		0.51 (high)
KS3 HLE academic enrichment (high)	2.80	2.60	3.89
KS3 HLE parental interest (high)		1.34	
Pre-school measures			
Pre-school attendance		1.48	
Pre-school quality		1.69	
Pre-school effectiveness pre-reading		1.73	
Primary school measures			
Primary school academic effectiveness - maths			1.94
Secondary school measures			
Secondary school quality – the quality of pupils' learning	3.04	2.74	5.44
Secondary school quality – attendance of learners	2.89	2.74	

I[‡]=Indian heritage

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[49] Odds Ratios represent the odds of achieving certain benchmark performance indicators given certain characteristics relative to the odds of the reference group.

Ofsted[50] inspection ratings were used to provide additional measures of secondary school quality. EPPSE students who attended secondary schools classified as 'outstanding' based on the 'quality of pupils' learning and their progress' had significantly better results in GCSE English (ES=0.47) and GCSE maths (ES=0.47), were more likely to achieve 5 A*-C, 5 A*-C including English and maths, as well as the EBacc than students from secondary schools characterised as 'inadequate' in their learning quality. Again, these analyses controlled for students' individual, family and HLE and neighbourhood characteristics (see Summary Tables).

Ofsted inspectors also rated secondary schools based on the level of attendance of their students. 'Learners' attendance' as rated by Ofsted inspectors was a statistically significant predictor of academic attainment in Year 11. Students from secondary schools rated as 'outstanding' on the 'learners' attendance' got higher grades in GCSE English (ES=0.50) and GCSE maths (ES=0.62) than students from secondary schools characterised as 'inadequate' while controlling for other influences. Students from 'outstanding' schools (in terms of 'learners' attendance') were entered significantly for more full GCSEs than students from schools where attendance was assessed as 'inadequate' (ES=0.78). The probability of achieving 5 A*-C and 5 A*-C including English and maths was significantly higher for students from schools with 'outstanding' attendance. There was less evidence of differences for schools rated as 'good' on Ofsted's 'learners' attendance' measure.

These results indicate that secondary school quality was important in shaping students' academic attainment over and above the impact of background characteristics.

Students' academic progress between KS2 and KS4

Students' academic progress across five years in secondary school (Year 7-Year 11) was studied by controlling for their prior attainment at the end of primary school and taking account of the significant individual student, family, HLE, neighbourhood and school characteristics discussed previously. Fewer background characteristics predicted progress between KS2 and KS4 than were found to predict attainment. The patterns were similar to those found at younger ages when we studied students' progress between KS2 and KS3 (Year 7- Year 9) for this sample.

Overall, there was evidence that students with the following characteristics made greater overall academic progress and progress in specific subjects between KS2 and KS4:

- older for their year group (Autumn born) (total GCSE score - ES=0.16; GCSE English - ES=0.18; GCSE maths - ES=0.20).

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[50] It should be noted that the inspector data are related to the time EPPSE students were in KS3 and were measured by the inspection frameworks in use between 2005 and 2010.

- females (total GCSE score - ES=0.25, GCSE English - ES=0.27; GCSE maths - ES=0.13).

- of Bangladeshi heritage[51] (total GCSE score - ES=0.83; GCSE English - ES=0.66; GCSE maths - ES=0.88).

- with higher family incomes (total GCSE score - ES=0.26; GCSE English - ES=0.34; GCSE maths - ES=0.21).

- with higher qualified parents (total GCSE score - ES=0.39; GCSE English - ES=0.59; GCSE maths - ES=0.42).

- who experienced more learning opportunities in terms of KS3 HLE academic enrichment (total GCSE score - ES=0.36; GCSE English - ES=0.37; GCSE maths - ES=0.45).

There were also small negative effects on progress related to early behavioural problems, early health problems and eligibility for FSM. Again, this is in accord with patterns found by EPPSE in KS2 and KS3.

Of the neighbourhood measures tested, only the percentage of White British residents was a significant predictor of poorer student progress in English. For progress in maths however, reported crime, level of unemployment, perceived neighbour safety, and the IMD and IDACI were all statistically significant. These findings indicate that the disadvantage of the school's intake and students' neighbourhood characteristics had small negative effects predicting both poorer progress and attainment in some outcomes. The results suggest that neighbourhood context plays some role in shaping students' outcomes up to age 16.

Similar to findings in Year 9, the pre-school measures and the primary school academic effectiveness measure did not predict academic progress in specific subjects (English and maths) between KS2 and KS4. These may be more sensitive to subject department effects. However, pre-school attendance, quality and effectiveness significantly predicted EPPSE students' overall academic progress in terms of promoting a higher total GCSE score. Overall GCSE performance is likely to be a broader measure of school effects for all students in contrast to subject results that are more likely to reflect subject department effects. Similarly, the CVA measure of secondary school academic effectiveness was a moderately strong predictor of overall academic progress in terms of total GCSE score (ES=0.53). Moreover, measures of secondary school quality (Ofsted ratings) were significant predictors of progress in specific GCSE subject grades in English and maths but not students' overall academic progress.

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[51] There is only a small sample size of EPPSE students who are of Bangladeshi heritage.

Students' experiences and views of secondary school

Students provided their own views on secondary school characteristics and on their experiences both in Year 9 (see Summary Table below) and Year 11. Various measures of school experiences were identified and tested whether they predicted variations in students' KS4 academic attainment and progress after control for individual, family, HLE characteristics and the percentage of students on FSM in the school (see related reports Sammons et al., 2014b; 2014c).

Views in Year 9

The results indicate that students who perceived their school to place higher 'emphasis on learning' in Year 9 had significantly higher GCSE attainment and made more progress across the five years in secondary school. The summary table below shows the strongest effects were on total GCSE score (ES=0.36). The effect on the overall academic progress was similar (ES=0.33).

Summary table of the effects of Year 9 views of schools on Year 11 academic outcomes

Year 9 views of schools	Year 11 Total GCSE score		Year 11 Total GCSE entries		Year 11 GCSE English		Year 11 GCSE maths	
Fixed effects (continuous)	**ES**	**Sig**	**ES**	**Sig**	**ES**	**Sig**	**ES**	**Sig**
Emphasis on learning	0.36	***	0.26	***	0.32	***	0.23	***
Behaviour climate	0.34	***	0.41	***	0.34	***	0.41	***
Headteacher qualities	0.14	*		ns	0.12	*		ns
School environment	0.15	*	0.19	**	0.12	*	0.13	*
Valuing pupils	0.22	***	0.20	***	0.15	*		ns
School/Learning resources	0.20	***	0.20	***	0.14	*	0.17	**
Teacher discipline and care	0.14	*		ns		ns		ns
Teacher support	0.15	*	0.12	*		ns		ns

* p<0.05, ** p<0.01, *** p<0.001

EPPSE students' attainment (in terms of all measures of GCSE results) was also found to be higher when they perceived a more positive 'behaviour climate' in their secondary school. The difference was particularly noticeable for grades in GCSE maths and the number of full GCSE entries (ES=0.41). For overall progress and progress in specific subjects the effects were similar and positive. Students' perceived quality of their 'school environment'[52] was also a predictor of better attainment (in total GCSE score and subject grades), although the effects were smaller. Similarly, small but positive effects were identified for the factor related to students' perceptions of how much they felt teachers valued and respected them.

The factor 'learning resources' (related to whether students felt the school was well equipped with computers and technology) also predicted better attainment in all

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[52] This factor includes attractive and well decorated buildings, cleanliness of toilets etc.

continuous measures of GCSE results. All Year 9 factors related to students' perceptions of school characteristics and processes significantly predicted overall academic progress measured by total GCSE score and progress in English and maths, controlling for Year 6 prior attainment and other background characteristics.

After testing these factors separately as predictors of attainment, we also tested them together to investigate which ones are the most important in predicting academic outcomes in Year 11 when still controlling for the influences of individual student, familial and HLE characteristics. It was found that the two factors 'emphasis on learning' and 'positive behaviour climate' together significantly predicted the majority of Year 11 academic attainment measures, but also academic progress.

Summary table of the effects of Year 9 views of schools on Year 11 benchmark indicators

Year 9 views of schools	Year 11 Achieved 5 A*-C		Year 11 Achieved 5 A*-C English and maths		Year 11 EBacc	
Fixed effects (continuous)	**OR**	**Sig**	**OR**	**Sig**	**OR**	**Sig**
Emphasis on learning	5.95	***	2.51	*	3.00	*
Behaviour climate	3.12	***	2.32	***	1.94	*
Headteacher qualities		ns		ns		ns
School environment		ns		ns		ns
Valuing pupils	2.44	***	1.67	*		ns
School/Learning resources		ns		ns		ns
Teacher discipline and care	2.27	*		ns		ns
Teacher support	1.69	*		ns		ns

* p<0.05, ** p<0.01, *** p<0.001

Views in Year 11

When testing the factors related to students' experiences and views in Year 11, we found that significantly higher total GCSE scores and better grades in GCSE English were obtained by students who reported that 1) their teachers had a strong focus on learning; 2) in their schools the relationships between students and teachers were good in terms of trust, respect and fairness; 3) there was a high level of monitoring by their teachers; 4) their teacher provided more feedback. The same factors were significant predictors of overall academic progress and progress in English. 'Positive relationship' and 'formative feedback' were both significant predictors of better GCSE grades in maths and also of academic progress in maths during secondary school. The results point to the importance of school and teaching experiences in both KS3 and KS4 in shaping academic attainment at GCSE level.

It is interesting to note that the latest report on PISA 2012 results shows that students in England generally have more favourable views of their schools (in terms of positive climate for learning) and teachers (and their relationships with teachers) than the students from other OECD countries (Wheater et al., 2013). The EPPSE analyses point to the importance of students' perspectives.

Homework

Again, after control for individual, family and HLE influences, the daily time spent on homework, as reported by students in Year 9 and Year 11, were important and strong predictors of better academic attainment and progress in both KS3 and KS4. The strongest effects were noted for those who reported spending 2-3 hours doing homework on a typical school night. Thus, for example, students who reported in Year 9 spending between 2 and 3 hours on homework on an average weeknight were almost 10 times more likely to achieve 5 A*-C (OR=9.97) than students who did not spend any time on homework. A similarly strong result was found for the time spent on homework reported in Year 11 (OR=9.61). Moderate to strong positive effects of time spent on homework were found for total GCSE score, specific GCSE grades and the benchmark indicators, but also on overall academic progress and progress in specific subjects.

Spending more time on homework is likely to increase students' study skills and opportunities to learn. It may also be influenced by and provide an indicator of self-regulation. Homework is likely to reflect secondary schools' policies, teachers' expectations and the academic emphasis in the school as well as encouragement from parents to take school work seriously. These results show that independent study and effort by students are important contributors to academic success at GCSE over and above the important role of all the other background influences and prior attainment.

Overview

The EPPSE project is unique in providing a broad focus on students' educational outcomes (academic, social-behavioural and dispositions) from pre-school to the end of compulsory schooling (age 16). It has been able to investigate students' outcomes at different ages and across different phases of education: pre-school, primary school and secondary school; from early childhood to adolescence. In addition to measuring students' outcomes and both academic and social-behavioural developmental progress over time, the research has collected rich data on students' self-reports of their experiences and views of school. These provide additional evidence about the nature of students' learning experiences in secondary school. This report provides a detailed analysis of GCSE outcomes in Year 11 at the end of compulsory schooling in England. It also explores students' academic progress from age 11 to 16. Elsewhere, in companion reports, findings are presented on EPPSE students' social-behavioural outcomes based on teacher ratings and on their views of school and dispositions including measures of health and well-being (Sammons et al., 2014a; 2014b; 2014c).

The KS4 phase of the research adds to the large body of evidence from the EPPSE sample at younger ages (pre-school and school entry, KS1, KS2 and KS3). The latest analyses extend and support previous findings that investigated the role of different sources of influence (proximal to distal) that shape children's and adolescents' development over time. The approach has links to the ecological model of human

development proposed by Bronfenbrenner (1994). We explore the way individual, family, HLE, neighbourhood, pre-school, and school influences shape children's development from early childhood through to adolescence.

There is clear evidence that various proximal influences like individual, family and HLE characteristics continue to influence students' attainments in secondary school up to the end of KS4. As at younger ages, significant differences in outcomes for different groups of students have been identified. Certain influences, especially a disadvantaged social background increase the risk of poor academic outcomes. While some influences reduce the likelihood of positive outcomes, others promote this.

There are modest gender effects on GCSE outcomes, as at younger ages. Females show better academic outcomes and are also rated much more favourably in terms of learning and other social-behaviours by their teachers compared to males (see Sammons et al., 2014a). The gender gap is the largest for total GCSE score and English GCSE grades.

The experience of various indicators of disadvantage in the early years increases the risk of poorer academic attainment up to age 16 years, as well as predicting poorer behaviour. The two are likely to be mutually reinforcing. Thus low family SES, low earned income level, eligibility for FSM status, single parent status and larger family size all predict poorer outcomes. Although often smaller in size, neighbourhood disadvantage measures and school context are significant negative predictors of academic attainment outcomes at GCSE, in line with findings in KS3. Contextual effects linked to 'place poverty' and school composition also shape social-behaviour in adolescence, as demonstrated in the companion report (Sammons et al., 2014a). Ways to target neighbourhood disadvantages as well as family disadvantages may be important in tackling such external conditions (e.g., via the Pupil Premium in schools or children's centres in disadvantage areas).

By contrast, higher parental qualification levels and positive parenting experiences in the early and later years, measured by the HLE (especially early years HLE and enrichment learning experiences in KS3), predict better academic outcomes. Although not as strong as evidence found at school entry and in primary school, pre-school experiences continue to shape attainment in secondary school. Having attended any pre-school setting compared to none still shows positive effects on attainment up to age 16. This is the case for both females and males. Pre-school quality also shows an influence, although the quality gradient is more evident for males and those students whose parents have lower qualification levels. By contrast, females and those from families where parents are more qualified show benefits from pre-school irrespective of quality.

The measure of primary school academic effectiveness predicted better attainment in primary school and in secondary school, in Year 9 and for GCSE outcomes in Year 11. However, primary school academic effectiveness did not predict better (or worse) social-behaviour. Similar results are found for the academic effectiveness of the secondary

school. Attending a more academically effective secondary school (as measured by the DfE CVA indicators) proved to be a significant predictor of number of GCSE entries and total GCSE score. However, it did not predict the variation in social-behavioural outcomes for the EPPSE sample (see Sammons et al., 2014a). The influence of the academic effectiveness of the schools that students attend on their academic outcomes points to the importance of providing CVA subject indicators in English and maths in primary school and the value of overall CVA type indicators for measuring secondary school effectiveness in promoting student progress taking into account the characteristics of the intakes served.

In KS3, attending a poor quality secondary school as measured by Ofsted judgments predicted poorer attainment outcomes for those unfortunate enough to attend a school rated as 'inadequate', but better outcomes if a student went to an 'outstanding' school, even controlling for the influence of individual, family and HLE characteristics. By age 16, this effect was weaker. This may reflect changes in schools judged to be 'inadequate' or 'satisfactory' over the time of the research, given the strong pressure to improve, inherent in the accountability system for schools in England.

The latest EPPSE research in KS4 points to the importance of the 'student voice'. Self-report surveys provided measures of students' experiences and views of school in Year 9 and Year 11. The various factors derived from these measures show variation in school experiences. These measures are moderate to strong predictors of both academic outcomes at GCSE and also social-behaviour as rated by teachers.

The 'quality of teaching', the school's 'behavioural climate', the 'emphasis on learning', 'positive relationships' with staff, and feeling 'valued' were found to be consistent predictors of better social-behavioural, as well as academic outcomes. Likewise, time spent on homework reported in Year 9 and also in Year 11 (as reported by students) strongly predict better academic and social-behavioural outcomes. These effects are found even when individual student, family, HLE and neighbourhood influences are taken into account. These factors also predict academic progress from Year 6 to Year 11 as well as social-behavioural developmental progress/change over the same time period.

The findings suggest that these features of students' secondary school experiences are important in shaping their academic development.

