Research Report DCSF-RR028

Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11)

The Influence of School and Teaching Quality on Children's Progress in Primary School

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department for children, schools and families

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Contents

Executive Summary

This report investigates the way school and classroom processes affect the cognitive progress and social/behavioural development of children between the ages of 6 (Year 1) and 10 (Year 5) in primary schools in England.

The research is part of the larger longitudinal study of Effective Pre-School and Primary Education (EPPE 3-11) funded by the Department for Children, Schools and Families (DCSF) that is following children's cognitive and social/behavioural development from ages 3 to 11 years. The EPPE 3-11 study investigates both pre-school and primary school influences on children's attainment, progress and social/behavioural development. This report describes the results of quantitative analyses based on a sub-sample of 1160 EPPE children across Year 1 to 5 of primary education. The research builds on the earlier analyses of children's Reading and Mathematics attainments and social/behavioural outcomes in Year 5 for the full EPPE 3-11 sample (see Sammons, 2007a; 2007b), by investigating relationships between children's outcomes and measures of classroom processes, collected through direct observation of Year 5 classes in 125 focal schools chosen from the larger EPPE 3-11 data set. The analyses also explore patterns of association between children's outcomes and broader measures of overall school characteristics derived from teacher questionnaires and Ofsted inspection reports for this sub-sample of schools.

Structure of the report

Section 1: Describes the sub-sample of schools in which classroom observations were conducted; and also presents the distribution of background variables for the sub-sample of EPPE 3-11 children and compares these to the characteristics of the larger EPPE 3-11 sample as a whole.

Section 2: Provides summary details of the two observation instruments used for the investigation of classroom processes and teachers' behaviour. The two instruments used are the Classroom Observation System for Fifth Grade (COS-5, NICHD/Pianta 2001) and the Instructional Environment Observation Scale (IEO, Stipek 1999). The underlying dimensions related to classroom processes are outlined and the creation of overall summary indicators of *Teaching quality* based on the two instruments described.

Section 3: Describes the results of multilevel analyses of children's cognitive progress in Reading and Mathematics between Years 1 and 5 and of development in four social/behavioural outcomes (Self-regulation, Hyperactivity, Pro-social and Anti-social behaviour) over the same period. The analyses examine the predictive power for various child outcomes of: an overall measure of *Teaching quality,* other observational measures and questionnaire-derived measures of teacher perceptions of school practices.

Section 4: Investigates the predictive power of various global measures of school quality based on Ofsted inspection judgements of school effectiveness, improvement and leadership as well as more specific measures such as quality of assessment.

The final section summarises the main results and conclusions.

Key Findings

Both teachers' classroom practice and overall school-level factors make a significant difference to children's academic and social/behavioural progress during primary school after controlling for the influence of child, family and home learning environment (HLE) factors. Classroom factors, (particularly overall *Teaching quality* and *Child positivity*, which combines teacher-child and peer relationships and children's own self-reliance) and *Parental support* have an important influence on children's progress in Reading between Year 1 and Year 5. School-level factors were relatively less important for Reading. Progress in Mathematics, however, is relatively equally influenced by factors at classroom-level (overall *Teaching quality* and *Quality of Pedagogy*) and school-level (*Quality of school leadership*, *School communication with parents*, *Use of homework and school standards*). This finding is in accord with EPPE 3-11 analyses for the full sample that indicate stronger school effects for children's progress in Mathematics (Sammons et al., 2007a).

The influence of overall *Teaching quality* on Reading and Mathematics is stronger than the net influence of some background factors such as gender and family disadvantage (measured by eligibility for free school meals - FSM), but weaker than the influence of Early Years Home Learning Environment (HLE) and mothers' qualifications.

The influence of primary schools upon Children's social/behavioural developmental progress appears to operate more through school-level characteristics (significant predictors include measures of *Anti-academic ethos*, *Use of homework and school standards* and the extent of *recent school Improvement since last inspection*) rather than classroom-level factors. The exception is the observed measure of *Quality of Pedagogy*, which is beneficial both for reducing pupils' Hyperactivity, and promoting their Pro-social behaviour and Self-regulation (e.g. concentration, self-reliance).

What matters in the classroom

An earlier report (Sammons et al., 2006) has provided a detailed analysis of the two classroom observation instruments used in this sub-study: Classroom Observation System for Fifth Grade (COS-5, Pianta, 2001) and the Instructional Environment Observation Scale (IEO, Stipek, 1999). Year 5 was chosen for observations because it avoided possible influences associated with preparations for National assessments at the end of Key Stage 2. The initial analyses found that teachers' and children's observed behaviours differed significantly across the 125 Year 5 classes observed (Sammons et al., 2006). The two observation instruments identified significant variations in observed quality indicating that children's educational experiences in Year 5 classes differed significantly with some having the benefit of higher quality experiences.

A number of important underlying dimensions of classroom processes were identified such as *Quality of Pedagogy*, *Disorganisation, Child positivity*, pupils' *Positive engagement* and the extent of *Attention and contro*l, as well as specific features of practice related to literacy and numeracy teaching and learning. In this report these underlying dimensions are tested in multilevel models of children's progress and development to establish whether there is any evidence that variations in classroom experiences influence children's outcomes. In addition, global measures of overall *Teaching quality* were derived as a composite of the dimensions of classroom practices mentioned above, and tested to establish whether teachers can be classified into different groups, on the basis of overall teaching quality.

The goal was to investigate experiences in Year 5 classes that were related to children's educational outcomes in Year 5. Multilevel models were used to test the predictive power of different measures of classroom processes and overall *Teaching quality* in relation to children's progress/development across Years 1 to 5. The models of children's progress control for prior attainment (or prior social behaviour) measured in Year 1 as well as a wide range of child, family and home learning environment (HLE) influences. The progress/developmental gains are measured over a four year period in primary school. The outcomes studied include Reading and Mathematics (measured by NFER standardised tests) and four social/behavioural measures derived from teachers' ratings of individual children (covering the four dimensions of Hyperactivity, Self-regulation, Anti-social behaviour and Pro-social behaviour)[1].

It was hypothesised that higher quality classroom experiences would predict better child progress between Year 1 and Year 5. School effectiveness research has drawn attention to the importance of the classroom level in accounting for variations in student outcomes in many studies but such research has generally only tested limited measures of classroom processes and usually only examined cognitive outcomes (Teddlie & Reynolds, 2000). The EPPE 3-11 research has studied a detailed set of classroom measures obtained from observations in Year 5 and a number of different indicators of children's outcomes and thus can explore the relative strength of different features on a wide range of outcomes.