Implications

The latest findings in KS4 are generally in line with those found in the most recent EPPSE analyses of Year 9 outcomes at the end of KS3. The latest findings cover outcomes at GCSE that have very important consequences for students' subsequent further higher education and employment opportunities. They highlight a number of features of school experience that can be addressed in school improvement policies intended to promote better outcomes for secondary school students. They also point to

the potential role of using survey data and other ways to tap into the student 'voice' in assessing the quality of their educational experiences. The aspects about secondary school experience identified here show the importance to school leaders and teaching staff of focusing on enhancing the quality of teaching and learning, student support, positive relationships, improving the behavioural climate of the school, ensuring students feel valued, and promoting a high quality physical environment and learning resources. These aspects should be viewed as key features for school self-evaluation and planning for improvement as well as for external evaluation.

Policy makers are increasingly interested in student progression in judging school performance. Indeed, schools are now required to publish information on progression in their school, not just on academic attainment.

Overall, the latest results confirm and extend earlier EPPSE findings. The life chances of some children are shaped by important individual, family, home and school experiences from an early age. There is no level playing field at the start of school or in later phases. These early effects of disadvantage emerge at a young age and their influences continue to shape students' later educational outcomes through subsequent phases of their educational careers. It is widely recognised that England has a very large equity gap in achievement in international comparisons and that life chances and social mobility are highly stratified. However, some influences can help to ameliorate the effects of disadvantage. Positive pre-school effects remain evident, while secondary school experiences are also relevant. There are important and probably reciprocal associations between academic and social-behavioural development.

Disadvantage remains a complex and multi-faceted concept. The longitudinal EPPSE research indicates that disadvantage is by no means captured by one simple indicator such as the FSM status of a student. This has important implications for funding to tackle disadvantage. Poverty, in terms of FSM status, does not embrace the full range of characteristics which are shown in this report to shape students' academic outcomes. The concept of multiple disadvantage is important and the challenges facing schools, parents and communities, in promoting better outcomes for students from disadvantaged homes and contexts remain strongly evident (related to neighbourhood and school composition influences).

Educational influences (including pre-school) have an important part to play in supporting those 'at risk' and can promote better outcomes by ameliorating the adverse effects of disadvantage. But the EPPSE data shows that equity gaps emerge early for all outcomes (cognitive/academic and social-behavioural) and remain strongly evident across different phases of education.

Taken together, the EPPSE research indicates that no single educational influence acts as a 'magic bullet' that can overcome disadvantage. However, parental actions that provide a better home learning environment and also supportive educational environments (pre-school, primary and secondary school) can make a difference to

children and young people's academic and other important educational outcomes and so can help to improve life chances. The findings confirm that pre-school effects last and have particular relevance for policy making. The academic effectiveness of the primary school, and later of the secondary school, attended also predicted students' attainment and progress. Those fortunate to attend more academically effective or higher quality schools receive a significant boost in terms of GCSE outcomes at age 16. There are also clear implications for practitioners about the role of students' secondary school experiences that can support school improvement strategies in KS3 and KS4.

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Appendix 1: Home Learning Environment (HLE) measures

The early years home learning environment (HLE)

The early years home learning environment (HLE) index is composed of the first seven of the measures below, specifically those deemed the most educationally orientated, and has a scale of 0-49; the frequency of each of the activities being coded on a scale of 0-7 (0 = *not occurring*, 7 = occurring *very frequently*) (Melhuish, Phan, Sylva, Sammons, Siraj-Blatchford, & Taggart, 2008).

The specific items associated with the early years (HLE) measure:

- Going to the library
- Being read to
- Learning activities with the alphabet
- Learning activities with numbers/shapes
- Learning activities with songs/poems/nursery rhymes
- Playing with letters/numbers
- Painting or drawing
- Playing with friends at home
- Playing with friends elsewhere
- Visiting relatives or friends
- Shopping with parent
- Watching TV
- Eating meals with the family
- Having a regular bedtime.

The Key Stage 1 (KS1) home learning environment (HLE)

KS1 HLE Factors and the items (from the KS1 Parent questionnaire) loading on these factors:

Home Computing

- The Child plays on computer by themself

- Respondent plays computer games with the child

- Respondent uses computer with the child in educational ways

Parent-Child enrichment outing/activity outside home

- Respondent visits library with the child

- Respondent does sport/physical activity with the child

- Respondent goes on educational visits with the child

Parent-child one-to-one interactions at home

- Respondent plays with the child using toys/games/puzzles

- Respondent reads to the child

- Respondent listens to the child read

Expressive play

- The Child plays 'make believe' or pretend games

- The Child paints/draws/makes models

- The Child enjoys dance music and movement.

The Key Stage 2 (KS2) home learning environment (HLE)

KS2 HLE Factors and the items (from the KS2 Parent Questionnaire and All about me) loading on these factors:

Parent-Child Educational Computing

- (Parent & EPPSE Child) Use the internet for learning (together)
- (Parent & EPPSE Child) Use the internet for play / recreation (together)
- (Parent & EPPSE Child) Use a computer in educational ways (together)
- (EPPSE Child) Uses the internet (on their own)
- (EPPSE Child) Uses the computer for activities related to learning (on their own).

Parent-Child Interactive Learning Processes

- (Parent & EPPSE Child) Sport, dance or physical activities (together)
- (Parent) Joins in with EPPE child during games or play
- (Parent & EPPSE Child) Go on educational visits to museums, nature parks, farm etc.
- (Parent) Teaches (EPPSE Child) a school subject e.g., geography, science, English
- (Parent & EPPSE Child) Visit the library (together).

Individual Child Activities

- (EPPSE Child) Reads on their own
- (EPPSE Child) Paints, draws or makes models (on their own)
- (EPPSE Child) Enjoys dance, music, movement (on their own).

Computer Games

- (Parent & EPPSE Child) Play computer games i.e. Play Station, X-Box etc. (together)
- (Child) Plays computer games i.e. Play Station, X-Box etc. (on their own).

The Key Stage 3 (KS3) home learning environment (HLE)

KS3 HLE Factors and the items (from the KS3 Parent and All about me Questionnaires) loading on these factors:

Learning Support & Resources

- (Parent) Bought/downloaded educational computer software

- (Parent) Helped with using the internet

- (Parent) Given help with difficult homework

- (Parent) Bought a book to help with school work.

Computer Use

- (EPPSE Child) Computer use MSN

- (EPPSE Child) Computer use E mail

- (EPPSE Child) Computer use Listening to music

- (EPPSE Child) Computer use Browsing/downloading from the net.

Parental Interest in School

- (Parent) Talked to them about their school work

- (Parent) Talked to them about their experiences at school

- (Parent) Talked to them about subjects for GCSE.

Academic Enrichment

- (EPPSE Child) Read on your own for pleasure

- (EPPSE Child) With family Go on educational visits

- (EPPSE Child) Go to the library (not school library).

Parental Academic Supervision

- (EPPSE Child) My parents make sure I do my homework

- (EPPSE Child) My parents know about how I'm getting on in school.

Appendix 2: Characteristics of the sample in Year 11

Table A2.1: Selected characteristics of sample with valid benchmark indicators data in Year 11

Background characteristics	Achieved 5 A*-C including English and maths N=2763					
	No		Yes		Total	
	N	%	N	%	N	%
Gender						
Male	668	47.2	747	52.8	1415	100.0
Female	540	40.1	808	59.9	1348	100.0
Total	1208	43.7	1555	56.3	2763	100.0
Ethnicity						
White European heritage	41	43.2	54	56.8	95	100.0
Black Caribbean heritage	47	43.1	62	56.9	109	100.0
Black African heritage	22	46.8	25	53.2	47	100.0
Any other ethnic minority heritage	31	47.0	35	53.0	66	100.0
Indian heritage	16	27.1	43	72.9	59	100.0
Pakistani heritage	67	46.2	78	53.8	145	100.0
Bangladeshi heritage	11	37.9	18	62.1	29	100.0
Mixed heritage	71	45.8	84	54.2	155	100.0
White UK heritage	901	43.8	1155	56.2	2056	100.0
Total	1207	43.7	1554	56.3	2761	100.0
Number of siblings in the house (age 3/5)						
No siblings	220	40.9	318	59.1	538	100.0
1 sibling	372	37.5	619	62.5	991	100.0
2 siblings	322	44.0	410	56.0	732	100.0
3 or more siblings	239	57.7	175	42.3	414	100.0
Missing	55	62.5	33	37.5	88	100.0
Total	1208	43.7	1555	56.3	2763	100.0
Early Years home learning environment (HLE) Index						
0-13	163	63.7	93	36.3	256	100.0
14-19	308	52.7	276	47.3	584	100.0
20-24	300	46.4	346	53.6	646	100.0
25-32	296	35.3	542	64.7	838	100.0
33-45	57	18.8	247	81.3	304	100.0
Total	1124	42.8	1504	57.2	2628	100.0
Type of pre-school						
Nursery class	255	48.6	270	51.4	525	100.0
Playgroup	250	45.5	299	54.5	549	100.0
Private day nursery	106	24.4	328	75.6	434	100.0
Local authority day nursery	184	52.1	169	47.9	353	100.0
Nursery schools	175	37.0	298	63.0	473	100.0
Integrated (combined) centres	70	43.5	91	56.5	161	100.0
Home	168	62.7	100	37.3	268	100.0
Total	1208	43.7	1555	56.3	2763	100.0

Mother's qualification level	Achieved 5 A*-C including English and maths					
	No		Yes		Total	
	N	%	N	%	N	%
None	382	66.8	190	33.2	572	100.0
Vocational	177	44.9	217	55.1	394	100.0
16 Academic	445	44.1	565	55.9	1010	100.0
18 Academic	63	29.4	151	70.6	214	100.0
Degree or higher degree	57	13.8	355	86.2	412	100.0
Other professional	6	15.8	32	84.2	38	100.0
Total	1130	42.8	1510	57.2	2640	100.0
Father's qualification level						
None	264	62.0	162	38.0	426	100.0
Vocational	119	39.3	184	60.7	303	100.0
16 academic	249	39.4	383	60.6	632	100.0
18 academic	65	34.4	124	65.6	189	100.0
Degree or higher degree	68	15.5	370	84.5	438	100.0
Other professional	10	35.7	18	64.3	28	100.0
Absent father	374	56.9	283	43.1	657	100.0
Total	1149	43.0	1524	57.0	2673	100.0
Family highest SES (age 3/5)						
Professional non manual	34	15.2	190	84.8	224	100.0
Other professional non manual	173	26.3	485	73.7	658	100.0
Skilled non manual	373	42.1	512	57.9	885	100.0
Skilled manual	241	59.5	164	40.5	405	100.0
Semi-skilled	233	65.3	124	34.7	357	100.0
Unskilled	50	73.5	18	26.5	68	100.0
Unemployed /not working	43	57.3	32	42.7	75	100.0
Total	1147	42.9	1525	57.1	2672	100.0
FSM at Year 11						
No Free School Meals (FSM)	841	38.1	1369	61.9	2210	100.0
Free School Meals (FSM)	349	67.9	165	32.1	514	100.0
Total	1190	43.7	1534	56.3	2724	100.0
Family earned income at KS1						
No earned salary	309	60.6	201	39.4	510	100.0
£ 2,500 – 17,499	231	51.2	220	48.8	451	100.0
£ 17,500 – 29,999	146	38.5	233	61.5	379	100.0
£ 30,000 – 37,499	84	33.2	169	66.8	253	100.0
£ 37,500 – 67,499	91	22.1	320	77.9	411	100.0
£ 67,500 – 132,000+	23	16.0	121	84.0	144	100.0
Total	884	41.2	1264	58.8	2148	100.0
SEN status at Year 11						
No special provision	653	31.9	1396	68.1	2049	100.0
School action	225	75.0	75	25.0	300	100.0
School action plus	156	86.7	24	13.3	180	100.0
Statement of SEN	87	91.6	8	8.4	95	100.0
Total	1121	42.7	1503	57.3	2624	100.0
Pre-school attendance						
Pre-school	1040	41.7	1455	58.3	2495	100.0
No pre-school	168	62.7	100	37.3	268	100.0
Total	1208	43.7	1555	56.3	2763	100.0

Table A2.2: Selected characteristics of sample with valid benchmark indicators in Year 11

Background characteristics	EBacc					
	No		Yes		Total	
	N	%	N	%	N	%
Gender						
Male	1126	85.7	188	14.3	1314	100.0
Female	993	78.3	275	21.7	1268	100.0
Total	2119	82.1	463	17.9	2582	100.0
Ethnicity						
White European heritage	69	77.5	20	22.5	89	100.0
Black Caribbean heritage	99	91.7	9	8.3	108	100.0
Black African heritage	41	89.1	5	10.9	46	100.0
Any other ethnic minority heritage	54	81.8	12	18.2	66	100.0
Indian heritage	39	72.2	15	27.8	54	100.0
Pakistani heritage	122	87.1	18	12.9	140	100.0
Bangladeshi heritage	24	85.7	4	14.3	28	100.0
Mixed heritage	124	81.6	28	18.4	152	100.0
White UK heritage	1545	81.4	352	18.6	1897	100.0
Total	2117	82.1	463	17.9	2580	100.0
Number of siblings in the house (age 3/5)						
No siblings	420	83.0	86	17.0	506	100.0
1 sibling	716	77.4	209	22.6	925	100.0
2 siblings	572	83.1	116	16.9	688	100.0
3 or more siblings	332	88.5	43	11.5	375	100.0
Missing	79	89.8	9	10.2	88	100.0
Total	2119	82.1	463	17.9	2582	100.0
Early Years home learning environment (HLE) Index						
0-13	225	92.6	18	7.4	243	100.0
14-19	479	87.9	66	12.1	545	100.0
20-24	504	83.6	99	16.4	603	100.0
25-32	613	79.1	162	20.9	775	100.0
33-45	182	64.1	102	35.9	284	100.0
Total	2003	81.8	447	18.2	2450	100.0
Type of pre-school						
Nursery class	320	82.7	67	17.3	387	100.0
Playgroup	464	85.0	82	15.0	546	100.0
Private day nursery	288	67.3	140	32.7	428	100.0
Local authority day nursery	290	82.9	60	17.1	350	100.0
Nursery schools	393	83.1	80	16.9	473	100.0
Integrated (combined) centres	144	89.4	17	10.6	161	100.0
Home	220	92.8	17	7.2	237	100.0
Total	2119	82.1	463	17.9	2582	100.0
Mother's qualification level						
None	498	93.6	34	6.4	532	100.0
Vocational	323	86.4	51	13.6	374	100.0
16 Academic	823	88.0	112	12.0	935	100.0
18 Academic	139	71.3	56	28.7	195	100.0
Degree or higher degree	197	50.6	192	49.4	389	100.0
Other professional	28	75.7	9	24.3	37	100.0
Total	2008	81.6	454	18.4	2462	100.0

Background characteristics	EBacc					
	No		Yes		Total	
	N	%	N	%	N	%
Father's qualification level						
None	375	94.2	23	5.8	398	100.0
Vocational	232	80.3	57	19.7	289	100.0
16 academic	508	86.8	77	13.2	585	100.0
18 academic	130	76.0	41	24.0	171	100.0
Degree or higher degree	209	50.5	205	49.5	414	100.0
Other professional	22	78.6	6	21.4	28	100.0
Absent father	562	92.4	46	7.6	608	100.0
Total	2038	81.7	455	18.3	2493	100.0
Family highest SES (age 3/5)						
Professional non manual	110	51.2	105	48.8	215	100.0
Other professional non manual	425	68.9	192	31.1	617	100.0
Skilled non manual	703	85.7	117	14.3	820	100.0
Skilled manual	355	94.9	19	5.1	374	100.0
Semi-skilled	313	95.7	14	4.3	327	100.0
Unskilled	63	95.5	3	4.5	66	100.0
Unemployed /not working	66	91.7	6	8.3	72	100.0
Total	2035	81.7	456	18.3	2491	100.0
FSM at Year 11						
No Free School Meals (FSM)	1633	79.2	429	20.8	2062	100.0
Free School Meals (FSM)	453	94.2	28	5.8	481	100.0
Total	2086	82.0	457	18.0	2543	100.0
Family earned income at KS1						
No earned salary	431	91.9	38	8.1	469	100.0
£ 2,500 – 17,499	375	88.9	47	11.1	422	100.0
£ 17,500 – 29,999	290	81.2	67	18.8	357	100.0
£ 30,000 – 37,499	175	75.8	56	24.2	231	100.0
£ 37,500 – 67,499	249	66.0	128	34.0	377	100.0
£ 67,500 – 132,000+	69	49.6	70	50.4	139	100.0
Total	1589	79.6	406	20.4	1995	100.0
SEN status at Year 11						
No special provision	1490	77.9	422	22.1	1912	100.0
School action	267	96.0	11	4.0	278	100.0
School action plus	163	98.8	2	1.2	165	100.0
Statement of SEN	87	97.8	2	2.2	89	100.0
Total	2007	82.1	437	17.9	2444	100.0
Pre-school attendance						
Pre-school	1899	81.0	446	19.0	2345	100.0
No pre-school	220	92.8	17	7.2	237	100.0
Total	2119	82.1	463	17.9	2582	100.0