Overall Teaching Quality

The results indicated that the overall measure of *Teaching quality* was a significant and moderate to strong predictor of both Reading (ES=0.35) and Mathematics progress (ES=0.37) for EPPE 3-11 children in the 125 schools. These differences refer to the contrast between the High and Low groups on the overall measure of *Teaching quality*. However, this overall measure did not show any clear pattern of relationships in predicting differences in children's social/behavioural development.

Three important conclusions can be drawn from these results. First, it is possible to classify teachers in Year 5 classes into groups according to differences in their overall *Teaching quality* across a range of different dimensions of classroom behaviour and practice.

Second, overall *Teaching quality* is a significant predictor of cognitive progress for children across the period Year 1 to Year 5. Children in schools where Year 5 overall *Teaching quality* was observed to be High do significantly better in both Reading and Mathematics than those attending schools where Year 5 quality was observed to be Low.

Third, the overall quality of teaching as measured by the instruments had a consistent influence on children's academic progress but not on children's social/behavioural development.

Nonetheless, more specific aspects of classroom processes were found to predict both better social/behavioural development and better cognitive progress.

It is possible to use effect sizes (ES) to compare the strength of different factors such as overall *Teaching quality* with that of other background influences on children's progress.

[1] For further details of the social/behavioural measures see Sammons et al., 2007b).

For example, the influence of overall *Teaching quality* is similar in order to the net influences of mothers' highest qualification level (comparing the influence of having academic qualifications at age 18 years versus no qualifications) and larger than the net influence of either gender or eligibility for FSM, for example). Further details of background effects are shown in the Appendix 2 of this report. For more detailed information on the ES of background factors (on the full sample) see Sammons et al., (2007a; 2007b).

Aspects of Teaching

High levels of observed classroom *Disorganisation* in Year 5 (related to teachers' organisation and the behavioural climate of the classroom) were associated with poorer progress in Reading, Mathematics and Hyperactivity.

The factor *Disorganisation* is related to the behavioural climate of the classroom and supports earlier teacher and school effectiveness studies indicating that a calm and orderly climate facilitates learning and teaching. Elsewhere we have shown associations between social disadvantage in the primary school intake and the level of *Disorganisation* in Year 5 classes (Sammons et al., 2006). It may be harder for teachers to maintain good order in schools serving higher proportions of disadvantaged children. It may also be the case that poorer classroom practice is one contributory factor in explaining the poorer outcomes of children in more disadvantaged communities. It is likely that both explanations play a part. Our analyses have tested and controlled for (where significant) a wide range of significant background measures, including parents' qualifications, occupations and income. The results show that, over and above such influences, features of classroom experience such as *Disorganisation* seem to play an important role in shaping children's educational outcomes.

Other research (Ross & Hutchings, 2003; Darling-Hammond, 2002; Wirt et al., 2002; 2003) has suggested that schools in disadvantaged settings can find it harder to recruit and retain teachers. This suggests that a stronger emphasis on promoting overall quality of teaching and a more orderly classroom climate will be important features of initiatives to promote better educational outcomes for pupils in schools that serve above average proportions of disadvantaged children.

While the overall *Teaching quality* was equally important for promoting both Reading and Mathematics progress, specific features of *Quality of Pedagogy* in Year 5 showed stronger relationships with children's Mathematics progress. Reviews of school and teacher effectiveness research have suggested that schools vary more in the effects on Mathematics than on Reading (Scheerens and Bosker, 1997; Muijs and Reynolds, 2005). These results suggest that the overall *Teaching quality* seems to be equally important for both outcomes but that specific features of classroom processes, such as *Quality of pedagogy*, tend to be better predictors of children's progress in Mathematics. It was also found to be important for children's progress in terms of reducing Hyperactivity, and promoting Pro-social behaviour and Self regulation. More detailed guidance on the features of Pedagogy associated with this higher quality factor may prove helpful in promoting improvement in practice. Items in the *Quality of Pedagogy* factor included richness of instructional method, a positive climate, productive use of instructional time, the use of evaluative feedback, teacher sensitivity and lack of teacher detachment. Overall, this factor describes a classroom where teachers provide a rich learning environment, where pupils are challenged in their learning and provided with specific evaluative feedback on how to improve their work, as well as a positive emotional climate.

The quality of *Attention and control* observed in the classroom was also found to be linked with better progress in Maths and better development in Self-regulation, while the measure of observed *Child Positivity*, (which involved the nature of Child-Teacher relationships, children's co-operative skills and their self-reliance) is a factor that relates more to the emotional features of classroom processes and was a predictor of better progress in Reading.

What matters in the school

In addition to classroom observation measures, the teachers of the observed classes completed a questionnaire to explore teachers' perceptions of different aspects of school/classroom processes and organisation. A number of underlying dimensions were identified. These were then tested in the multilevel progress models to predict child outcomes in Year 5.

Use of homework and school standards

Teachers' reports on the *Use of homework and school standards* indicated a positive relationship with Mathematics progress although the strongest effects were for the Medium group. Higher scores on this factor were also associated with better developmental gains for Self-regulation and Pro-social behaviour. For these two aspects of children's social behaviour results were stronger for the High versus the Low group. The items included: teachers set homework every week for their class, most teachers mark and return homework promptly, and whether the overall standards set for pupils at the school were perceived to be high enough.

Pupils' agency and voice

Progress in Reading was positively linked with the factor *Pupils' agency and voice*. Differences were largest between the Low and the Medium-High groups suggesting that moderate levels of *Pupils' agency and voice* have a more positive impact on progress in Reading than either Low or High levels. Self-regulation was also positively linked with the factor on *Pupils' agency and voice.* Children in schools where teachers indicated High or Medium-High levels of *Pupils' agency and voice* showed significantly increased levels of Self-regulation.

It was hypothesised that children would show positive social behaviour in schools where pupils had greater opportunities to organise activities for themselves and their views are listened to and accommodated, however the findings appear to suggest otherwise. Contrary to expectations, children's Hyperactive and Anti-social behaviour was significantly increased in schools where teachers indicated High levels of *Pupils' agency and voice*. These schools may be responding to bad pupil behaviour by giving more emphasis to pupils' voice so *Pupils' agency and voice* may be a constructive response by schools seeking to counter negative behaviour. Alternatively, some moderate amount of *involvement* and *autonomy* may be optimum, and beyond a certain point, children at this age may not respond well to high levels of autonomy because such strategies may adversely affect the disciplinary climate. Further study of *Pupil Agency and voice* may be needed to explore these associations and their impact.

Anti-academic ethos

Schools with high levels of *Anti-academic ethos* showed significantly poorer progress in Reading and Mathematics; differences were mainly between the High and Low groups. The relationships between *Anti-academic ethos* and the social/behavioural dimensions were more graduated, showing a steady decrease in Pro-social behaviour and a steady

increase in Hyperactive and Anti-social behaviour as a function of increasing *Anti-academic ethos* in the school.

Parental communication and support
Two factors (from the teacher questionnaire): *School communication with parents* and *Parental support of their child's learning* were significant predictors of better outcomes for the EPPE 3-11 sub-sample in Year 5.

Of the two factors, teachers' perceptions of *School communication with parents* was the stronger predictor (Reading ES=0.38, Mathematics ES=0.34) with children making better progress in schools where teachers reported good communication (such as *parents being regularly informed about their child's progress/achievement*s and *the school being good at communicating its expectations of pupils to parents)*. This factor also predicted better developmental progress for Self regulation (ES=0.27) (which is strongly linked to cognitive outcomes).

Teachers' judgements of overall *Parental support of their child's learning* also showed a significant positive relationship with pupils' progress in Reading (ES=0.28) but not in Mathematics; this factor was also found to be a strong and positive predictor of Pro-social behaviour (ES=0.38).

Overall these findings indicate that, taking account of other influences, children make better progress in schools where teachers reported good communication with parents in aspects such as communicating expectations of pupils to parents, or regularly informing parents about their child's progress and achievements.

Quality matters (Ofsted inspection data from reports)
In addition to investigating the impact of classroom processes based on observational data, further analyses were conducted to explore the predictive power of more global indicators of school quality based on independent professional judgements of Ofsted inspectors. Earlier analyses (Sammons et al., 2006) at the school level had already indicated that significant associations between observational data and inspection reports exist for the 125 focal schools. A number of the classroom process factors derived from the observations were found to be positively related to Ofsted measures of school effectiveness, improvement and leadership. This supported the conclusion that the observed measure of overall *Teaching quality* was found to be higher in schools previously identified as showing better quality in terms of overall judgements of *School effectiveness*, *Improvement since last inspection* and *Leadership*.

It was hypothesised that children in the 125 schools would make more cognitive progress and show more favourable social/behavioural development in the focal schools that had previously been rated more favourably on the various Ofsted indicators of quality. Ofsted measures were tested in the multilevel models of children's outcomes in Year 5 and the results supported the hypothesis.

School effectiveness
The overall Ofsted judgement of *School effectiveness* was a strong predictor of better outcomes for the sub-sample of EPPE 3-11 children, after control for other factors (prior attainment/social behaviour and background factors). Attending a more effective school (as judged by inspectors) made a significant difference to all outcomes (Reading, Mathematics and all four social/behavioural outcomes), more strongly for Mathematics, (ES=0.41), Self-regulation (ES=0.39) and Pro-social behaviour (ES=0.37).

Improvement since last inspection
The Ofsted judgement of overall school improvement since the last inspection showed a similar pattern to findings on overall *School effectiveness*; results were particularly strong for Self-regulation (ES=0.49), Pro-social behaviour (ES=0.43), Anti-social behaviour (ES=0.31) and Mathematics (ES=0.35).

Leadership
The Ofsted judgements related to School *Leadership* also showed a modest but positive relationship with progress in Mathematics (ES=0.32), Hyperactivity (ES=-0.22) and Anti-social behaviour (ES=-0.23).

These results are of policy interest as they show that going to a higher quality school (as identified by Ofsted) does make a significant difference to children's cognitive and social/behavioural progress across the board. Children who attended more effective and improved schools showed longer term benefits in terms of a wide range of outcomes. The results can also be seen to provide some independent support for the validity of the Ofsted judgements, by confirming their predictive validity for a range of child outcomes.

Measures of social disadvantage (Free school Meals - FSM)
There is evidence that the overall characteristics of pupil intake (measured by the percentage of pupils eligible for free school meals) also influence children's cognitive progress and social/behavioural outcomes (for Mathematics, Hyperactivity, Self-regulation and Anti-social behaviour comparing those in schools below the mean of this factor). Higher levels of social disadvantage were a predictor of poorer outcomes, controlling for all other significant child, family and HLE characteristics including the individual child's family income and eligibility for FSM. However, the effects are somewhat weaker (ES range 0.23-0.29) than those found for the Ofsted measures of school effectiveness and improvement (ES range 0.27-0.49). Elsewhere EPPE 3-11 have shown that only one of the classroom observation measures was associated with level of disadvantage (Sammons et al., 2006). Classroom *Disorganisation* was weakly negatively associated with overall social disadvantage of pupil intake to a school (% of pupils eligible for Free School Meals, Correlation r=0.36). These findings support other research on the importance of school composition and indicate that the challenges in raising attainment are greater for schools in areas of higher disadvantage.

Conclusions and Implications
Reviews of school and teacher effectiveness research have repeatedly pointed to the importance of a range of school and classroom features that promote better educational outcomes for students; see Teddlie & Reynolds (2000), Scheerens & Bosker (1997), Sammons (2007c). These include a positive school culture, good leadership, creating a positive learning environment, high expectations and good quality teaching.

The EPPE 3-11 study is the first to combine a wide range of data that explore the relationship between detailed measures of child, family and home learning and children's progress (in both cognitive and social/behavioural outcomes) and link this detailed information to what teachers do in the classroom and measures from inspection judgements (Ofsted). This has enabled the exploration of the predictive power of different measures in accounting for variation in children's progress across a range of outcomes.

The EPPE 3-11 analyses of classroom observations show it is possible to group teachers in Year 5 classes in terms of differences in overall *Teaching quality* across a range of observed dimensions of classroom behaviour and practice.

Overall *Teaching quality* is a significant predictor of better cognitive progress for children between Years 1 and 5, and this is particularly evident in the High and Low groups. In other words, children in schools where Year 5 overall *Teaching quality* was observed to be High do significantly better in both Reading and Mathematics progress than those attending schools where Year 5 teaching quality was observed to be Low.

However, overall *Teaching quality* was not associated with social/behavioural progress in any consistent way. It appears that the overall quality of teaching as measured by the observations has a greater influence on children's academic progress, than on other social/behavioural outcomes.

With regard to other measures, children who attended more effective and improved schools, as measured by earlier Ofsted judgements made during regular school inspections, showed longer term benefits on a range of social/behavioural outcomes as well as academic outcomes. The judgement of school leadership also showed a significant though weaker positive influence. This supports the conclusions of school effectiveness research that *school matters*. Even when the powerful influences of child, family and home are controlled, going to a 'better' primary school exerts a positive net influence on children's academic progress and also on social/behavioural outcomes.

In addition, the results indicate that teachers' perceptions of a number of features of their schools (such as school communication with parents, parental support, consistent emphasis on homework, pupil agency and voice, and anti-academic ethos) are also significant predictors of children's academic progress and social/behavioural progress from Year 1 to Year 5.