Appendix 3: Associations between students' earlier measures of academic attainment

Table A3.1: Correlations of different academic outcomes in Year 6

	KS2 TA English	KS2 TA maths
Year 6 English	0.77	0.641
National Assessment Standardised Scores	N=2368	
Year 6 maths	0.6718	0.82
National Assessment Standardised Scores		N=2378

Table A3.2: Correlations of different academic outcomes in Year 9 and Year 6

	Year 9 English National Assessment Standardised Scores	Year 9 maths National Assessment Standardised Scores	Year 9 English Teacher Assessment (TA)	Year 9 maths Teacher Assessment (TA)
Year 9 English National Assessment Standardised Scores	1		0.75 (N=1105)	0.68 (N=1103)
Year 9 maths National Assessment Standardised Scores	0.72 (N=1133)	1	0.70 (N=1143)	0.89 (N=1144)
Year 6 English National Assessment Standardised Scores	0.74 (N=1100)	0.66 (N=1125)	0.70 (N=2416)	0.65 (N=2413)
Year 6 maths National Assessment Standardised Scores	0.60 (N= 1107)	0.86 (N=1135)	0.61 (N=2426)	0.82 (N=2424)

Appendix 4: Contextualised multilevel models

Table A4.1: Contextualised model for total GCSE score in Year 11 - Parents' highest qualification level

Fixed Effects	Total GCSE score			
	Coef.	SE	ES	Sig
Age	2.70	0.84	0.14	**
Gender	25.67	6.15	0.19	***
Ethnic group (compared with White UK)				
White European heritage	19.24	17.04	0.14	
Black Caribbean heritage	37.82	16.84	0.28	*
Black African heritage	3.62	24.28	0.03	
Any other ethnic minority	18.70	20.97	0.14	
Indian	48.77	22.24	0.37	*
Pakistani	52.97	19.09	0.40	**
Bangladeshi	101.91	31.43	0.76	**
Mixed Race	-15.91	13.58	-0.12	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-38.85	9.07	-0.29	***
Early health problems (compared with none)				
1+ Health problem	-15.90	6.65	-0.12	*
Number of siblings at age 3/5 (compared with none)				
1 sibling	6.48	8.29	0.05	
2 siblings	-0.72	8.74	-0.01	
3 + siblings	-23.18	10.27	-0.17	*
Missing	67.04	47.87	0.50	
Year 11 FSM (compared with no)	-42.03	8.36	-0.32	***
KS1 family salary (compared with no earned salary)				
£2500-15000	14.12	9.93	0.11	
£17500-27500	22.73	10.63	0.17	*
£30000-35000	32.03	12.20	0.24	**
£37500-66000	34.69	11.41	0.26	**
£67500-132000	39.20	19.29	0.29	*
Missing	16.65	10.08	0.12	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-5.50	13.90	-0.04	
Skilled non-manual	-19.76	14.74	-0.15	
Skilled manual	-41.60	16.03	-0.31	**
Semi-skilled	-40.34	16.55	-0.30	*
Unskilled	-35.51	23.47	-0.27	
Never worked	-30.27	22.86	-0.23	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Total GCSE score			
	Coef.	SE	ES	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	29.22	11.94	0.22	*
Academic age 16	38.81	9.42	0.29	***
Academic age 18	42.76	12.72	0.32	***
Other professional	47.29	24.63	0.35	
Degree	69.43	13.28	0.52	***
Higher degree	78.94	18.68	0.59	***
Absent father or missing mother's	42.83	40.85	0.32	
Missing	-102.19	50.03	-0.77	*
Early years HLE (compared with 0-13)				
14-19	7.20	10.58	0.05	
20-24	4.80	10.76	0.04	
25-32	22.58	10.74	0.17	*
>33	48.43	13.44	0.36	***
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	14.28	7.22	0.11	*
KS1 HLE educational computing high	0.15	10.57	0.00	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	39.77	6.73	0.30	***
KS3 HLE academic enrichment high	63.11	9.62	0.47	***
FSM school level (continuous)	0.11	0.36	0.03	
% White British neighbourhood (continuous)	-0.36	0.22	-0.13	
Intercept	374.25	21.13		***
Variance-school level	7701.87	951.69		***
Variance-student level	17763.03	579.71		***
Total variance	25464.90			
Number of students	2497			
Number of schools	610			
Deviance (-2 x Log Restricted-Likelihood)	31642.29			
Intra-school correlation (ICC)	0.3025			
% Reduction student variance	15.1			
% Reduction school variance	28.3			
% Reduction total variance	19.6			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.2: Contextualised model for total GCSE score in Year 11 -Mother's and Father's highest qualification level

Fixed Effects	Total GCSE score			
	Coef.	SE	ES	Sig
Age	2.75	0.84	0.14	**
Gender	26.29	6.14	0.20	***
Ethnic group (compared with White UK)				
White European Heritage	20.69	17.00	0.16	
Black Caribbean Heritage	37.59	16.95	0.28	*
Black African Heritage	4.14	24.25	0.03	
Any Other Ethnic Minority	18.37	20.91	0.14	
Indian	54.22	22.19	0.41	*
Pakistani	57.65	19.02	0.43	**
Bangladeshi	111.92	30.98	0.84	***
Mixed Race	-14.19	13.55	-0.11	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-36.50	9.04	-0.28	***
Early health problem (compared with none)				
1+ Health problem	-16.09	6.62	-0.12	*
Number of siblings at age 3/5(compared with none)				
1 sibling	6.74	8.28	0.05	
2 siblings	0.64	8.81	0.00	
3 + siblings	-21.02	10.32	-0.16	*
Missing	94.32	41.16	0.71	*
Year 11 FSM (compared with no)	-40.67	8.36	-0.31	***
KS1 family salary (compared with no earned salary)				
£2500-15000	13.11	9.90	0.10	
£17500-27500	19.99	10.68	0.15	
£30000-35000	29.81	12.26	0.22	*
£37500-66000	30.48	11.51	0.23	**
£67500-132000	33.92	19.37	0.26	
Missing	16.01	10.07	0.12	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-6.22	14.02	-0.05	
Skilled non-manual	-21.98	14.92	-0.17	
Skilled manual	-40.74	16.14	-0.31	*
Semi-skilled	-39.67	16.79	-0.30	*
Unskilled	-35.47	23.60	-0.27	
Never worked	-27.78	23.14	-0.21	
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	21.95	10.77	0.17	*
Academic age 16	38.23	8.79	0.29	***
Academic age 18	49.38	13.45	0.37	***
Degree or higher degree	62.96	14.01	0.47	***
Other professional	36.56	26.80	0.28	
Missing	-17.42	23.13	-0.13	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Total GCSE score			
	Coef.	SE	ES	Sig
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	27.72	11.50	0.21	*
Academic age 16	18.34	9.71	0.14	
Academic age 18	4.14	13.87	0.03	
Degree or higher degree	26.84	13.95	0.20	
Other professional	16.74	31.53	0.13	
Absent father	5.57	9.59	0.04	
Missing	-112.13	41.79	-0.85	**
Early years HLE (compared with 0-13)				
14-19	6.34	10.55	0.05	
20-24	2.09	10.74	0.02	
25-32	19.66	10.71	0.15	
>33	44.88	13.42	0.34	***
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	13.80	7.20	0.10	
KS1 HLE educational computing high	1.08	10.54	0.01	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	37.84	6.72	0.29	***
KS3 HLE academic enrichment high	61.57	9.60	0.46	***
FSM school level (continuous)	0.13	0.36	0.03	
% White British (continuous)	-0.36	0.21	-0.13	
Intercept	371.67	21.63		***
Variance-school level	7787.26	954.61		***
Variance-student level	17586.23	574.79		***
Total variance	25373.49			
Number of students	2497			
Number of schools	610			
Deviance (-2 x Log Restricted-Likelihood)	31586.70			
Intra-school correlation (ICC)	0.3069			
% Reduction student variance	16.0			
% Reduction school variance	27.5			
% Reduction total variance	19.9			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table A4.3: Contextualised model for grade achieved in full GCSE English in Year 11 -Parents' highest qualification level

Fixed Effects	GCSE English			
	Coef.	SE	ES	Sig
Age	0.15	0.05	0.13	**
Gender	2.82	0.33	0.38	***
Ethnic group (compared with White UK)				
White European heritage	-0.09	0.95	-0.01	
Black Caribbean heritage	1.42	0.93	0.19	
Black African heritage	0.10	1.30	0.01	
Any other ethnic minority	1.77	1.12	0.24	
Indian	3.05	1.20	0.41	*
Pakistani	1.73	1.02	0.23	
Bangladeshi	4.11	1.72	0.55	*
Mixed Race	0.05	0.76	0.01	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-1.28	0.51	-0.17	*
Early health problems (compared with none)				
1+ Health problem	-1.04	0.37	-0.14	**
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.46	0.45	0.06	
2 siblings	-0.45	0.48	-0.06	
3 + siblings	-2.09	0.58	-0.28	***
Missing	0.72	2.98	0.10	
Mother's age at age 3/5	0.82	0.27	0.15	**
Year 11 FSM (compared with no)	-2.30	0.48	-0.31	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.35	0.56	0.05	
£17500-27500	1.48	0.60	0.20	*
£30000-35000	1.47	0.68	0.20	*
£37500-66000	1.95	0.64	0.26	**
£67500-132000	3.04	1.05	0.41	**
Missing	0.97	0.54	0.13	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-1.49	0.78	-0.20	
Skilled non-manual	-1.90	0.83	-0.25	*
Skilled manual	-3.46	0.91	-0.46	***
Semi-skilled	-3.94	0.94	-0.53	***
Unskilled	-3.69	1.33	-0.49	**
Never worked	-0.97	1.30	-0.13	
Missing	-1.71	3.56	-0.23	
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	1.90	0.66	0.25	**
Academic age 16	2.02	0.53	0.27	***
Academic age 18	3.12	0.70	0.42	***
Other professional	3.76	1.36	0.50	**
Degree	5.14	0.73	0.69	***
Higher degree	5.96	1.03	0.80	***
Absent father or missing mother's	-0.49	2.31	-0.07	
Missing	-5.61	5.50	-0.75	

Fixed Effects	GCSE English			
	Coef.	SE	ES	Sig
Early years HLE (compared with 0-13)				
14-19	0.56	0.59	0.07	
20-24	0.62	0.60	0.08	
25-32	1.60	0.60	0.21	**
>33	3.84	0.74	0.51	***
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	0.77	0.38	0.10	*
KS2 HLE educational computing high	0.12	0.60	0.02	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	1.87	0.38	0.25	***
KS3 HLE academic enrichment high	3.57	0.53	0.48	***
FSM school level (continuous)	-0.04	0.02	-0.18	**
% White British neighbourhood (continuous)	-0.03	0.01	-0.20	**
Intercept	36.12	1.17		***
Variance-school level	4.08	1.10		***
Variance-student level	56.17	1.79		***
Total variance	60.26			
Number of students	2343			
Number of schools	573			
Deviance (-2 x Log Restricted-Likelihood)	16134.96			
Intra-school correlation (ICC)	0.0678			
% Reduction student variance	20.8			
% Reduction school variance	84.7			
% Reduction total variance	38.2			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.4: Contextualised model for grade achieved in full GCSE English in Year 11 - Mother's and Father's highest qualification level

Fixed Effects	GCSE English			
	Coef.	SE	ES	Sig
Age	0.15	0.05	0.14	**
Gender	2.92	0.33	0.39	***
Ethnic group (compared with White UK)				
White European Heritage	-0.10	0.95	-0.01	
Black Caribbean Heritage	1.19	0.94	0.16	
Black African Heritage	-0.11	1.29	-0.02	
Any Other Ethnic Minority	1.69	1.11	0.23	
Indian	3.22	1.19	0.43	**
Pakistani	1.87	1.02	0.25	
Bangladeshi	4.08	1.71	0.55	*
Mixed Race	0.06	0.76	0.01	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-1.12	0.50	-0.15	*
Early health problem (compared with none)				
1+ Health problem	-1.04	0.37	-0.14	**
Number of siblings at age 3/5(compared with none)				
1 sibling	0.46	0.45	0.06	
2 siblings	-0.38	0.48	-0.05	
3 + siblings	-1.90	0.58	-0.25	**
Missing	0.78	2.95	0.11	
Mother's age at age 3/5	0.78	0.27	0.14	**
Year 11 FSM (compared with no)	-2.19	0.48	-0.29	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.33	0.55	0.04	
£17500-27500	1.36	0.60	0.18	*
£30000-3500	1.26	0.68	0.17	
£37500-6600	1.65	0.64	0.22	*
£67500-132000	2.47	1.06	0.33	*
Missing	0.96	0.54	0.13	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-1.27	0.79	-0.17	
Skilled non-manual	-1.64	0.85	-0.22	
Skilled manual	-3.08	0.93	-0.41	***
Semi-skilled	-3.47	0.96	-0.47	***
Unskilled	-3.28	1.34	-0.44	*
Never worked	-0.58	1.31	-0.08	
Missing	-1.62	3.55	-0.22	
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	1.80	0.60	0.24	**
Academic age 16	2.07	0.49	0.28	***
Academic age 18	2.87	0.74	0.39	***
Degree or higher degree	5.25	0.77	0.70	***
Other professional	3.94	1.47	0.53	**
Missing	1.07	1.59	0.14	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	GCSE English			
	Coef.	SE	ES	Sig
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	1.84	0.63	0.25	**
Academic age 16	1.41	0.53	0.19	**
Academic age 18	1.83	0.76	0.25	*
Degree or higher degree	2.49	0.77	0.33	**
Other professional	2.84	1.74	0.38	
Absent father	0.69	0.53	0.09	
Missing	-4.54	3.21	-0.61	
Early years HLE (compared with 0-13)				
14-19	0.53	0.59	0.07	
20-24	0.43	0.60	0.06	
25-32	1.43	0.59	0.19	*
>33	3.57	0.74	0.48	***
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	0.71	0.37	0.10	
KS2 HLE educational computing high	0.15	0.60	0.02	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	1.73	0.37	0.23	***
KS3 HLE academic enrichment high	3.48	0.53	0.47	***
FSM school level (continuous)	-0.04	0.02	-0.17	**
% White British (continuous)	-0.03	0.01	-0.21	**
Intercept	35.16	1.20		***
Variance-school level	4.33	1.14		***
Variance-student level	55.43	1.78		***
Total variance	59.77			
Number of students	2343			
Number of schools	573			
Deviance (-2 x Log Restricted-Likelihood)	16104.06			
Intra-school correlation (ICC)	0.0725			
% Reduction student variance	21.8			
% Reduction school variance	83.7			
% Reduction total variance	38.7			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table A4.5: Contextualised model for grade achieved in full GCSE maths in Year 11- Parents' highest qualification level