The EPPE 3-11 findings delineate particular aspects of teachers' classroom practice and overall features of schools (including inspection judgements of school quality) that have predictive validity in terms of better child outcomes at age 10. They support conclusions from previous school and teacher effectiveness studies that identify important variations between teachers and schools in their effects on pupils' progress and social/behavioural development. In combination with the findings on teacher quality, the results point to important features of schools and classroom processes that help to explain differences in children's outcomes and thus provide evidence on successful practice. The quality of classroom teaching and the overall quality of the primary school both matter, while contextual influences and communication with parents are also significant. We conclude that initiatives that give a stronger emphasis to promoting the overall quality of teaching and creating a more orderly classroom climate are likely to improve educational outcomes for all children and may be particularly important for schools with higher proportions of disadvantaged children (because these schools are more likely to have higher levels of classroom disorder).

After taking account of other influences it is clear that the quality of classroom teaching matters, and the overall quality of the school also matters. Children in the EPPE sample who had the benefit of attending a primary school judged (by Ofsted) to be more effective and improved, showed benefits in all the outcomes studied. The results support the view that more effective schools tend to foster both cognitive and social/behavioural outcomes. The findings also provide some independent confirmation that inspection

judgements of effectiveness and improvement provide useful indicators of important features of school quality that have a measurable impact on a range of pupil outcomes. Both the quality of teaching and the overall effectiveness of the school are found to be significant predictors of better cognitive progress and social/behavioural development. Given that many studies (including EPPE 3-11) have demonstrated links between disadvantage (such as low SES and family income) and significantly poorer educational outcomes, enhancing the quality of teaching and the overall effectiveness of the school are likely to be particularly important for disadvantaged groups of pupils. A major review by Scheerens & Bosker (1997) concluded that school effects are larger for ethnic minority and disadvantaged groups (in this report the sample size does not allow detailed analysis of school effects for specific sub-groups). Therefore improving the quality of teaching and overall effectiveness of the school is likely to be necessary to promote better long term educational outcomes for disadvantaged pupils in particular. This conclusion is also supported by recent Ofsted findings of schools in disadvantaged areas (Ofsted, 2007).[2] The EPPE 3-11 findings support the view that quality of classroom practices and overall quality of schools and their leadership make an important difference to children's academic and social/behavioural progress. The results suggest the need to reduce the variation in the quality found between classroom practices and schools processes in order to raise overall standards and promote greater equity.

This longitudinal study is the first of its kind in England (educational effectiveness) to provide recent and robust evidence on the role of classroom influences such as teaching quality and school processes in shaping primary children's progress and development (on a wide range of outcomes) during Key Stage 2. The strength of the findings is enhanced by the controls for the impact of other background factors.

[2] See Ofsted Annual Report 2006/2007 (para. 282-284, p. 69 -70).

Introduction

The Effective Pre-school and Primary Education Project 3-11 (EPPE 3-11) is a large-scale longitudinal study of the influence of pre-school and primary school on children's cognitive and social/behavioural development. The study has been following children from the start of pre-school (at age 3 years plus) through to primary school entry and across Key Stage 1 (KS1) and Key Stage 2 (KS2). Over 3000 children and 141 pre-school centres were included in the first phase of the pre-school research. Children were tracked from age 3 years to the end of KS1 in primary school at age 7 years. During the pre-school phase the project explored the links between child outcomes and pre-school setting/classroom practices and processes through observations. This identified the features of pre-school experiences found to be linked with more positive developmental outcomes for young children up to age 5 years (see Sylva, 1999; Siraj-Blatchford, 2003; Sylva et al., 2006).

This follow-up phase of the longitudinal research investigates the development of the same group of children across KS2 of primary education (7 to 11 years). It consists of three "Tiers". Tier 1 involves the analysis of primary school academic effectiveness across all primary schools in England using value added approaches measuring pupil progress for three successive cohorts across Key Stage 2 in terms of National Assessment outcomes in English, Mathematics and Science (Melhuish et al., 2006a; 2006b). Tier 2 focuses on the academic and social/behavioural progress of around 2,500 individual children in the original EPPE 3-11 sample and uses the results from Tier 1 to provide measures of primary school academic effectiveness for the schools attended by EPPE 3-11 children, to explore pre-school and primary school influences in combination. Tier 3 explores variations in observed classroom practices during KS2 focusing on a sub-sample of 125 schools and Year 5 classes drawn from among the 850 plus primaries in which the EPPE 3-11 children were located (see Sammons et al., 2006).

This paper is the second in a series reporting on the classroom observation component of the study (Tier 3) conducted in the Year 5 classes during the spring and summer terms of 2004 and 2005. The first paper in this series provided a detailed description of the two observation instruments used and the extent to which they identified variation between classes in different aspects of teachers' practice and in children's observed responses. In addition, the first paper explored the associations between several Ofsted measures of overall school quality and effectiveness, and the observed measures of teachers' behaviour and children's responses. Further analyses linking classrooms observations to value added indicators of school effectiveness derived from the Tier 1 component of the research (using National assessment data) were also described. The results indicated that there were substantial variations in children's educational experiences (as observed through the research instruments) in different schools and classes, and that these were associated with the external measures of school quality and effectiveness (based on value added measures and Ofsted inspection grades).

The current paper examines patterns of association between children's developmental progress and observed classroom behaviour focusing on the sub-sample of EPPE 3-11 children who attended the 125 focal schools during the classroom observations period. It provides a more detailed statistical analysis, using multilevel models to predict individual children's developmental trajectories, using child, family, and home learning environment (HLE) measures as controls in addition to prior attainment or prior social behaviour, so that the net influence of different measures of classroom practice and overall indicators of school quality and climate can be explored.

Aims of the Analyses

- To link observed classroom behaviour to children's developmental progress at age 10.
- To explore the impact of classroom processes on children's cognitive and social/behavioural development at age 10.
- To investigate the relationships between selected Ofsted measures of quality and effectiveness and children's cognitive and social/behavioural outcomes at age 10.

Methods

This analysis focuses on a sub-sample of 1160 children in 123 focal schools that form part of a large sample in the EPPE 3-11 study.[3] We have reported on the attainment, progress and social/behavioural development of the full EPPE 3-11 sample at Year 5 (age 10) in separate reports (see Sammons et al., 2007a; 2007b; Melhuish et al., 2008) with a particular focus on the influences of child, family, HLE as well as pre- and primary school experience. Here we investigate in more detail the influences of classroom experience in Year 5 using observation data collected in 125 primary schools.

For this analysis we adapt the value added multilevel models developed to study progress and social/behavioural development across Year 1 to Year 5 to include only statistical predictors of the reduced child sample so that the study of classroom measures controls for intake differences. Therefore the estimates of the effects of these classroom measures are reported net of the impact of background influences including prior attainments (cognitive outcomes) in Year 1 or prior social behavioural development (social/behavioural outcomes).

A wide range of information has been drawn upon and used to analyse data for the full EPPE 3-11 sample for which cognitive and social/behavioural outcome data were collected in Year 5. This included standardised cognitive assessments, teachers' assessments of social/behavioural development, information about child, family and home learning environment (HLE) characteristics collected from parental interviews when children were recruited to the study and again in Key Stage 1 (KS1), measures of pre-school quality and effectiveness collected during the first phase of the study, and independent measures of primary school academic effectiveness derived from the Tier 1 analyses of National assessment data for successive cohorts (Melhuish et al., 2006a). A more detailed description of the information and methods used to develop the original models can be found in Appendix 1.

Two observation instruments were used to explore variation in classroom processes: the Classroom Observation Instructional Environment Observation Scales (IEO, Stipek, 1999) and the Classroom Observation System for Fifth Grade (COS-5, Pianta, NICHD, 2001). These instruments were selected because they were devised relatively recently for the primary age group, cover a wide range of pupil and teacher behaviours and offered the opportunity to facilitate comparison with research in other contexts (e.g. Galton et al., 1999; NICHD, 1998; 2001).

Data from the COS-5 (Pianta) child and classroom codes and from the Literacy and Numeracy scales of the IEO (Stipek) instrument were entered into a principal components analysis with Varimax rotation to identify factors of empirically linked items. Five factors were extracted for the COS-5 instrument accounting for seventy-six percent of the variance; and three factors were extracted for the Literacy and Numeracy scales of the IEO instrument, explaining seventy-three percent and seventy-six percent of the variance respectively. These factors were used in all subsequent analysis (for further details see Sammons et al., 2006).

Classroom observation and children's outcome data for Year 5 classes were matched with a number of measures taken from the most recent Ofsted inspection report available for schools (from either the most recent 2003 or the earlier 2000 inspection cycle). These provided global measures of inspectors' judgements of: overall school effectiveness, the extent of improvement since the previous inspection, the effectiveness of leadership within schools, quality of teaching and learning in Key Stage 1 and Key Stage 2, and judgements about a number of pupil measures such as overall patterns of exclusion, attitudes and attendance.

A teacher questionnaire was also administered by research officers to explore teachers' views and perception of school policies and organization and different aspects of their practice. Responses were received from 118 Year 5 teachers (94% of the 125 focal schools).

[3] Two of the 125 classes were excluded from the analyses due to insufficient data and low numbers.

Overview of the report

Section 1: This section describes the sample of focal schools in which classroom observations were conducted; and also presents the distribution of background variables for the sample of children attending these schools and compares these to the characteristics of the EPPE 3-11 sample as a whole.

Section 2: This section provides summary details of the two observation instruments used for the investigation of classroom processes and teachers' behaviour. The two observation instruments used are Pianta's Classroom Observation System for Fifth Grade (COS-5) and the Instructional Environment Observation Scale (IEO) of Stipek. The underlying dimensions related to classroom processes are outlined and the creation of overall summary indicators of *Teaching quality,* based on the two instruments, are described.

Section 3: This section describes the results of multilevel analyses of children's cognitive progress between Years 1 and 5 in Reading and Mathematics and of development in four social/behavioural outcomes over the same period. The analyses are used to test the predictive power of the overall measure of *Teaching quality*, and of the different dimensions identified by the two observation instruments in terms of the various child outcomes in Year 5. The results support the hypothesis that better child progress and developmental outcomes are associated with more positive scores in terms of the observational measures. In addition a number of measures derived from a questionnaire survey of the Year 5 teachers are also tested and point to some significant relationships.

Section 4: This section investigates the predictive power of various global measures of school quality based on Ofsted inspection judgements of school effectiveness, improvement and leadership as well as more specific measures such as quality of assessment. The results indicate that children who attended a more effective or improved school show benefits across a wide range of cognitive and social/behavioural outcomes.

The final section summarises the main results and conclusions.

Section 1: The Sample

1.1 The sample of focal schools

The project identified a purposive school sample of primary schools from amongst those attended by the EPPE 3-11 children to include in the observation component of the research. The criteria for sampling included indicators of schools' effectiveness (across a range of 'effectiveness' measures) and the number of EPPE 3-11 children enrolled.

We used the school value added 'effectiveness' scores obtained from the early stages of the analysis for Tier 1 of the EPPE 3-11 project (Melhuish et al., 2006a) (described earlier in the report). From an analysis of school value added residuals for English, Mathematics and Science and their associated confidence limits, schools were classified into different effectiveness categories for the three core subjects. Schools where pupils were making significantly more progress than might be expected given their pupil and school intake characteristics were categorised as relatively 'more effective' and those where pupil progress was significantly below expected as 'less effective' in each subject.

The EPPE 3-11 child sample spans four academic years and cohorts of children with Cohorts 2 and 3 being the largest. The purposive sub-sample for this paper was selected from schools attended by children in these two larger cohorts. In 2004, Cohort 2 of EPPE 3-11 (1180) children was in Year 5 in 483 schools. In 2005 Cohort 3 (1435) was in Year 5 in 616 schools. Schools where four or more EPPE 3-11 children attended were selected so that there were approximately equal numbers of relatively 'more effective' and relatively 'less effective' schools in each region of the study. Table 1.1 presents the sample of classrooms observed and the instruments used.

Table 1.1: The Sample of classrooms

Year	COS-5 (Pianta) observations	IEO (Stipek) observations
2004 (Spring/Summer)	54	24
2005 (Spring/Summer)	71	69
Total	125	93

In the first year (2004) 54 schools were selected for observation using the Classroom Observation System for Fifth Grade (COS-5, Pianta, NICHD, 2001) instrument, applying the above criteria. An additional sub-group of 24 of these 54 schools were observed using the Instructional Environment Observation Scale (IEO, Stipek, 1999) instrument. These 24 schools were chosen to reflect an approximately equal number of relatively more 'effective' and less 'effective' schools. In the second year (2005), 71 schools were selected using the same criteria described above in which to apply both the COS-5 (Pianta) and IEO (Stipek) instruments. The COS-5 (Pianta) instrument was conducted in all 71 schools, making a total of 125 schools. However, due to imminent Ofsted inspections, two of the schools were unable to accommodate the additional IEO (Stipek) visits and therefore a total of 69 schools were observed using the IEO (Stipek) instrument in the second year, making an overall total of 93 schools for this instrument.

1.2 The sample of children in the focal schools

This section provides descriptive statistics for the sample of EPPE 3-11 children in the 125 focal schools. Table 1.2 provides a brief summary of background characteristics[4] for this sample.

[4] To prevent loss of sample size for further analyses, missing values of number of siblings and eligibility for free school meals where imputed using 'the last observation carried forward' method. See Appendix 3 for a description of this imputation method.