Fixed Effects	GCSE maths			
	Coef.	SE	ES	Sig
Age	0.19	0.05	0.14	***
Gender	-0.61	0.39	-0.07	
Ethnic group (compared with White UK)				
White European heritage	0.97	1.07	0.11	
Black Caribbean heritage	1.60	1.10	0.18	
Black African heritage	0.67	1.53	0.07	
Any other ethnic minority	3.83	1.29	0.42	**
Indian	4.80	1.42	0.53	***
Pakistani	2.69	1.16	0.29	*
Bangladeshi	3.96	2.03	0.43	
Mixed Race	0.90	0.88	0.10	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-2.47	0.59	-0.27	***
Early health problems (compared with none)				
1+ Health problem	-1.43	0.43	-0.16	***
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.58	0.52	0.06	
2 siblings	-0.53	0.56	-0.06	
3 + siblings	-1.53	0.68	-0.17	*
Missing	0.21	3.59	0.02	
Mother's age at age 3/5	0.66	0.31	0.10	*
Year 11 FSM (compared with no)	-3.41	0.56	-0.37	***
KS1 family salary (compared with no earned salary)				
£2500-15000	-0.06	0.65	-0.01	
£17500-27500	1.14	0.70	0.12	
£30000-35000	1.25	0.80	0.14	
£37500-66000	2.02	0.74	0.22	**
£67500-132000	2.57	1.07	0.28	*
Missing	0.94	0.67	0.10	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-1.84	0.82	-0.20	*
Skilled non-manual	-3.00	0.91	-0.33	***
Skilled manual	-4.31	1.01	-0.47	***
Semi-skilled	-4.96	1.05	-0.54	***
Unskilled	-6.02	1.54	-0.66	***
Never worked	-2.30	1.49	-0.25	
Missing	-7.88	3.65	-0.86	*

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	GCSE maths			
	Coef.	SE	ES	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	1.54	0.78	0.17	*
Academic age 16	1.83	0.63	0.20	**
Academic age 18	3.81	0.83	0.42	***
Other professional	4.43	1.64	0.48	**
Degree	5.93	0.85	0.65	***
Higher degree	6.77	1.13	0.74	***
Absent father or missing mother's	-0.61	2.79	-0.07	
Missing	-14.73	6.68	-1.61	*
Early years HLE (compared with 0-13)				
14-19	0.96	0.75	0.10	
20-24	1.44	0.76	0.16	
25-32	2.07	0.76	0.23	**
>33	4.08	0.91	0.45	***
Missing	3.70	1.45	0.40	*
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	1.03	0.50	0.11	*
KS1 HLE outing high	0.73	0.82	0.08	
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	1.40	0.44	0.15	**
KS2 HLE educational computing high	0.81	0.71	0.09	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	2.38	0.44	0.26	***
KS3 HLE academic enrichment high	4.28	0.61	0.47	***
% White British neighbourhood (continuous)	-0.03	0.01	-0.15	*
Intercept	36.30	1.37		***
Variance-school level	3.58	1.34		***
Variance-student level	83.48	2.56		***
Total variance	87.06			
Number of students	2535			
Number of schools	675			
Deviance (-2 x Log Restricted-Likelihood)	18393.63			
Intra-school correlation (ICC)	0.0411			
% Reduction student variance	18.6			
% Reduction school variance	86.0			
% Reduction total variance	32.0			

* p<0.05, ** p<0.01, *** p<0.001

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Table A4.6: Contextualised model for grade achieved in full GCSE maths in Year 11- Mother's and Father's highest qualification level

Fixed Effects	GCSE maths			
	Coef.	SE	ES	Sig
Age	0.19	0.05	0.14	***
Gender	-0.51	0.39	-0.06	
Ethnic group (compared with White UK)				
White European Heritage	1.10	1.07	0.12	
Black Caribbean Heritage	1.57	1.11	0.17	
Black African Heritage	0.72	1.53	0.08	
Any Other Ethnic Minority	3.92	1.29	0.43	**
Indian	5.00	1.42	0.55	***
Pakistani	2.80	1.16	0.31	*
Bangladeshi	4.02	2.02	0.44	*
Mixed Race	0.94	0.88	0.10	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-2.33	0.59	-0.26	***
Early health problem (compared with none)				
1+ Health problem	-1.41	0.42	-0.15	***
Number of siblings at age 3/5(compared with none)				
1 sibling	0.46	0.52	0.05	
2 siblings	-0.61	0.56	-0.07	
3 + siblings	-1.51	0.68	-0.17	*
Missing	0.43	3.57	0.05	
Mother's age at age 3/5	0.59	0.31	0.09	
Year 11 FSM (compared with no)	-3.24	0.56	-0.36	***
KS1 family salary (compared with no earned salary)				
£2500-15000	-0.05	0.65	-0.01	
£17500-27500	1.04	0.71	0.11	
£30000-3500	1.08	0.80	0.12	
£37500-66000	1.81	0.74	0.20	*
£67500-132000	1.99	1.07	0.22	
Missing	0.89	0.67	0.10	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-1.34	0.83	-0.15	
Skilled non-manual	-2.54	0.92	-0.28	**
Skilled manual	-3.75	1.03	-0.41	***
Semi-skilled	-4.29	1.07	-0.47	***
Unskilled	-5.29	1.56	-0.58	***
Never worked	-1.63	1.51	-0.18	
Missing	-7.09	3.65	-0.78	
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	1.07	0.71	0.12	
Academic age 16	2.39	0.58	0.26	***
Academic age 18	3.24	0.86	0.36	***
Degree or higher degree	4.88	0.88	0.54	***
Other professional	5.18	1.72	0.57	**
Missing	-0.51	1.92	-0.06	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	GCSE maths			
	Coef.	SE	ES	Sig
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	1.59	0.76	0.17	*
Academic age 16	1.01	0.64	0.11	
Academic age 18	1.97	0.89	0.22	*
Degree or higher degree	3.63	0.88	0.40	***
Other professional	2.08	2.02	0.23	
Absent father	0.24	0.64	0.03	
Missing	-3.57	3.61	-0.39	
Early years HLE (compared with 0-13)				
14-19	0.88	0.75	0.10	
20-24	1.26	0.76	0.14	
25-32	1.89	0.76	0.21	*
>33	3.85	0.91	0.42	***
Missing	3.40	1.44	0.37	*
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	0.98	0.50	0.11	
KS1 HLE outing high	0.66	0.82	0.07	
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	1.39	0.44	0.15	**
KS2 HLE educational computing high	0.87	0.71	0.10	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	2.24	0.44	0.25	***
KS3 HLE academic enrichment high	4.14	0.61	0.45	***
% White British (continuous)	-0.03	0.01	-0.16	*
Intercept	35.40	1.41		***
Variance-school level	3.92	1.38		***
Variance-student level	82.79	2.55		***
Total variance	86.71			
Number of students	2535			
Number of schools	675			
Deviance (-2 x Log Restricted-Likelihood)	18371.65			
Intra-school correlation (ICC)	0.0452			
% Reduction student variance	19.3			
% Reduction school variance	84.7			
% Reduction total variance	32.3			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.7: Contextualised model for total number of full GCSE entries in Year 11- Parents' highest qualification level

Fixed Effects	Total no. of full GCSE entries			
	Coef.	SE	ES	Sig
Gender	0.21	0.09	0.11	*
Ethnic group (compared with White UK)				
White European heritage	0.05	0.25	0.03	
Black Caribbean heritage	0.20	0.25	0.10	
Black African heritage	0.16	0.36	0.08	
Any other ethnic minority	1.05	0.31	0.53	***
Indian	0.73	0.33	0.37	*
Pakistani	0.58	0.29	0.29	*
Bangladeshi	1.15	0.47	0.58	*
Mixed Race	-0.09	0.20	-0.05	
Birth weight (compared with normal, i.e. > 2500g)				
Fetal infant < 1500g	-0.78	0.38	-0.39	*
Low birth weight 1501-2500g	-0.14	0.17	-0.07	
Missing	0.64	0.37	0.32	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.59	0.13	-0.30	***
Early health problems (compared with none)				
1+ Health problem	-0.24	0.10	-0.12	*
Number of siblings at age 3/5 (compared with none)				
1 sibling	-0.12	0.12	-0.06	
2 siblings	-0.15	0.13	-0.08	
3 + siblings	-0.65	0.15	-0.33	***
Missing	-0.66	0.74	-0.33	
Year 11 FSM (compared with no)	-0.45	0.12	-0.23	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.25	0.15	0.12	
£17500-27500	0.45	0.16	0.23	**
£30000-35000	0.64	0.18	0.32	***
£37500-66000	0.59	0.17	0.30	***
£67500-132000	1.04	0.29	0.52	***
Missing	0.35	0.15	0.17	*
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	0.00	0.22	0.00	
Skilled non-manual	-0.22	0.23	-0.11	
Skilled manual	-0.71	0.25	-0.36	**
Semi-skilled	-0.51	0.26	-0.25	
Unskilled	-1.15	0.36	-0.58	**
Never worked	-0.13	0.35	-0.06	
Missing	-0.32	0.70	-0.16	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Total no. of full GCSE entries			
	Coef.	SE	ES	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	0.24	0.18	0.12	
Academic age 16	0.24	0.14	0.12	
Academic age 18	0.45	0.19	0.23	*
Other professional	0.60	0.37	0.30	
Degree	0.80	0.20	0.40	***
Higher degree	0.72	0.28	0.36	*
Absent father or missing mother's	0.86	0.61	0.43	
Missing	-0.70	0.92	-0.35	
Early years HLE (compared with 0-13)				
14-19	0.51	0.17	0.26	**
20-24	0.48	0.17	0.24	**
25-32	0.70	0.17	0.35	***
>33	1.01	0.21	0.51	***
Missing	0.68	0.33	0.34	*
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	0.25	0.11	0.13	*
KS1 HLE educational computing high	0.04	0.16	0.02	
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	0.27	0.10	0.13	**
KS2 HLE educational computing high	0.15	0.17	0.08	
KS3 HLE computer (compared with low)				
KS3 HLE computer medium	0.22	0.11	0.11	*
KS3 HLE computer high	0.29	0.14	0.15	*
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.61	0.11	0.31	***
KS3 HLE academic enrichment high	0.86	0.15	0.43	***
FSM school level (continuous)	-0.04	0.01	-0.55	***
% White British neighbourhood (continuous)	-0.01	0.00	-0.19	*
Intercept	5.76	0.33		***
Variance-school level	1.73	0.22		***
Variance-student level	3.94	0.13		***
Total variance	5.67			
Number of students	2510			
Number of schools	614			
Deviance (-2 x Log Restricted-Likelihood)	11092.77			
Intra-school correlation (ICC)	0.3047			
% Reduction student variance	11.4			
% Reduction school variance	61.9			
% Reduction total variance	36.9			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table A4.8: Contextualised model for total number of full GCSE entries in Year 11 -Mother's and Father's highest qualification level

Fixed Effects	Total no. of full GCSE entries			
	Coef.	SE	ES	Sig
Gender	0.22	0.09	0.11	*
Ethnic group (compared with White UK)				
White European Heritage	0.05	0.25	0.02	
Black Caribbean Heritage	0.26	0.25	0.13	
Black African Heritage	0.18	0.36	0.09	
Any Other Ethnic Minority	1.03	0.31	0.52	***
Indian	0.77	0.33	0.39	*
Pakistani	0.63	0.28	0.32	*
Bangladeshi	1.24	0.46	0.63	**
Mixed Race	-0.07	0.20	-0.03	
Birth weight (compared with normal, i.e. > 2500g)				
Fetal infant < 1500g	-0.80	0.38	-0.40	*
Low birth weight 1501-2500g	-0.10	0.17	-0.05	
Missing	0.73	0.36	0.37	*
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.53	0.13	-0.27	***
Early health problem (compared with none)				
1+ Health problem	-0.24	0.10	-0.12	*
Number of siblings at age 3/5(compared with none)				
1 sibling	-0.13	0.12	-0.07	
2 siblings	-0.18	0.13	-0.09	
3 + siblings	-0.65	0.15	-0.33	***
Missing	-0.34	0.69	-0.17	
Year 11 FSM (compared with no)	-0.44	0.12	-0.22	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.21	0.15	0.11	
£17500-27500	0.37	0.16	0.19	*
£30000-35000	0.56	0.18	0.28	**
£37500-66000	0.49	0.17	0.25	**
£67500-132000	0.91	0.29	0.46	**
Missing	0.32	0.15	0.16	*
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	0.06	0.22	0.03	
Skilled non-manual	-0.15	0.24	-0.07	
Skilled manual	-0.63	0.25	-0.32	*
Semi-skilled	-0.36	0.26	-0.18	
Unskilled	-0.99	0.36	-0.50	**
Never worked	0.09	0.36	0.04	
Missing	-0.01	0.67	-0.00	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Total no. of full GCSE entries			
	Coef.	SE	ES	Sig
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.09	0.16	0.04	
Academic age 16	0.21	0.13	0.11	
Academic age 18	0.45	0.20	0.23	*
Degree or higher degree	0.61	0.21	0.31	**
Other professional	0.40	0.40	0.20	
Missing	-0.08	0.35	-0.04	
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.55	0.17	0.28	**
Academic age 16	0.32	0.14	0.16	*
Academic age 18	0.26	0.21	0.13	
Degree or higher degree	0.49	0.21	0.25	*
Other professional	0.64	0.47	0.33	
Absent father	-0.06	0.14	-0.03	
Missing	-1.25	0.68	-0.63	
Early years HLE (compared with 0-13)				
14-19	0.48	0.17	0.24	**
20-24	0.45	0.17	0.23	**
25-32	0.66	0.17	0.33	***
>33	0.96	0.21	0.48	***
Missing	0.68	0.33	0.34	*
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	0.24	0.11	0.12	*
KS1 HLE educational computing high	0.06	0.16	0.03	
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	0.27	0.10	0.14	**
KS2 HLE educational computing high	0.15	0.16	0.08	
KS3 HLE computer (compared with low)				
KS3 HLE computer medium	0.20	0.11	0.10	
KS3 HLE computer high	0.30	0.14	0.15	*
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.58	0.11	0.30	***
KS3 HLE academic enrichment high	0.85	0.15	0.43	***
FSM school level (continuous)	-0.03	0.01	-0.54	***
% White British (continuous)	-0.01	0.00	-0.18	*
Intercept	5.66	0.34		***
Variance-school level	1.74	0.22		***
Variance-student level	3.90	0.13		***
Total variance	5.65			
Number of students	2510			
Number of schools	614			
Deviance (-2 x Log Restricted-Likelihood)	11080.81			
Intra-school correlation (ICC)	0.3086			
% Reduction student variance	12.2			
% Reduction school variance	61.6			
% Reduction total variance	37.1			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.9: Contextualised model for achieving 5 A*-C in Year 11 - Parents' highest qualification level

Fixed Effects	Achieved 5 A*-C			
	Coef.	SE	OR	Sig
Age	0.01	0.01	1.01	
Gender	0.37	0.10	1.45	***
Ethnic group (compared with White UK)				
White European Heritage	-0.16	0.30	0.85	
Black Caribbean Heritage	0.26	0.28	1.29	
Black African Heritage	-0.03	0.39	0.97	
Any Other Ethnic Minority	0.56	0.34	1.75	
Indian	0.72	0.39	2.06	
Pakistani	0.22	0.30	1.24	
Bangladeshi	0.88	0.53	2.41	
Mixed Race	-0.07	0.23	0.93	
Early developmental problems (compared with none)				
1+ Developmental problem	-0.39	0.16	0.68	*
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.43	0.15	0.65	**
Early health problems (compared with none)				
1+ Health problem	-0.46	0.12	0.63	***
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.13	0.14	1.14	
2 siblings	-0.08	0.15	0.93	
3 + siblings	-0.48	0.18	0.62	**
Missing	-1.09	1.10	0.34	
Mother's age at age 3/5	0.29	0.08	1.33	***
Year 11 FSM (compared with no)	-0.49	0.15	0.61	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.08	0.17	1.08	
£17500-27500	0.48	0.18	1.61	**
£30000-35000	0.46	0.21	1.59	*
£37500-66000	0.57	0.20	1.76	**
£67500-132000	1.37	0.51	3.94	**
Missing	0.28	0.17	1.32	
Parents' highest SES at age 3/5 (compared with Professional, Non-Manual)				
Other professional non-manual	-0.02	0.30	0.99	
Skilled non-manual	-0.14	0.31	0.87	
Skilled manual	-0.69	0.32	0.50	*
Semi-skilled	-0.57	0.33	0.57	
Unskilled	-0.85	0.44	0.43	
Never worked	-0.00	0.42	1.00	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Achieved 5 A*-C			
	Coef.	SE	OR	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	0.34	0.20	1.40	
Academic age 16	0.20	0.16	1.23	
Academic age 18	0.52	0.21	1.68	*
Other professional	1.20	0.45	3.32	**
Degree	1.21	0.24	3.36	***
Higher degree	1.28	0.42	3.58	**
Absent father or missing mother's	0.60	0.69	1.82	
Early years HLE (compared with 0-13)				
14-19	0.28	0.18	1.32	
20-24	0.42	0.18	1.51	*
25-32	0.60	0.18	1.82	**
>33	1.28	0.25	3.61	***
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	0.31	0.13	1.36	*
KS1 HLE outing high	0.20	0.23	1.22	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.75	0.12	2.12	***
KS3 HLE academic enrichment high	1.03	0.19	2.80	***
% White British neighbourhood (continuous)	-0.01	0.00	0.99	**
FSM school level (continuous)	-0.02	0.00	0.98	***
Intercept	-0.94	0.40		*
Variance-school level	0.21	0.09		***
Number of students	2429			
Number of schools	601			
Deviance (-2 x Log Restricted-Likelihood)	2569.47			
% Reduction school variance	82.9			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.10: Contextualised model for achieving 5 A*-C in Year 11- Mother's and Father's highest qualification level