Overall 1160 EPPE 3-11 children attended the 125 focal schools. This is approximately 45% of the total EPPE child sample. Within this sample fifty per cent of children were male, nearly three quarters were of White UK heritage, twelve per cent had English as an Additional Language (EAL) and around forty per cent of EAL children (representing 4.8% in the total sample) still required EAL support at age 10. In terms of family characteristics, the majority of children (63.6%) lived with one sibling, eighteen per cent were singletons and seventeen per cent were part of larger families with 3 siblings or more. Just under half (44%) of children had relatively high scores (25+) in an index of early years home learning environment (HLE) measured in the pre-school period. A substantial minority of children (31%) were from families where scores on the early years HLE index were relatively low (below 20 was indentified as relatively low).

About thirteen per cent of both mothers and fathers had a degree or higher degree level qualification. The large majority, however, were educated to GCSE level or below – three quarters of mothers and fifty-six per cent of fathers (note that 21% of children were in families where the father was recorded as absent and this contributed to the difference here). Low family socio-economic status (SES) was recorded for nineteen per cent of the sample, half (49.7%) were in the medium (skilled manual or skilled non manual) group and twenty-nine per cent were identified as from the higher (professional) groups. Nearly a quarter of children in the sample (24%) lived in households where parents reported no earned income, while for around a fifth the family earned income was reported to be under £15,000 (data were collected towards the end of KS1 when children aged around 6 years old), and twenty two percent were recorded as eligible for free school meals (FSM). On an index of multiple disadvantage twenty-seven percent were identified as of medium to high disadvantage (3+ disadvantages)[5].

Overall, this sub-sample of children (1160) is not significantly different from the total sample of EPPE 3-11 children (3172), variations in the distributions of background variables are generally within 2 percent, except on income. There is a notable over representation of children whose reported family earned income is either 'none' or lower than £15,000 (44.4% in comparison to 33.2% in the total sample), although the proportional representation of children eligible for FSM is almost identical in both samples. There is also an over representation of children whose mothers or fathers have '16-academic' level of qualification (39.7% and 26.7% respectively) in comparison to the characteristics of the sample tracked at entry to primary school (35.2% and 21.3%). Finally, the distributions by 'type of pre-school' are significantly different between the samples; private-day nurseries, local authority day nurseries and integrated centres are greatly under represented in the current sub-sample.

The distributions of background variables in the sub-sample of 823 children who attended the schools in which the IEO instrument was used are broadly the same as those described above with the exception of ethnicity and type of pre-school attended. Within the 'IEO' sub-sample there is an over representation of children of Pakistani (10.3%) and Mixed race (5.2%) origins in comparison to the characteristics of the COS-5 sub-sample (2.2% and 1.5% respectively) as well as of the total sample of EPPE 3-11 children (2.1 and 1.3% respectively). In addition, there is an over representation of children who have attended playgroups (27.2%) and nursery classes (22.0%) relative to the COS-5 sample (24.2% and 16.9% respectively) and the total sample (19.2% and 16.4% respectively). These slight differences in sample characteristics means that caution should be employed in interpreting results in relation to the full PPE sample. However, the focus of these analyses is not to investigate the relative influence of measures such as ethnicity or pre-school type but rather to provide statistical control for intake differences in exploring the influence of variations in teacher behaviours across the sample of 125 Year 5 classes.

[5] Only a small number of children had missing demographic data. The proportion of missing data generally did not exceed three percent with the exception of 'need of EAL support' (13%) and multiple disadvantage (6.5%).

Table 1.2[6]: Characteristics of children with valid Year 5 data and classroom observation data compared to the total sample at entry to primary school

	COS-5 sample n=1160		IEO sample N=823		Total sample n=3172	
	n	%	n	%	n	%
Gender						
Male	582	50.2	407	49.5	1636	51.6
Female	578	49.8	416	50.5	1536	48.4
Ethnicity						
White UK Heritage	862	74.3	585	71.1	2295	72.4
White European Heritage	39	3.4	27	3.3	122	3.8
Black Caribbean Heritage	30	2.6	25	3.0	116	3.7
Black African Heritage	17	1.5	12	1.5	66	2.1
Indian Heritage	20	1.7	17	2.1	93	2.9
Pakistani Heritage	25	2.2	85	10.3	67	2.1
Bangladeshi Heritage	89	7.7	13	1.6	177	5.6
Mixed Heritage	17	1.5	43	5.2	40	1.3
Any Other Ethnic Minority Heritage	59	5.1	14	1.7	192	6.1
English as an Additional Language (EAL)	139	12.0	113	13.7	354	11.2
Child needs EAL support at Year 5	56	4.8	45	5.5	98	3.1
No. of siblings						
No. siblings	204	17.6	132	16.0	624	19.7
1sibling	738	63.6	529	64.3	1955	61.6
2+ siblings	198	17.1	145	17.6	483	15.2
Pre-school Home Learning Environment (HLE) Index						
0 – 13	110	9.5	84	10.2	308	9.7
14 – 19	249	21.5	176	21.4	665	21.0
20 – 24	259	22.3	189	23.0	727	22.9
25 – 32	374	32.2	264	32.1	960	30.3
33 – 45	133	11.5	83	10.1	346	10.9
Type of Pre-School						
Nursery class	274	23.6	120	14.6	588	18.5
Playgroup	281	24.2	224	27.2	609	19.2
Private day nursery	111	9.6	83	10.1	516	16.3
Local Authority day nursery	101	8.7	63	7.7	433	13.7
Nursery schools	196	16.9	181	22.0	519	16.4
Integrated (Combined) centres	37	3.2	34	4.1	191	6.0

[6] All background variables used in the models were obtained from a detailed parent interview conducted on entry to the study with the exception of maternal employment (not shown in Table 1.1) and family earned income; these measures were obtained during Key Stage 1 (KS1 - 6-7 years old) through a follow up parental questionnaire. Measures of FSM eligibility and 'Need of EAL support' are collected yearly through the teacher completed child profile; the measure obtained for a given year is the measure used in the models for that year's outcomes, e.g. Year 5 FSM for Year 5 models, Year 1 FSM for Year 1 models etc.

Throughout the report the variable of family earned income is used as a measure of the income level of the family. The 'no' family earned income group may have income through benefits or other sources such as a pension. The 'no' family earned income group is used as the reference group in comparisons. Family earned income is categorised into 6 levels (see Table 1.2). Any reference through out the report to 'income' equates to family earned income.

Home	160	13.8	117	14.2	314	9.9
Mother's Qualifications						
None	247	21.3	179	21.7	647	20.4
Vocational	173	14.9	129	15.7	442	13.9
16 Academic	461	39.7	314	38.2	1118	35.2
18 Academic	78	6.7	49	6.0	257	8.1
Miscellaneous	9	.8	7	.9	25	.8
Degree and higher degree	156	13.4	114	13.9	533	16.8
Father's Qualifications						
None	199	17.2	144	17.5	484	15.3
Vocational	141	12.2	110	13.4	346	10.9
16 academic	310	26.7	203	24.7	676	21.3
18 academic	69	5.9	47	5.7	223	7.0
Degree or equivalent	123	10.6	90	10.9	378	11.9
Higher degree	37	3.2	28	3.4	165	5.2
Other professional/ miscellaneous	12	1.0	10	1.2	32	1.0
Father absent	246	21.2	173	21.0	757	23.9
Family Highest SES						
Professional Non Manual	80	6.9	62	7.5	281	8.9
Other Professional Non manual	260	22.4	185	22.5	776	24.5
Skilled Non Manual	390	33.6	265	32.2	974	30.7
Skilled Manual	187	16.1	137	16.6	452	14.2
Semi-Skilled	170	14.7	118	14.3	406	12.8
Unskilled	29	2.5	20	2.4	79	2.5
Unemployed / Not working	24	2.1	19	2.3	88	2.8
FSM (at Year 5 or earlier)						
Free School Meals	250	21.6	180	21.9	673	21.2
Salary of family						
No salary	280	24.1	188	22.8	569	17.9
£ 2,500 – 17,499	235	20.3	172	20.9	485	15.3
£ 17,500 – 29,999	196	16.9	151	18.3	411	13.0
£ 30,000 – 37,499	107	9.2	73	8.9	271	8.5
£ 37,500 – 67,499	179	15.4	118	14.3	470	14.8
£ 67,500 – 132,000+	41	3.5	33	4.0	173	5.5
No salary data	122	10.5	88	10.7	792	25.0
Total Multiple Disadvantage Index						
0 (low disadvantage)	235	20.3	156	19.0	644	20.3
1	282	24.3	192	23.3	781	24.6
2	236	20.3	172	20.9	613	19.3
3	145	12.5	110	13.4	391	12.3
4	102	8.8	76	9.2	257	8.1
5 plus (high disadvantage)	85	7.3	59	7.2	213	6.7

Section 2: The Classroom Observation Instruments

Two observation instruments were adapted and used in the EPPE 3-11 project to obtain information about variation in classroom processes, including teachers' and pupils' classroom behaviour and experiences. These instruments were selected because they were devised relatively recently, they are appropriate for the primary age group (Year 5), they cover a wide range of pupil and teacher behaviours and they offered the opportunity to facilitate comparison with research in other contexts (e.g., NICHD, 1998; 2001). The following section provides a brief description of the two instruments. The COS-5 (Pianta) Observations were completed in the Spring term (2003/4 and 2004/5) and the IEO (Stipek) was conducted in the Summer term (2003/4 and 2004/5). The COS-5 (Pianta) observations were conducted across a range of academic subjects whereas the IEO (Stipek) focused on Literacy and Numeracy only.

2.1 The Instructional Environment Observation Scale (IEO, Stipek)

The Instructional Environment Observation Scale (IEO, see Appendix 5) was designed by Professor Deborah Stipek, University of California, for the Centre on Organisation and Restructuring of Schools. The purpose of the IEO (Stipek, 1999) is to gather high inference, numerical indicators of the instructional environments experienced by pupils by combining judgements about the teachers' teaching and pupils' learning behaviours. In the EPPE 3-11 study, the IEO was used specifically to observe both Literacy and a Numeracy hour/session in Year 5 classrooms in focal schools. These core subjects were of particular concern given the development of the National Literacy and Numeracy (later to be known as the Primary Strategies) Strategies. Researchers observed one complete Literacy and one complete Numeracy lesson. A brief description of this instrument is presented in Box 1.

Box 1: The IEO (Stipek) Instrument

Instructional Environment Observation Scale (IEO) (Stipek)
Researchers using the IEO observed one complete Literacy and Numeracy lesson. There are 4 main areas of this instrument: General Classroom Management and Climate, General Instruction Scales for both subjects, plus Mathematical Instruction Scales for Numeracy, and Writing Instruction Scales for Literacy.

Literacy	Numeracy
1. Classroom climate	1. Classroom climate
2. Classroom routines	2. Classroom routines
3. Cross-Disciplinary Connections	3. Cross-Disciplinary Connections
4. Linkage to life beyond the classroom	4. Linkage to life beyond the classroom
5. Social support for student learning	5. Social support for student learning
6. Student engagement	6. Student engagement
7. Reading as meaning making	7. Use of Maths analysis
8. Basic skills development in the context of reading	8. Depth of knowledge and student understanding
9. Higher order thinking in writing	9. Basic skill development in the context of problem solving
10. Purposeful development of writing skills	10. Maths discourse and communication
11. Instructional conversations.	11. Locus of Maths authority

2.2 The Classroom Observation System (COS-5, Pianta)

The Classroom Observation System (COS-5, Pianta, see Appendix 6), developed by Professor Robert Pianta (NICHD, 2001), was initially used by the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development in the USA. The instrument is divided into two main parts that include The Behavioural Coding System, which

we refer to as the Frequency of Behaviour Coding System, and the Qualitative Coding System, which we refer to as the Measures of Quality Coding System. A brief description of this instrument is presented in Box 2.[7]

Box 2: The COS-5 (Pianta) instrument

This instrument is divided into two main parts: The Frequency of Behaviour Coding System, and the Measures of Quality Coding System.

The Frequency of Behaviour Coding System

The Frequency of Behaviour Coding System is used in the first of the two 10 minute observation segments. This part includes the coding of child and teacher behaviours across a range of classroom and curriculum settings. For the duration of this part of the observation, a target child (TC) is observed and recorded during a sequence of ten 60 second intervals (30 seconds observe, 30 seconds record) during which focus is placed upon capturing information in five general areas of the target child's classroom behaviour and experience.

The categories are:

Child level setting – the classroom setting in which the target child is working:

1. Whole class
2. Individual
3. Large group
4. Small group.

Content of target child's activity - The nature of the activity in which the target child is engaged in including:

1. Subject areas (e.g. Literacy, Numeracy, etc.),
2. Sub categories within a sub area (e.g. Word-Level and Comprehension in Literacy)
3. Part of Literacy and Numeracy hour as describe by the NLS (specifically adapted for use in the UK)
3. Non-curricular activities such as Enrichment and Free Time.

Teacher behaviour – Interaction with the target child:

1. Attending to target child (directly)
2. Teaching basic skills
3. Teaching analysis
4. Managerial instructions
5. Monitoring and checking work
6. Displaying positive or negative effect and discipline.