Fixed Effects	Achieved 5 A*-C			
	Coef.	SE	OR	Sig
Age	0.01	0.01	1.01	
Gender	0.40	0.11	1.48	***
Ethnic group (compared with White UK)				
White European Heritage	-0.16	0.31	0.85	
Black Caribbean Heritage	0.31	0.28	1.36	
Black African Heritage	-0.00	0.39	1.00	
Any Other Ethnic Minority	0.59	0.34	1.80	
Indian	0.73	0.40	2.09	
Pakistani	0.23	0.31	1.25	
Bangladeshi	0.81	0.53	2.24	
Mixed Race	-0.05	0.24	0.95	
Early developmental problems (compared with none)				
1+ Developmental problem	-0.37	0.16	0.69	*
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.37	0.16	0.69	*
Early health problem (compared with none)				
1+ Health problem	-0.46	0.12	0.63	***
Number of siblings at age 3/5(compared with none)				
1 sibling	0.09	0.14	1.10	
2 siblings	-0.11	0.15	0.89	
3 + siblings	-0.48	0.18	0.62	**
Missing	-1.00	1.10	0.37	
Mother's age at age 3/5	0.26	0.08	1.30	**
Year 11 FSM (compared with no)	-0.47	0.15	0.62	**
KS1 family salary (compared with no earned salary)				
£2500-15000	0.05	0.17	1.05	
£17500-27500	0.41	0.18	1.50	*
£30000-35000	0.37	0.21	1.44	
£37500-66000	0.46	0.21	1.58	*
£67500-132000	1.20	0.52	3.31	*
Missing	0.24	0.17	1.27	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	0.07	0.32	1.08	
Skilled non-manual	-0.04	0.32	0.96	
Skilled manual	-0.59	0.34	0.56	
Semi-skilled	-0.39	0.34	0.68	
Unskilled	-0.60	0.45	0.55	
Never worked	0.16	0.43	1.17	
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.15	0.18	1.16	
Academic age 16	0.31	0.15	1.37	*
Academic age 18	0.42	0.23	1.52	
Degree or higher degree	1.14	0.28	3.14	***
Other professional	1.14	0.53	3.13	*
Missing	0.46	0.46	1.58	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Achieved 5 A*-C			
	Coef.	SE	OR	Sig
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.68	0.19	1.97	***
Academic age 16	0.38	0.16	1.46	*
Academic age 18	0.53	0.24	1.70	*
Degree or higher degree	0.91	0.27	2.48	***
Other professional	0.80	0.57	2.22	
Absent father	0.06	0.16	1.06	
Missing	0.72	0.89	2.05	
Early years HLE (compared with 0-13)				
14-19	0.28	0.18	1.32	
20-24	0.41	0.19	1.51	*
25-32	0.57	0.19	1.77	**
>33	1.25	0.25	3.49	***
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	0.28	0.13	1.32	*
KS1 HLE outing high	0.15	0.24	1.16	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.72	0.12	2.06	***
KS3 HLE academic enrichment high	1.02	0.19	2.77	***
% White British (continuous)	-0.01	0.00	0.99	**
FSM school level (continuous)	-0.02	0.00	0.98	***
Intercept	-1.22	0.41		**
Variance-school level	0.21	0.09		***
Number of students	2429			
Number of schools	601			
Deviance (-2 x Log Restricted-Likelihood)	2545.09			
% Reduction school variance	83.0			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.11: Contextualised model for achieving 5 A*-C including English and maths in Year 11 - Parents' highest qualification level

Fixed Effects	Achieved 5 A*-C including English and maths			
	Coef.	SE	OR	Sig
Age	0.04	0.01	1.04	**
Gender	0.22	0.10	1.24	*
Ethnic group (compared with White UK)				
White European Heritage	0.24	0.27	1.27	
Black Caribbean Heritage	0.53	0.26	1.70	*
Black African Heritage	-0.22	0.37	0.80	
Any Other Ethnic Minority	0.40	0.32	1.50	
Indian	0.83	0.38	2.28	*
Pakistani	0.66	0.28	1.94	*
Bangladeshi	0.70	0.49	2.02	
Mixed Race	0.03	0.22	1.03	
Early developmental problems (compared with none)				
1+ Developmental problem	-0.40	0.15	0.67	**
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.47	0.15	0.63	**
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.12	0.13	1.12	
2 siblings	-0.08	0.14	0.92	
3 + siblings	-0.38	0.17	0.69	*
Missing	-0.32	0.39	0.72	
Year 11 FSM (compared with no)	-0.68	0.14	0.51	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.07	0.16	1.08	
£17500-27500	0.37	0.17	1.45	*
£30000-35000	0.45	0.20	1.57	*
£37500-66000	0.67	0.19	1.95	***
£67500-132000	0.54	0.30	1.71	
Missing	0.50	0.16	1.64	**
Parents' highest SES at age 3/5 (compared with Professional, Non-Manual)				
Other professional non-manual	0.04	0.24	1.04	
Skilled non-manual	-0.11	0.25	0.90	
Skilled manual	-0.52	0.27	0.59	*
Semi-skilled	-0.54	0.27	0.58	*
Unskilled	-0.88	0.40	0.42	*
Never worked	-0.04	0.37	0.96	
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	0.34	0.19	1.41	
Academic age 16	0.38	0.15	1.46	*
Academic age 18	0.63	0.20	1.87	**
Other professional	1.09	0.42	2.97	*
Degree	1.37	0.22	3.92	***
Higher degree	1.05	0.32	2.86	***
Absent father or missing mother's	1.04	0.65	2.84	

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Fixed Effects	Achieved 5 A*-C including English and maths			
	Coef.	SE	OR	Sig
Early years HLE (compared with 0-13)				
14-19	0.23	0.17	1.26	
20-24	0.31	0.18	1.37	
25-32	0.59	0.17	1.81	***
>33	1.06	0.23	2.90	***
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	0.33	0.12	1.39	**
KS1 HLE outing high	0.14	0.21	1.16	
KS3 HLE parental interest (compared with low)				
KS3 HLE parental interest medium	0.03	0.16	1.03	
KS3 HLE parental interest high	0.29	0.12	1.34	*
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.63	0.12	1.88	***
KS3 HLE academic enrichment high	0.96	0.18	2.60	***
% White British neighbourhood (continuous)	-0.01	0.00	0.99	*
Intercept	-1.23	0.34		***
Variance-school level	0.36	0.11		***
Number of students	2753			
Number of schools	735			
Deviance (-2 x Log Restricted-Likelihood)	3032.73			
% Reduction school variance	42.6			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table A4.12: Contextualised model for achieving 5 A*-C including English and maths in Year 11 - Mother's and Father's highest qualification level)

Fixed Effects	Achieved 5 A*-C including English and maths			
	Coef.	SE	OR	Sig
Age	0.04	0.01	1.04	**
Gender	0.23	0.10	1.26	*
Ethnic group (compared with White UK)				
White European Heritage	0.25	0.28	1.28	
Black Caribbean Heritage	0.55	0.27	1.74	*
Black African Heritage	-0.18	0.38	0.84	
Any Other Ethnic Minority	0.43	0.32	1.54	
Indian	0.88	0.38	2.41	*
Pakistani	0.76	0.28	2.15	**
Bangladeshi	0.83	0.48	2.30	
Mixed Race	0.05	0.22	1.06	
Early developmental problems (compared with none)				
1+ Developmental problem	-0.38	0.15	0.68	**
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.43	0.15	0.65	**
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.11	0.13	1.12	
2 siblings	-0.08	0.14	0.92	
3 + siblings	-0.36	0.17	0.70	*
Missing	0.06	0.70	1.06	
Year 11 FSM (compared with no)	-0.67	0.14	0.51	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.05	0.16	1.05	
£17500-27500	0.32	0.17	1.38	
£30000-35000	0.41	0.20	1.50	*
£37500-66000	0.60	0.19	1.82	**
£67500-132000	0.36	0.31	1.43	
Missing	0.47	0.16	1.60	**
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	0.17	0.24	1.19	
Skilled non-manual	0.03	0.25	1.03	
Skilled manual	-0.36	0.27	0.69	
Semi-skilled	-0.37	0.28	0.69	
Unskilled	-0.66	0.40	0.52	
Never worked	0.16	0.38	1.17	
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.27	0.17	1.30	
Academic age 16	0.40	0.14	1.49	**
Academic age 18	0.65	0.22	1.91	**
Degree or higher degree	1.12	0.24	3.06	***
Other professional	1.41	0.53	4.11	**
Missing	0.08	0.38	1.09	

* p<0.05, ** p<0.01, *** p<0.001

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Fixed Effects	Achieved 5 A*-C including English and maths			
	Coef.	SE	OR	Sig
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.37	0.19	1.45	*
Academic age 16	0.39	0.16	1.48	*
Academic age 18	0.23	0.22	1.25	
Degree or higher degree	0.73	0.24	2.07	**
Other professional	0.37	0.51	1.45	
Absent father	0.10	0.16	1.11	
Missing	-0.23	0.69	0.80	
Early years HLE (compared with 0-13)				
14-19	0.22	0.17	1.25	
20-24	0.29	0.18	1.34	
25-32	0.56	0.18	1.75	**
>33	1.02	0.23	2.77	***
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	0.31	0.12	1.37	*
KS1 HLE outing high	0.12	0.21	1.12	
KS3 HLE parental interest (compared with low)				
KS3 HLE parental interest medium	0.01	0.16	1.01	
KS3 HLE parental interest high	0.27	0.12	1.31	*
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.61	0.12	1.83	***
KS3 HLE academic enrichment high	0.93	0.18	2.53	***
% White British (continuous)	-0.01	0.00	0.99	*
Intercept	-1.48	0.36		***
Variance-school level	0.37	0.11		**
Number of students	2753			
Number of schools	735			
Deviance (-2 x Log Restricted-Likelihood)	3018.18			
% Reduction school variance	40.7			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.13: Contextualised model for achieving EBacc in Year 11 - Parents' highest qualification level

Fixed Effects	Achieved EBacc			
	Coef.	SE	OR	Sig
Age	0.03	0.02	1.03	
Gender	0.55	0.15	1.74	***
Ethnic group (compared with White UK)				
White European Heritage	0.14	0.40	1.15	
Black Caribbean Heritage	-0.18	0.47	0.83	
Black African Heritage	-0.41	0.61	0.67	
Any Other Ethnic Minority	0.72	0.46	2.06	
Indian	0.38	0.49	1.46	
Pakistani	0.45	0.46	1.56	
Bangladeshi	0.89	0.74	2.44	
Mixed Race	0.07	0.32	1.07	
Mother's age at age 3/5	0.33	0.12	1.39	**
Year 11 FSM (compared with no)	-0.31	0.27	0.73	
KS1 family salary (compared with no earned salary)				
£2500-15000	0.37	0.30	1.44	
£17500-27500	0.67	0.30	1.96	*
£30000-35000	0.85	0.32	2.33	**
£37500-66000	0.72	0.30	2.06	*
£67500-132000	1.40	0.39	4.04	***
Missing	0.03	0.31	1.03	
Parents' highest SES at age 3/5 (compared with Professional, Non-Manual)				
Other professional non-manual	0.04	0.25	1.04	
Skilled non-manual	-0.06	0.29	0.94	
Skilled manual	-0.90	0.38	0.41	*
Semi-skilled	-0.54	0.41	0.58	
Unskilled	-0.61	0.72	0.54	
Never worked	0.04	0.58	1.04	
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	-0.05	0.35	0.95	
Academic age 16	-0.25	0.30	0.78	
Academic age 18	0.36	0.34	1.44	
Other professional	0.36	0.57	1.43	
Degree	0.82	0.34	2.28	*
Higher degree	1.04	0.41	2.83	*
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	-0.10	0.17	0.90	
KS1 HLE educational computing high	-0.67	0.30	0.51	*
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.65	0.16	1.92	***
KS3 HLE academic enrichment high	1.36	0.20	3.89	***
% White British neighbourhood (continuous)	-0.01	0.00	0.99	*
FSM school level (continuous)	-0.04	0.01	0.96	***

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Model statistics	Achieved EBacc			
	Coef.	SE	OR	Sig
Intercept	-3.16	0.45		***
Variance-school level	0.52	0.20		
Number of students	2255			
Number of schools	584			
Deviance (-2 x Log Restricted-Likelihood)	1505.62			
% Reduction school variance	77.3			

* p<0.05, ** p<0.01, *** p<0.001

Table A4.14: Contextualised model for achieving EBacc in Year 11 - Mother's and Father's highest qualification level

Fixed Effects	Achieved EBacc			
	Coef.	SE	OR	Sig
Age	0.03	0.02	1.03	
Gender	0.58	0.15	1.78	***
Ethnic group (compared with White UK)				
White European Heritage	0.12	0.41	1.13	
Black Caribbean Heritage	-0.14	0.48	0.87	
Black African Heritage	-0.50	0.64	0.60	
Any Other Ethnic Minority	0.75	0.47	2.11	
Indian	0.40	0.50	1.49	
Pakistani	0.50	0.47	1.64	
Bangladeshi	0.87	0.73	2.38	
Mixed Race	0.03	0.33	1.03	
Mother's age at age 3/5	0.30	0.12	1.34	*
Year 11 FSM (compared with no)	-0.32	0.27	0.73	
KS1 family salary (compared with no earned salary)				
£2500-15000	0.28	0.30	1.32	
£17500-27500	0.58	0.30	1.78	
£30000-35000	0.69	0.32	1.99	*
£37500-66000	0.56	0.30	1.75	
£67500-132000	1.15	0.39	3.16	**
Missing	-0.04	0.31	0.96	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	0.20	0.26	1.22	
Skilled non-manual	0.16	0.30	1.17	
Skilled manual	-0.73	0.39	0.48	
Semi-skilled	-0.24	0.43	0.79	
Unskilled	-0.25	0.73	0.78	
Never worked	0.34	0.60	1.41	
Mother's highest qualifications level at age 3/5 (compared with none)				
Vocational	-0.18	0.30	0.84	
Academic age 16	-0.23	0.26	0.79	
Academic age 18	0.23	0.33	1.26	
Degree or higher degree	0.61	0.32	1.84	
Other professional	0.33	0.56	1.39	
Father's highest qualifications level at age 3/5 (compared with none)				
Vocational	0.77	0.31	2.15	*
Academic age 16	0.38	0.29	1.46	
Academic age 18	0.77	0.35	2.16	*
Degree or higher degree	1.15	0.33	3.16	***
Other professional	0.85	0.68	2.33	
Absent father	0.13	0.31	1.14	
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	-0.11	0.18	0.90	
KS1 HLE educational computing high	-0.64	0.30	0.53	*

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Achieved EBacc			
	Coef.	SE	OR	Sig
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	0.61	0.16	1.84	***
KS3 HLE academic enrichment high	1.34	0.20	3.81	***
% White British (continuous)	-0.01	0.00	0.99	
FSM school level (continuous)	-0.04	0.01	0.96	***
Intercept	-3.62	0.48		***
Variance-school level	0.58	0.22		
Number of students	2255			
Number of schools	584			
Deviance (-2 x Log Restricted-Likelihood)	1490.59			
% Reduction school variance	74.4			

* p<0.05, ** p<0.01, *** p<0.001

Appendix 5: Contextualised value added multilevel models

Table A5.1: Contextualised value added models for total GCSE score

Fixed Effects	Total GCSEs score			
	Coef.	SE	ES	Sig
Age	2.57	0.75	0.16	***
Gender	28.25	5.70	0.25	***
Ethnic group (compared with White UK)				
White European heritage	25.68	15.48	0.23	
Black Caribbean heritage	29.97	15.17	0.26	*
Black African heritage	9.13	21.94	0.08	
Any other ethnic minority	4.83	18.65	0.04	
Indian	40.43	20.88	0.35	
Pakistani	46.85	17.09	0.41	**
Bangladeshi	94.77	28.30	0.83	***
Mixed Race	-1.99	12.24	-0.02	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-26.51	8.18	-0.23	**
Early health problems (compared with none)				
1+ Health problem	-13.07	5.94	-0.11	*
Number of siblings at age 3/5 (compared with none)				
1 sibling	3.68	7.36	0.03	
2 siblings	-0.35	7.79	-0.00	
3 + siblings	-13.65	9.27	-0.12	
Missing	46.79	42.04	0.41	
Year 11 FSM (compared with no)	-22.79	7.58	-0.20	**
KS1 family salary (compared with no earned salary)				
£2500-15000	12.85	8.87	0.11	
£17500-27500	9.22	9.46	0.08	
£30000-35000	29.42	10.85	0.26	**
£37500-66000	17.62	10.14	0.15	
£67500-132000	23.01	17.07	0.20	
Missing	7.66	9.10	0.07	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	6.03	12.25	0.05	
Skilled non-manual	-1.43	13.00	-0.01	
Skilled manual	-3.04	14.22	-0.03	
Semi-skilled	-1.91	14.75	-0.02	
Unskilled	-4.68	21.11	-0.04	
Never worked	-9.80	20.39	-0.09	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	Total GCSEs score			
	Coef.	SE	ES	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	18.20	10.80	0.16	
Academic age 16	29.30	8.48	0.26	***
Academic age 18	31.00	11.38	0.27	**
Other professional	13.55	21.47	0.12	
Degree	35.94	11.88	0.32	**
Higher degree	44.19	16.55	0.39	**
Absent father or missing mother's	-8.11	36.79	-0.07	
Missing	-66.13	44.04	-0.58	
Early years HLE (compared with 0-13)				
14-19	-8.16	9.64	-0.07	
20-24	-13.93	9.82	-0.12	
25-32	-4.35	9.80	-0.04	
>33	1.50	12.17	0.01	
KS1HLE educational computing (compared with low)				
KS1 HLE educational computing medium	3.22	6.43	0.03	
KS1 HLE educational computing high	-3.94	9.34	-0.03	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	28.26	5.96	0.25	***
KS3 HLE academic enrichment high	41.10	8.57	0.36	***
FSM school level (continuous)	0.39	0.34	0.11	
% White British (continuous)	-0.24	0.20	-0.10	
Year 6 English	2.11	0.26	0.55	***
Year 6 maths	3.33	0.25	0.87	***
Intercept	-143.93	28.50		***
Variance-school level	7789.70	911.87		***
Variance-student level	13013.32	446.36		***
Total variance	20803.02			
Number of students	2367			
Number of schools	590			
Deviance (-2 x Log Restricted-Likelihood)	29353.50			
Intra-school correlation (ICC)	0.3745			
% Reduction student variance	37.8			
% Reduction school variance	27.4			
% Reduction total variance	34.3			

* p<0.05, ** p<0.01, *** p<0.001

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Table A5.2: Contextualised value added models for GCSE English

Fixed Effects	GCSE English			
	Coef.	SE	ES	Sig
Age	0.16	0.04	0.18	***
Gender	1.58	0.27	0.27	***
Ethnic group (compared with White UK)				
White European heritage	1.06	0.79	0.18	
Black Caribbean heritage	0.28	0.76	0.05	
Black African heritage	0.19	1.05	0.03	
Any other ethnic minority	1.68	0.89	0.28	
Indian	2.35	1.01	0.40	*
Pakistani	1.65	0.82	0.28	*
Bangladeshi	3.92	1.40	0.66	**
Mixed Race	0.74	0.62	0.12	
Early behavioural problems (compared with none)				
1+ Behavioural problem	-0.81	0.41	-0.14	
Early health problems (compared with none)				
1+ Health problem	-0.72	0.30	-0.12	*
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.51	0.36	0.08	
2 siblings	0.06	0.39	0.01	
3 + siblings	-1.06	0.47	-0.18	*
Missing	1.38	2.37	0.23	
Mother's age	0.53	0.22	0.12	*
Year 11 FSM (compared with no)	-1.04	0.39	-0.17	**
KS1 family salary (compared with no earned salary)				
£2500-15000	0.23	0.45	0.04	
£17500-27500	0.92	0.48	0.15	
£30000-35000	1.41	0.55	0.24	*
£37500-66000	0.84	0.51	0.14	
£67500-132000	2.00	0.85	0.34	*
Missing	0.78	0.44	0.13	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-1.04	0.62	-0.17	
Skilled non-manual	-1.15	0.67	-0.19	
Skilled manual	-1.48	0.74	-0.25	*
Semi-skilled	-1.73	0.76	-0.29	*
Unskilled	-1.38	1.07	-0.23	
Never worked	0.37	1.05	0.06	
Missing	-2.15	2.83	-0.36	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	GCSE English			
	Coef.	SE	ES	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	1.09	0.54	0.18	*
Academic age 16	1.59	0.43	0.27	***
Academic age 18	2.23	0.57	0.38	***
Other professional	2.02	1.09	0.34	
Degree	2.80	0.60	0.47	***
Higher degree	3.51	0.84	0.59	***
Absent father or missing mother's	-1.96	1.84	-0.33	
Missing	-0.84	4.38	-0.14	
Early years HLE (compared with 0-13)				
14-19	-0.49	0.49	-0.08	
20-24	-0.62	0.49	-0.10	
25-32	-0.28	0.49	-0.05	
>33	0.52	0.61	0.09	
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	0.60	0.30	0.10	*
KS2 HLE educational computing high	0.20	0.49	0.03	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	1.32	0.30	0.22	***
KS3 HLE academic enrichment high	2.19	0.43	0.37	***
FSM school level (continuous)	-0.04	0.01	-0.18	**
% White British (continuous)	-0.02	0.01	-0.20	**
Year 6 English	0.34	0.01	1.73	***
Intercept	3.77	1.36		**
Variance-school level	2.59	0.80		**
Variance-student level	35.40	1.18		***
Total variance	37.99			
Number of students	2252			
Number of schools	561			
Deviance (-2 x Log Restricted-Likelihood)	14494.50			
Intra-school correlation (ICC)	0.0682			
% Reduction student variance	50.1			
% Reduction school variance	90.3			
% Reduction total variance	61.1			

* p<0.05, ** p<0.01, *** p<0.001

Table A5.3: Contextualised value added models for GCSE maths

Fixed Effects	GCSE maths			
	Coef.	SE	ES	Sig
Age	0.17	0.04	0.20	***
Gender	0.78	0.28	0.13	**
Ethnic group (compared with White UK)				
White European heritage	1.74	0.81	0.28	*
Black Caribbean heritage	0.73	0.77	0.12	
Black African heritage	2.34	1.07	0.38	*
Any other ethnic minority	3.62	0.91	0.59	***
Indian	2.24	1.01	0.37	*
Pakistani	2.59	0.81	0.42	**
Bangladeshi	5.42	1.44	0.88	***
Mixed Race	1.28	0.63	0.21	*
Early behavioural problems (compared with none)				
1+ Behavioural problem	-1.11	0.42	-0.18	**
Early health problems (compared with none)				
1+ Health problem	-1.28	0.30	-0.21	***
Number of siblings at age 3/5 (compared with none)				
1 sibling	0.29	0.37	0.05	
2 siblings	-0.37	0.40	-0.06	
3 + siblings	-0.82	0.48	-0.13	
Missing	-0.81	2.45	-0.13	
Mother's age	0.66	0.22	0.14	**
Year 11 FSM (compared with no)	-1.74	0.39	-0.28	***
KS1 family salary (compared with no earned salary)				
£2500-15000	0.52	0.46	0.08	
£17500-27500	0.53	0.49	0.09	
£30000-35000	1.26	0.56	0.21	*
£37500-66000	0.75	0.52	0.12	
£67500-132000	1.51	0.81	0.25	
Missing	0.05	0.48	0.01	
Parents' highest SES at age 3/5 (compared with professional, non-manual)				
Other professional non-manual	-0.81	0.62	-0.13	
Skilled non-manual	-1.05	0.67	-0.17	
Skilled manual	-0.74	0.74	-0.12	
Semi-skilled	-1.32	0.76	-0.21	
Unskilled	-2.58	1.10	-0.42	*
Never worked	-0.07	1.06	-0.01	
Missing	-2.53	2.51	-0.41	

* p<0.05, ** p<0.01, *** p<0.001

Fixed Effects	GCSE maths			
	Coef.	SE	ES	Sig
Parents' highest qualifications level at age 3/5 (compared with none)				
Vocational	1.19	0.55	0.19	*
Academic age 16	1.16	0.44	0.19	**
Academic age 18	2.06	0.58	0.33	***
Other professional	2.45	1.12	0.40	*
Degree	2.31	0.60	0.38	***
Higher degree	2.56	0.82	0.42	**
Absent father or missing mother's	-2.89	1.98	-0.47	
Missing	-4.53	4.56	-0.74	
Early years HLE (compared with 0-13)				
14-19	0.20	0.53	0.03	
20-24	-0.15	0.54	-0.02	
25-32	0.53	0.54	0.09	
>33	1.07	0.65	0.17	
Missing	1.55	1.03	0.25	
KS1 HLE outing (compared with low)				
KS1 HLE outing medium	-0.45	0.35	-0.07	
KS1 HLE outing high	-0.62	0.58	-0.10	
KS2 HLE educational computing (compared with low)				
KS2 HLE educational computing medium	0.77	0.31	0.13	*
KS2 HLE educational computing high	0.16	0.50	0.03	
KS3 HLE academic enrichment (compared with low)				
KS3 HLE academic enrichment medium	1.33	0.31	0.22	***
KS3 HLE academic enrichment high	2.76	0.43	0.45	***
% White British (continuous)	-0.01	0.01	-0.08	
Year 6 maths	0.50	0.01	2.43	***
Intercept	-12.25	1.39		***
Variance-school level	3.28	0.93		***
Variance-student level	37.70	1.24		***
Total variance	40.98			
Number of students	2354			
Number of schools	619			
Deviance (-2 x Log Restricted-Likelihood)	15309.27			
Intra-school correlation (ICC)	0.0800			
% Reduction student variance	63.2			
% Reduction school variance	87.2			
% Reduction total variance	68.0			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Appendix 6: Contextualised multilevel models for combined effects

Table A6.1: Combined effects of pre-school quality and gender on total GCSE score

Fixed effects	Total GCSE score			
Pre-school quality by Gender (compared to No pre-school and Male)	**Coef.**	**SE**	**ES**	**Sig**
Low quality, Male	58.37	18.82	0.44	**
Medium quality, Male	51.15	16.69	0.38	**
High quality, Male	65.08	18.13	0.49	***
No pre-school, Female	55.65	18.61	0.42	**
Low quality, Female	93.95	19.66	0.70	***
Medium quality, Female	77.97	16.77	0.58	***
High quality, Female	91.82	18.32	0.69	***
Number of students	2497			
Number of schools	610			
Intra-school correlation (ICC)	0.2997			
% Reduction student variance	14.9			
% Reduction school variance	28.9			
% Reduction total variance	19.6			

* p<0.05, ** p<0.01, *** p<0.001

Table A6.2: Combined effects of pre-school quality and gender on GCSE English

Fixed effects	GCSE English			
Pre-school quality by Gender (compared to No pre-school and Male)	**Coef.**	**SE**	**ES**	**Sig**
Low quality, Male	1.03	1.08	0.14	
Medium quality, Male	1.40	0.97	0.19	
High quality, Male	2.69	1.04	0.36	**
No pre-school, Female	2.79	1.11	0.37	*
Low quality, Female	5.15	1.12	0.69	***
Medium quality, Female	4.28	0.97	0.57	***
High quality, Female	4.69	1.05	0.63	***
Number of students	2343			
Number of schools	573			
Intra-school correlation (ICC)	0.0612			
% Reduction student variance	20.7			
% Reduction school variance	86.3			
% Reduction total variance	38.6			

* p<0.05, ** p<0.01, *** p<0.001

Table A6.3: Combined effects of pre-school quality and gender on GCSE maths

Fixed effects	GCSE maths			
Pre-school quality by Gender (compared to No pre-school and Male)	Coef.	SE	ES	Sig
Low quality, Male	2.48	1.27	0.27	
Medium quality, Male	3.01	1.14	0.33	**
High quality, Male	3.71	1.22	0.41	**
No pre-school, Female	1.28	1.32	0.14	
Low quality, Female	2.82	1.31	0.31	*
Medium quality, Female	2.17	1.14	0.24	
High quality, Female	2.46	1.23	0.27	*
Number of students	2535			
Number of schools	675			
Intra-school correlation (ICC)	0.0397			
% Reduction student variance	18.7			
% Reduction school variance	86.5			
% Reduction total variance	32.2			

* p<0.05, ** p<0.01, *** p<0.001

Table A6.4: Combined effects of pre-school quality and parents' highest qualification level on total GCSE score

Fixed effects	Total GCSE score			
Pre-school quality by Parents' highest qualification level (compared to No pre-school and Low qualification)	Coef.	SE	ES	Sig
Low quality, Low qualification	44.60	16.18	0.33	**
Medium quality, Low qualification	32.34	13.77	0.24	*
High quality, Low qualification	44.56	15.39	0.33	**
No pre-school, Moderate/High qualification	-34.60	29.44	-0.26	
Low quality, Moderate/High qualification	64.43	19.60	0.48	**
Medium quality, Moderate/High qualification	58.12	15.59	0.44	***
High quality, Moderate/High qualification	72.09	18.15	0.54	***
Number of students	2413			
Number of schools	598			
Intra-school correlation (ICC)	0.2955			
% Reduction student variance	15.2			
% Reduction school variance	30.6			
% Reduction total variance	20.4			

* p<0.05, ** p<0.01, *** p<0.001

Table A6.5: Combined effects of pre-school quality and parents' highest qualification level on GCSE English

Fixed effects	GCSE English			
Pre-school quality by Parents' highest qualification level (compared to No pre-school and Low qualification)	**Coef.**	**SE**	**ES**	**Sig**
Low quality, Low qualification	1.74	0.88	0.23	*
Medium quality, Low qualification	1.22	0.75	0.16	
High quality, Low qualification	2.66	0.83	0.35	**
No pre-school, Moderate/High qualification	2.62	1.71	0.35	
Low quality, Moderate/High qualification	3.65	1.06	0.48	***
Medium quality, Moderate/High qualification	4.39	0.85	0.58	***
High quality, Moderate/High qualification	4.62	0.98	0.61	***
Number of students	2329			
Number of schools	573			
Intra-school correlation (ICC)	0.0573			
% Reduction student variance	18.8			
% Reduction school variance	86.9			
% Reduction total variance	37.4			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table A6.6: Combined effects of pre-school quality and parents' highest qualification level on GCSE maths

Fixed effects	GCSE maths			
Pre-school quality by Parents' highest qualification level (compared to No pre-school and Low qualification)	**Coef.**	**SE**	**ES**	**Sig**
Low quality, Low qualification	1.21	1.02	0.13	
Medium quality, Low qualification	1.30	0.87	0.14	
High quality, Low qualification	2.27	0.96	0.25	*
No pre-school, Moderate/High qualification	1.91	2.05	0.21	
Low quality, Moderate/High qualification	5.10	1.21	0.56	***
Medium quality, Moderate/High qualification	5.26	0.98	0.57	***
High quality, Moderate/High qualification	5.13	1.11	0.56	***
Number of students	2521			
Number of schools	675			
Intra-school correlation (ICC)	0.0373			
% Reduction student variance	18.0			
% Reduction school variance	87.3			
% Reduction total variance	31.8			

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Glossary of terms

A-level (include Applied A-level): the GCE Advanced Level qualifications are the main pre-university qualification taken by students in England. For further information see http://ofqual.gov.uk/qualifications-and-assessments/qualification-types/a-levels/

A/S-level: The AS is a stand-alone qualification, usually made up of two units, and is worth half the value of a full A level. For further information see http://ofqual.gov.uk/qualifications-and-assessments/qualification-types/a-levels/

Academic self-concept: EPPSE derived two measures of Academic self-concept from Year 9 student questionnaire data: 'Academic self-concept for English' & 'Academic self-concept for maths'. Both measures are based on items taken from existing well established 'academic self-concept' scales (Marsh, 1990a; 1990b; Marsh & Hau, 2003; Marsh & Craven, 2006). In addition a General academic self-concept measure, based on similar items (and based on Marsh's scale) was derived from the Year 11 questionnaire.

Academic ethos – Year 11 Factor: A factor derived from Year 11 student questionnaire items that relate to the extent to which students feel that other students within the school are interested in learning, doing well and continuing their education past compulsory schooling age.

Age standardised scores: Assessment scores adjusted to take account of the pupil's age at testing, enabling comparisons between the cognitive/academic outcome of an individual pupil, and the achievement of a nationally representative sample of pupils in the same age group or, in this case, the achievement of the EPPSE sample.

Anti-social behaviour: A social-behavioural construct identified from teachers' ratings about EPPSE students, collected through a pupil profile based on Goodman's (1997) Strength and Difficulties questionnaire. Five items formed the factor 'anti-social' behaviour e.g., Steals from home, school or elsewhere.

Anxiety: A factor derived from Year 9 student questionnaire items that reflect the degree to which the students feel unhappy, worried, nervous, fearful in new situations, or suffer from minor ailments.

Aspiration: Aspirations refer to students intentions for future educational destinations and achievements, such as gaining qualifications, carry on in education (e.g. going to university) and career choices.

'At risk': The term 'at risk' is complex and differs depending on the criteria used. The definition of possible cognitive/academic 'at risk' used in the ETYSEN study (Taggart et al., 2006), was based on children's cognitive/academic attainment age 3; a score of one standard deviation (sd) below the mean (in standardised assessments) in relation to national norms (at risk). In the EPPSE case studies, there are various definitions of risk and resilience (Siraj-Blatchford et al., 2011).

Basic Skills: qualifications in literacy and numeracy for adults and other skills for everyday life (http://ofqual.gov.uk/files/2010-11-26-statistics-glossary.pdf [Last accessed 14 March 2014]).

Birth weight: In the EPPSE research, babies born weighing 2500 grams (5lbs 8oz) or less are defined as below normal birth weight; foetal infant classification is below 1000 grams, very low birth weight is classified as 1001-1500 grams and low birth weight is classified as 1501-2500 grams (Scott and Carran, 1989). When EPPSE uses this measure in analyses, the categories foetal infant (<1000g) and very low birth weight (1001-1005g) are often collapsed into one category due to small numbers in the former group.

British Ability Scales (BAS): This is a battery of assessments specially developed by NFER-Nelson to assess very young pupils' abilities. The assessments used at entry to the EPPE study and at entry to reception were:

- Block building - Visual-perceptual matching, especially in spatial orientation (only entry to study).

- Naming Vocabulary – Expressive language and knowledge of names.

- Pattern construction – Non-verbal reasoning and spatial visualisation (only entry to reception).

- Picture Similarities – Non-verbal reasoning.

- Early number concepts – Knowledge of, and problem solving using pre-numerical and numerical concepts (only entry to reception).

- Copying – Visual–perceptual matching and fine-motor co-ordination. Used specifically for pupils without English.

- Verbal comprehension – Receptive language, understanding of oral instructions involving basic language concepts.

BTEC: This is a type of vocational work-related qualification offered by the Business and Technology Education Council (BTEC) in three levels: Award, Certificate and Diploma.

Centre/School level variance: The proportion of variance in a particular child/student outcome measure (i.e. Year 9 English Teacher Assessment level at the end of Key Stage 3 in secondary school) attributable to differences between individual centres/schools rather than differences between individual children/students.

Citizenship values: A factor derived from Year 9 student questionnaire items that relate to how important students feel certain behaviours are such as strong people not picking on weak people, respecting rules and laws, controlling your temper, respecting other's views, and sorting out disagreements without fighting.

City & Guilds: This is a type of vocational work-related qualification, offered by City & Guilds qualifications, which can be completed in the workplace, in the classroom or workshop. For further information, see http://www.cityandguilds.com/courses-and-qualifications/qualifications-explained/ [Last accessed 14 March 2014]).

Comparative Fit Index (CFI): The CFI is an index of a statistical model fit that takes into account sample size. Values close to 0.95 indicate good fit (Hu & Bentler, 1999).

Compositional effects: The influence of a student's peer group on that particular student's individual outcomes.. For example, the influence of attending a school where a high percentage of students are in receipt of Free School Meals (FSM) or come from disadvantaged backgrounds. This influence is irrespective of the characteristics (FSM status) of the individual student in question. For further details see Harker (2001).

Confidence intervals (at 95 or 99%): A range of values which can be expected to include the 'true' value in 95 or 99 out of 100 samples (i.e. if the calculation was repeated using 100 random samples).

Continuous measures: Numerical/Scale variables. In this report, continuous measures include total GCSE and equivalents point score, grade achieved in full GCSE English, grade achieved in full GCSE maths, and total number of full GCSE entries

Contextualised models: Cross-sectional multilevel models exploring individuals' outcomes, while controlling for individual, family and home learning environment characteristics (but not prior attainment).

Controlling for: Several variables may influence an outcome and these variables may themselves be associated. Multilevel statistical analyses can calculate the influence of one variable upon an outcome having allowed for the effects of other variables. When this is done the net effect of a variable upon an outcome controlling for other variables can be established.

Correlation: A correlation is a measure of statistical association ranging from + 1 to -1.

Cronbach's alpha (α): A measurement of the internal reliability (or consistency) of the items on a test or questionnaire that ranges between 0 and 1 showing the extent to which the items are measuring the same thing (Reber, 1995). A value greater than 0.7 ($α<0.7$) suggests that the items consistently reflect the construct that is being measured.

CVA (Contextualised Value Added): Measures of secondary school academic effectiveness derived from KS2-KS4 contextual value added (CVA) indicators produced by the Department for Education (DfE). At the pupil level, the CVA score was calculated as the difference between predicted attainment (i.e., the average attainment achieved by similar pupils) and real attainment in KS4. The predicted attainment was obtained by using multilevel modelling controlling for pupils' prior attainment and adjusting for their background characteristics (i.e., gender, age, ethnicity, SEN, FSM, mobility etc.). For

each school, all individual pupil scores were averaged and adjusted for the proportion of pupils attending the school in a specific year. This final averaged score represents the school level CVA and it is presented as a number based around 1000.

Dichotomous measures: categorical variable with only two possible values (1 defining the existence of a characteristic and 0 defining the inexistence). In this report, dichotomous measures include achieved 5 or more GCSE/GNVQs at grades A*-C, achieved 5 or more GCSE and equivalents at grades A*-C including GCSE English and maths and achieved the English Baccalaureate.

The Diploma: The Diploma is composite qualification for 14 to 19 year-olds, made up of individual free-standing qualifications combined in a specific way, mixing practical and theoretical learning, with an emphasis on 'applied learning'. Three of the components of the Diploma (Principal Learning, Project and Functional Skills) can also be studied as qualifications in their own right. (http://webarchive.nationalarchives.gov.uk/+/http://www.ofqual.gov.uk/popups/explaining-qualifications/ [Last accessed 14 March 2014]).

Disaffected behaviour (from Year 11 Dispositions report): Disaffected behaviour is the term EPPSE has used to reflect negative and positive behaviours/attitudes that indicate the extent of school engagement (behaviour within class and a more general item covering perceptions of the worth of schooling).

Dispositions: An overarching term used to refer to factors such as 'Mental well-being', 'School Enjoyment', 'Disaffected behaviour', 'Resistance to Peer Influence' and 'general academic self concept'. The EPPSE study derived these factors from the Life in Year 11 questionnaire. EPPSE had previously derived other disposition factors such as 'enjoyment of school', 'academic self concept (English and maths)', 'popularity', 'citizenship values' and 'anxiety' from questionnaires completed by students in Year 9 called 'All about Me' and 'All about Me in school'.

E2E: Entry to employment is a learning programme which is part of the work-based learning route and funded by the Learning and Skills Council (LSC). It is designed to provide opportunities for young people aged 16 and over who are not yet ready or able to take up a Modern Apprenticeship or further education or to move directly into employment. http://www.nfer.ac.uk/publications/EET01/EET01_home.cfm

English Baccalaureate (EBacc): The EBacc is not a qualification but a performance measure that indicates where a student has secured a C grade or above across a core of KS4 academic subjects (https://www.gov.uk/government/publications/english-baccalaureate-eligible-qualifications/ [Last accessed 14 March 2014]).

ECERS-R and ECERS-E: The American Early Childhood Environment Rating Scale (ECERS-R) is an observational instrument based on child centred pedagogy that assesses interactions and resources for indoor and outdoor learning (Harms et al., 1998). The English ECERS-E rating scale (Sylva et al., 2003) is an extension to the ECERS-R that was developed specially for the Effective Provision of Pre-school Education (EPPE) study to reflect developmentally appropriate practices in early years Literacy, Numeracy, Science & the Environment and Diversity (gender, race, individual needs).For more information see Sylva et al., (2010).

Educational effectiveness: Research design which seeks to explore the effectiveness of educational institutions in promoting a range of child/student outcomes (often academic measures) while controlling for the influence of intake differences in child/student characteristics.

Effect size (ES): Effect sizes (ES) provide a measure of the strength of the relationships between different predictors and the outcomes under study. For further information see Elliot & Sammons (2004).

Emphasis on learning: A factor derived from Year 9 student questionnaire items that relate to teacher expectations, emphasis on understanding something not just memorising it, teachers believing that it is okay for students to mistakes as long as they learn from them, students wanting to do well in exams, and lessons being challenging.

Enjoyment of school: A factor derived from Year 9 student questionnaire items that reflect the degree to which students reported they like lessons and being at school, like answering questions in class, but also how much the student experiences boredom in lessons or feels school is a waste of time.

EPPE: The Effective Provision of Pre-school Education (EPPE) project was designed to explore the impact of pre-school on children's cognitive/academic and social-behavioural outcomes as well as other important background influences (including family characteristics and the home learning environment). EPPE was the original phase of the EPPSE study, funded by the Department for Education and Employment it ran from 1997-2003.

Factor Analysis (FA): An umbrella term covering a number of statistical procedures that are used to identify a smaller number of factors or dimensions from a larger set of independent variables or items (Reber, 1995). At KS3 EPPSE used:

- Exploratory FA – a type of analyses where no prior (theoretical) knowledge is imposed on the way the items cluster/load.

- Principal Components Analysis (PCA) – a procedure that converts a set of observations of possibly correlated items into a set of values of uncorrelated items called principal components.

- Confirmatory FA – type of factor analyses used where the measure of a factor/construct are tested against a prior (theoretical) knowledge.

Family characteristics: Examples of family characteristics are mother's highest qualification level, father's highest qualification level and family socio-economic status (SES).

Formative feedback – Year 11 Factor: A factor derived from Year 11 student questionnaire items that relate to students' experiences of practical support from teachers, helping students when they are stuck and guiding them on how to improve their work.

Free school meals (FSM): An indicator of family poverty.

Functional Skills: These qualifications, available in England to those aged 14 and older, are available as stand-alone qualifications at a number of different levels, and may also contribute towards the Diploma qualification. Functional Skills qualifications lead to the development of practical skills that allow learner to use English, maths and ICT in real life contexts (http://ofqual.gov.uk/files/2010-11-26-statistics-glossary.pdf [Last accessed 14 March 2014]).

GCSE: General Certificate of Secondary Education (GCSE) exams are usually sat during Year 11 at age 16 but can be taken by 15 to 18 year olds in schools or colleges. They can also be taken by those wanting to gain an exit school level qualification see http://ofqual.gov.uk/qualifications-and-assessments/qualification-types/gcses/ [Last accessed 14 March 2014]).

GCSE Benchmark Indicators: DfE benchmark indicators of GCSE performance include: achieved 5 or more GCSE/GNVQs at grades A*-C /-/ achieved 5 or more GCSE and equivalents at grades A*-C including GCSE English and maths /-/ achieved the English Baccalaureate.

Head teacher qualities: A factor derived from Year 9 student questionnaire items that reflect the head teacher making sure that students behave well, their presence around the school and interest in how much students learn.

Hierarchical nature of the data: Data that clusters into pre-defined subgroups or levels within a system (i.e. students, schools, local authorities).

Higher academic route: dichotomous measure based on students' responses on the Life After Year 11-Questionnaire 1- Full-Time Education. It takes the value 1 for those who took 4 or more AS/A levels and 0 for all others returning a Life After Year 11 questionnaires.

Home learning environment (HLE) characteristics: Measures derived from reports from parents (at interview or using parent questionnaires) about what children do at home (with/independent of their parents). There are several HLE measures: early years HLE, KS1 HLE, KS2 HLE (please see Appendix 1 for further details).

Homework: Student's self-reported time spent on homework on an average school night.

Hyperactivity: A social-behavioural construct identified from teachers' ratings about EPPSE students, collected through a pupil profile based on Goodman's (1997) Strength and Difficulties questionnaire. Several items formed the factor 'hyperactivity' e.g., Restless, overactive, cannot stay still for long.

Income Deprivation Affecting Children Index (IDACI): The IDACI represents the percentage of children in each SOA that live in families that are income deprived. For further details see Noble et al., (2008).

Independent School - Category: An independent school is any school or establishment, which is not maintained by a local authority or a non-maintained special school, that provides full time education for 5 or more pupils of compulsory school age (http://www.education.gov.uk/edubase/glossary.xhtml?letter=I [Last accessed 14 March 2014]).

Index of Multiple Deprivation (IMD): The IMD is a measure of a range of characteristics evident in a neighbourhood. For further details see Noble et al. (2004; 2008).

Internal Reliability/Consistency: The degree to which the various parts of a test (items) or other instrument (e.g., questionnaire) measure the same variables/construct (Reber, 1995). An example measure would be **Cronbach's alpha** (see earlier).

International Baccalaureate: The International Baccalaureate Diploma Programme (DP) is a programme of education with final examinations that prepares students, aged 16 to 19, for success at university and life beyond - see http://www.ibo.org/diploma/ [Last accessed 14 March 2014]).

Intra-centre/school correlation: The intra-centre/school correlation measures the extent to which the outcomes from children/students in the same centre/school resemble each other as compared with those from children/students at different centres/schools. The intra-centre/school correlation provides an indication of the extent to which unexplained variance in children's/students' progress (i.e. that not accounted for by prior attainment) may be attributed to differences between centres/schools. This gives an indication of possible variation in pre-school centre/school effectiveness.

Key Skills: These qualifications can be studied in 6 subject areas (communication, application of number, information and communication technology (ICT), working with others, improving own learning and performance, and problem solving) that provide the necessary skills for learning, working and life in general (http://ofqual.gov.uk/files/2010-11-26-statistics-glossary.pdf [Last accessed 14 March 2014]).

Key Stage (KS): The English education system splits students into age phases known as Key Stages as follows: KS1 (age 5-7), KS2 (8-11), KS3 (12-14), KS4 (14-16).

Lower academic route: dichotomous measure based on students' responses on the "Life After Year 11-Questionnaire 1- Full-Time Education". It takes the value 1 for those who took 3 or less As/A levels and 0 for those who are on a higher academic route.

Matriculation: exam refers to the qualification (in any country) that describes the transfer from secondary to tertiary education.

Mean average: A measure of central tendency that is calculated by summing a set of values (or scores) and then dividing by the number of values or scores (Reber, 1995).

Mental well-being (from Year Dispositions report): In order to asses mental well-being EPPSE included items from the Warwick-Edinburgh Mental Well-Being scale (WEMWB; Tennant et al., 2007) in the Life in Year 11 questionnaire. The Warwick-Edinburgh Mental Well-being scale was used to measure students' positive mental well-being in Year 11 allowing investigation of specific aspects of mental well-being as well as providing an overall scale.

Monitoring students – Year 11 Factor: A factor derived from Year 11 student questionnaire items that relate to the extent to which teachers monitor the progress students are making, set targets and reward hard work.

Multilevel modelling: A methodology that allows data to be examined simultaneously at different levels within a system (i.e. children/students, pre-school centres/schools, local authorities), essentially a generalisation of multiple regression.

Multiple Disadvantage Index: This measure was developed as part of the Early Years Transition & Special Educational Needs (EYTSEN) Project, which focuses on the identification of children 'at risk' of SEN (see Sammons et al., 2004d). An index was created based on 10 indicators in total: three child variables, six parent variables, and one related to the Early years Home Learning Environment (HLE).

Child variables: First language: English as an additional language (EAL) - Large family: 3 or more siblings - Pre-maturity / low birth weight.

Parent/HLE variables:mother's highest qualification level: no qualifications - Social class of father's occupation: Semi-skilled, unskilled, never worked, absent father - Father not employed - Young Mother (Age 13-17 at birth of EPPE child) - Lone parent - Mother not working / unemployed - Low Early years Home Learning Environment (HLE). For further details see Sammons et al., (2002).

Multiple regression: method of predicting outcome scores on the basis of the statistical relationship between observed outcome scores and one or more predictor variables.

National Assessment Levels: The table below shows the levels that could be achieved by a student at different ages in their National Assessments tests / can be awarded to a student for their Teacher Assessment (TA).

Outcome	Key Stage 1 (KS1), Age 7	Key Stage 2 (KS2), Age 11	Key Stage 2 (KS3), Age 14
Reading/ English Levels	Working towards level 1		
	Level 1	Level 1	Level 1
	Level 2 – Expected Level	Level 2	Level 2
	Level 3	Level 3	Level 3
	Level 4	Level 4 – Expected Level	Level 4
		Level 5	Level 5 – Expected Level
		Level 6	Level 6
			Level 7
			Level 8
Maths Levels	Working towards level 1		
	Level 1	Level 1	Level 1
	Level 2 – Expected Level	Level 2	Level 2
	Level 3	Level 3	Level 3
	Level 4	Level 4 – Expected Level	Level 4
		Level 5	Level 5 – Expected Level
		Level 6	Level 6
			Level 7
			Level 8
Science Levels	Working towards level 1		
	Level 1	Level 1	Level 1
	Level 2 – Expected Level	Level 2	Level 2
	Level 3	Level 3	Level 3
	Level 4	Level 4 – Expected Level	Level 4
		Level 5	Level 5 – Expected Level
		Level 6	Level 6
			Level 7
			Level 8

Net effect: The unique contribution of a particular variable upon an outcome while other variables are controlled.

NEET: The term NEET (Not in Education, Employment or Training) is used to describe young people (aged 16 to 25) who are not studying, working or involved in formal training programmes.

Non-Maintained Special School - Category: Type of Establishment. Non-Maintained Special schools are special schools approved by the Secretary of State for Education and Skills, and are run on a not-for-profit basis by charitable trusts and normally cater for children with severe and/or low incidence special educational needs. Non-Maintained Special schools get the majority of their funding from local authorities placing children

with special educational needs statements at the schools and paying the fees (http://www.education.gov.uk/edubase/glossary.xhtml?letter=N) [Last accessed 14 March 2014]).

Null model: multilevel model with no predictors.

NVQ: National Vocational Qualifications (NVQ)s are 'outcome based' and are delivered in a workplace setting. NVQs are work-related, competence-based qualifications that cover a broad range of industry sectors and occupations (http://webarchive.nationalarchives.gov.uk/+/http://www.ofqual.gov.uk/popups/explaining-qualifications/ [Last accessed 14 March 2014]).

Odds Ratio (OR): Odds Ratios represent the odds of achieving certain benchmark performance indicators given certain characteristics relative to the odds of the reference group.

Ofsted: The Office for Standards in Education, Children's Services and Skills (Ofsted) inspect and regulate services that care for children and young people, and those providing education and skills for learners of all ages. See Matthews & Sammons (2004), and the Ofsted website (http://www.ofsted.gov.uk/) for further details.

Out of school activities (from Year 11 Dispositions report): Out of school activities include activities students were involved in outside of school during Year 11 (during the month previous to completing the Life in Year 11 questionnaire). They include activities such as reading, going to the library, going to parties, going to church, music groups etc.

Pedagogical strategies: Strategies used by an educator to support learning. These include the face to face interactions with students, the organisation of resources and the assessment practices.

Peer group (and Peer group affiliation) (from Year 11 Dispositions report): The peer group refers to other students in their immediate social circle, primarily other students sharing similarities such as age and background. Peer affiliation refers to being affiliated, or associated, with a specific friendship group.

Physical Health (from Year 11 Dispositions report): Physical health refers to students' health status, including any illness, disability or infirmity experienced in the 12 months pervious to completing the Life in Year 11 questionnaire.

 (Poor) behaviour climate: A factor derived from Year 9 student questionnaire items that relate to the general behaviour climate in the EPPSE student's school; students being given a hard time by others if they work hard, level of compliance with school rules, fighting and weapons being brought into school, and whether most students want to leave the school as soon as they can.

Popularity: A factor derived from Year 9 student questionnaire items that relate to how popular students feel they are with other teenagers and how many friends they have.

Positive relationships – Year 11 Factor: A factor derived from Year 11 student questionnaire items that relate to how well students and teachers get on, such as students feeling they are treated fairly and respected and teachers showing an interest in students.

Pre-reading attainment: Composite formed by adding together the scores for phonological awareness (rhyme and alliteration) and letter recognition.

Pre-school effectiveness: Measures of the effectiveness of pre-schools were derived from Value Added (VA) models of the sample's actual progress during pre-school, controlling for prior attainment and children's background characteristics (Sammons et al., 2004b).

Primary school effectiveness: Primary school academic effectiveness scores were obtained from National Assessment data for several cohorts across all primary schools in England. Value-added scores were calculated across the years 2002-4, for each primary school in England and then extracted for schools attended by the EPPE sample (Melhuish et al., 2006a; 2006b).

Prior attainment: Measures which describe a participant's achievement at the beginning of the phase or period under investigation (i.e. taken on entry to the study or school, or for Year 9 and Year 11 analyses, outcomes from Year 6).

Pro-social Behaviour: A social-behavioural construct identified from teachers' ratings about EPPSE students, collected through a pupil profile based on Goodman's (1997) Strength and Difficulties questionnaire. Several items formed the factor 'pro-social' behaviour e.g., Considerate of other people's feelings.

Pupil Profile: An instrument containing Goodman's (1997) Strength and Difficulties questionnaire plus some additional items used to collect information about EPPSE student's social behaviour. It is completed by a teacher who knows the EPPSE student well.

Resistance to peer influence (from Year 11 Dispositions report): The Resistance to Peer Influence scale (RPI) examines a students' ability to resist the influence of their peers in more than just anti-social scenarios, ranging from wanting to fit in with the crowd to being willing to break the law to fit in with friends. Items included 'I think it's more important to be who I am than to fit in with the crowd'.

Risky behaviours (from Year 11 Dispositions report): Students were asked about activities considered as risky to health or as risky anti-social behaviours and responses to these items were then combined to form an overall measure of 'risky' behaviours. EPPSE asked about the following risky behaviours in the Life in Year 11 questionnaire: Truanting

- Smoking prevalence - Drinking prevalence - Drug usage - Anti-social criminal behaviours and legal intervention.

Quality of pre-school: Measures of pre-school centre quality were collected through observational assessments (ECERS-R, ECERS-E) completed by trained researchers. For further information see **ECERS** and Sylva et al. (2010).

Quality of secondary schools: Secondary school quality was derived from measures taken from Ofsted inspection judgments. See Ofsted for further details.

Root Mean Square Error of Approximation (RMSEA): The RMSEA is an index measure of model; values less than 0.06 are an indication of a good fit.

Sampling profile/procedures: The EPPSE sample was constructed of: Five regions (six Local authorities) randomly selected around the country, but being representative of urban, rural, inner city areas. Pre-schools from each of the 6 main types of target provision (nursery classes, nursery schools, local authority day nurseries, private day nurseries, play groups and integrated centres) randomly selected across the region.

School engagement (from Year 11 Dispositions report): Fredericks et al (2004) view School engagement as multi-dimensional covering 'behavioural engagement', 'emotional engagement' and 'cognitive engagement'.

School enjoyment (from Year 11 Dispositions report): The EPPSE definition of School Enjoyment is an aspect of what Fredricks et al., (2004) would describe as the 'emotional' dimension of 'school engagement'. The EPPSE factor 'School Enjoyment' includes items such as 'On the whole I like being at school'.

School environment: A factor derived from Year 9 student questionnaire items that relate to how EPPSE students view their school in terms of the physical space (the attractiveness of buildings, the decorative state of the classrooms, the condition of the toilets), as well as its reputation as a good school and how well organised it is.

School/learning resources: A factor derived from Year 9 student questionnaire items that relate to practical resources for learning at the EPPSE student's school; amount of computers and getting enough time on them in lessons, and the quality of science labs and the school library.

School level variation: School level variance here refers to the percentage of variation in students' outcomes that can be attributed to differences between schools.

Secondary school effectiveness: Secondary school academic effectiveness scores were obtained from the Department for Education (DfE). The measure of academic effectiveness is represented by the average KS2 to KS4 contextual value added (CVA) school level scores over 4 years (2006-2009) when EPPSE students were in secondary school. See 'CVA' as this is the same measure.

Self-regulation: A social-behavioural construct identified from teachers' ratings about EPPSE students, collected through a pupil profile based on Goodman's (1997) Strength and Difficulties questionnaire. Several items formed the factor 'self-regulation' e.g., Likes to work things out for self; seeks help rarely.

Significance level: Criteria for judging whether differences in scores between groups of children/students or centres/schools might have arisen by chance. The most common criteria is the 95% level ($p < 0.05$), which can be expected to include the 'true' value in 95 out of 100 samples (i.e. the probability being one in twenty that a difference might have arisen by chance).

Social-behavioural development: A student's ability to 'socialise' with other adults and pupils and their general behaviour to others. EPPSE uses this overarching name to refer to a range of social-behavioural outcome measures. At age 16, two of these outcomes refer to positive outcomes ('self-regulation' and 'pro-social' behaviour) and two refer to negative outcomes ('hyperactivity' and 'anti-social' behaviour).

Socio-economic status (SES): Occupational information was collected by means of a parental interview/questionnaire at different time points. The Office of Population Census and Surveys (OPCS) (1995) Classification of Occupations was used to classify mothers and fathers current employment into one of 8 groups: professional I, other professional non manual II, skilled non manual III, skilled manual III, semi-skilled manual IV, unskilled manual V, never worked and no response. Family SES was obtained by assigning the SES classification based on the parent with the highest occupational status.

Special Educational Needs (SEN): Children with an SEN have been assessed as having a specific need which demands additional attention/resources. Children with an SEN can be placed on the Code of Practice a various levels, depending on their conditions see https://www.gov.uk/government/publications/special-educational-needs-sen-code-of-practice

Standard deviation (sd): A measure of the spread around the mean in a distribution of numerical scores. In a normal distribution, 68% of cases fall within one standard deviation of the mean and 95% of cases fall within two standard deviations.

Structural equation modelling (SEM): is an umbrella term for statistical modelling techniques which allow for testing causal processes and structural relationships (Byrne, 2010).

Student background characteristics: Student background characteristics include age, birth weight, gender, and ethnicity.

Target centre: A total of 141 pre-school centres were recruited to the EPPSE research covering 6 types of provision

Teacher Assessment (TA) : These assessments made by teachers provide measures of students' educational outcomes for English, maths and science in Year 9 (age 14) in the form of National curriculum levels.

Teacher discipline: A factor derived from Year 9 student questionnaire items that relate to the level of teacher control during lessons, in terms of behaviour, noise, rule breaking and teachers being bothered if students turn up late.

Teacher professional focus – Year 11 Factor: A factor derived from Year 11 student questionnaire items that relate to perceptions of teachers' focus on day to day teaching responsibilities such as learning and behaviour within the classroom.

Teacher support: A factor derived from Year 9 student questionnaire items that relate to support given by teachers in terms of helping students, giving them feedback, making them feel confident about their work, rewarding them for good behaviour, being available to talk privately, and marking and returning homework.

Term of birth: Using EPPSE student's dates of birth, the EPPSE sample were categorised into three 'term of birth' categories: Autumn born (September to December); Spring born (January to April); Summer born (May to August).

Total GCSE and equivalents point score: This is a mechanism for comparing equivalencies of different types of KS4 exams, based on the total pupil's point scores and not the average points scores per subject. For example in School A, if pupils take 10 full GCSEs and in each obtain grade C, which has a points score of 40, their total points score will be 10 x 40, which is 400. If all pupils in the school had the same results, the school's average total points score would be 400. In School B all pupils might take only 8 GCSEs but in each attain grade B, which has a points score of 46. The school's average total points score would be 368. So School A has a higher average total points score than School B. In EPPSE total points score is a continuous measure.

Total number of full GCSE entries: The total number of GCSE's entered regardless of the results.

Truanting (from Year 11 Dispositions report): Truanting refers to whether the student had taken unauthorised time off school during Year 11 (the students were asked if they had bunked/skived off in Year 11).

Value added models: Longitudinal multilevel models exploring individuals' progress over time, controlling for prior attainment as well as significant individual, family and home learning environment characteristics.

Value added residuals (pre-school effectiveness): Differences between predicted and actual results for pre-school centres (where predicted results are calculated using value added models). See **Pre-school effectiveness** for further information

Value added residuals (primary school academic effectiveness): Differences between predicted and actual results for primary schools measuring pupil progress across KS1 – KS2. For further information see **Primary school effectiveness** and Melhuish et al. (2006a; 2006b).

Valuing pupils: A factor derived from Year 9 student questionnaire items that relate to whether the school values students' views, teachers listen to students views, are respectful and friendly to students, teachers are unpleasant to students if they make mistakes.

Views of school: An overarching term refering to factors such as 'teacher support', 'school environment', 'valuing pupils', 'headteacher qualities', 'poor behaviour climate', 'emphasis on learning', 'teacher discipline', and 'school/learning resources'. EPPSE derived these factors from a Year 9 questionnaire called 'All about me in school', and the Life in Year 11 questionnaire, completed in Year 11.

Vocational qualifications: work-related qualifications examined through practical assessment as opposed to formal academic assessment i.e. NVQs, VRQs & Diploma.

Vocational route: dichotomous measure based on students' responses on the "Life After Year 11-Questionnaire 1- Full-Time Education". It takes the value 1 for those who did not take any As/A levels, but returned a "Life After Year 11-Questionnaire 1- Full-Time Education" questionnaire.

Z score (from Year 11 Dispositions report): A Z score is a statistical method for standardising data so that the mean equals zero and the standard deviation equals one.

VRQ: Vocationally Related Qualifications (VRQ) are related to employment but, unlike NVQs, do not necessarily require a work placement. VRQs are work-related, competence-based qualifications designed to provide learners with the skills and knowledge needed to do a job (http://ofqual.gov.uk/files/2010-11-26-statistics-glossary.pdf [Last accessed 14 March 2014]).

Well-being: Well-being here refers to aspects of young people's life such as physical health, peer and family relationships, and engagement (or not) in risky behaviours.

The Warwick-Edinburgh Mental Well-being scale: The Warwick-Edinburgh Mental Well-being scale is a 14 item scale (WEMWB; Tennant et al., 2007) that covers aspects of hedonic and eudaemonic well-being. Hedonic well-being is more emotional in nature, such as feelings of optimism, cheerfulness and feeling good about oneself. Eudaemonic well-being relates to mental capacities such as dealing with problems, thinking clearly and decision making.

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