Child academic behaviour:

Type of behaviour	**Degree of involvement**
1. Learning/performing basic skills	1. engaged
2. Learning/performing analysis	2. highly engaged
3. Collaborative work	3. unproductive
4. Requesting attention/help/information	4. off task or– alternative academic behaviour
5. volunteers	

Child social behaviour - social interactions with peers and adults in the classroom:

1. Positive/neutral engagement with peers
2. Negative/aggressive engagement with peers
3. Positive effect towards teacher
4. Negative effect towards teacher
5. General disruptive behaviour.

The Measures of Quality Coding System

The Measures of Quality Coding System part of the observation instrument is dedicated to ten minutes continuous observation of behaviours and characteristics of the target child, the teacher in the classroom at a more global level. This section contains two broad categories: Child Codes and Classroom Codes. Under these main headings there are a number of sub-headings or constructs (behaviours, characteristics) that must be rated.

Child codes	**Classroom codes**
1. Positive affect	1.Richness of instructional methods
2. Self-reliance	2. Over-control
3. Sociable/Co-operative with peers	3. Chaos
4. Attention	4. Detachment/Teacher
5. Disruptive	5. Positive classroom climate
6. Activity level	6. Negative climate
7. Child-Teacher relationship	7. Purposeful use of instructional time
	8. Teacher sensitivity (Main teacher only).

Each individual item is rated on a seven-point scale (1 = very uncharacteristic and 7 = very characteristic).

[7] The COS-5 (Pianta) schedule was used to study the following classroom events: 1xStart of the morning, 1xStart of the afternoon, 2xLiteracy sessions, 2xNumeracy sessions, 1xScience or Social Science and 1xOther academic subject, making a total of 8 observation cycles in each school. High priority was placed on core-academic subjects because of their key role in academic progress.

The individual scales within the COS-5 and IEO instruments have been explored in the first paper in this series (see Sammons et al., 2006 for details). Overall, those analyses indicated significant but relatively modest associations between the two observation instruments, suggesting that the two measure somewhat different aspects, and seem to tap into somewhat different underlying dimensions of teacher and pupil behaviour and pupil responses.

2.3 Key Dimensions in Classroom Processes

Data from the COS-5 (Pianta) child and classroom codes and from the Literacy and Numeracy scales of the IEO instrument were entered into a principal components analysis with Varimax rotation to identify factors of empirically linked items. Five factors were extracted for the COS-5 instrument accounting for seventy-six percent of the variance; and three factors were extracted for the Literacy and Numeracy scales of the IEO instrument, explaining seventy-three percent and seventy-six percent of the variance respectively. These factors were used in all subsequent analysis.

The Instructional Environment Observation Scale (IEO, Stipek) Factors
Data from the Literacy and Numeracy scales of the IEO instrument were analysed separately. Analysis of both Literacy[8] and Numeracy yielded similar factors - *Pedagogy*, *Subject development* and *Learning linkages* - explaining seventy-three percent of the variance in the individual Literacy items, and seventy-six percent of the variance in the Numeracy items. The Literacy and Numeracy items that form particular factors are reported in Box 3.

Box 3: Underlying dimensions for the IEO (Stipek)

Literacy	**Numeracy**
1. Pedagogy 1. Classroom climate 2. Classroom routines 3. Social support for student learning 4. Student engagement 5. Instructional conversations	**1. Subject development** 1. Use of Maths analysis 2. Depth of knowledge and student understanding 3. Basic skill development in the context of problem solving 4. Maths discourse and communication 5. Locus of Maths authority
2. Subject development 1. Higher Order Thinking (HOT) in writing 2. Purposeful development of writing skills	**2. Pedagogy** 1. Classroom climate 2. Classroom routines 3. Social support for student learning 4. Student engagement
3. Learning linkages 1. Cross-Disciplinary connections 2. Linkage to life beyond the classroom	**3. Learning linkages** 1. Cross-disciplinary connections 2. Linkage to life beyond the classroom

The latent structures underlying the Literacy and Numeracy data were conceptually similar. Three factors were extracted for each set of data, each consisting of *Subject development*, *Pedagogy* and *Learning linkages* dimensions. The items loading on the 'Learning linkages' were the same for both Literacy and Numeracy; the items loading on *Pedagogy* were again the same with the exception of 'Instructional conversation' which was an additional item to load on Literacy; the *Subject Development* factors were subject specific.

[8] The analysis of the Literacy scale included only nine of the 11 items. The two remaining items - 'Reading as meaning making' and 'Basic skills development in the context of Reading' - were not included as these two activities were mutually exclusive and would rarely co-occur within the same observation cycle, consequently the number of observations for these items were too small to include.

The Classroom Observation System (COS-5, Pianta) Factors
Data from the COS-5 child and classroom observations were analysed and five distinct factors were identified, accounting for seventy-six percent of the variance in the 16 individual item scores (Box 4).

Box 4: Underlying Dimensions for the COS-5 (Pianta)

1. Quality of pedagogy
1. Classroom codes - Richness of instructional method
2. Classroom codes - Teacher detachment
3. Classroom codes - Positive classroom climate
4. Classroom codes - Productive use of instructional time
5. Classroom codes - Evaluative feedback
6. Classroom codes - Teacher sensitivity

2. Disorganisation
1. Child code - Disruptive
2. Classroom codes - Chaos
3. Classroom codes - Negative classroom climate

3. Child positivity
1. Child code - Self-reliance
2. Child code - Co-operative with peers
3. Child code - Child-Teacher Relationship

4. Positive engagement
1. Child code - Positive affect
2. Child code - Activity level

5. Attention and control
1. Child code - Attention
2. Classroom codes - Over control

The first factor is interpreted as representing general classroom processes and pedagogy and was termed *Quality of pedagogy*. Scoring high on this dimension indicates a classroom where the teacher provides pupils with a rich learning environment. The focus is on learning and a 'can do' culture. Pupils are supported in their learning with 'feedback' from the teacher that challenges them.

'Child's disruptive behaviour', 'Chaos' and 'Negative climate' formed the second factor. This dimension may be conceptualised as measuring the extent of classroom *Disorganisation* (or its obverse) characterised by higher scores on general chaotic and negative classroom climate and pupils' disruptive behaviour or its absence. This clustering appears to suggest that disruptive behaviour and negative or chaotic classroom atmosphere are likely to coincide; however, whether a chaotic atmosphere in the classroom encourages disruptive behaviour or whether it is a reflection of it, is not possible to determine, it seems probable that the two would tend to reinforce each other. Scoring high on all elements in this factor was rare; nevertheless there were a small proportion of atypical classrooms where the level of chaotic and disruptive behaviour observed was relatively high.

Two of the three items loading on the *Disorganisation* factor ('Chaos' and 'Negative classroom climate') also load (negatively) on the *Quality of pedagogy* factor. This suggests that while P *Quality of pedagogy* and *Disorganisation* may represent different underlying dimensions the two constructs are not entirely independent from each other. Disruptive behaviour may undermine good teaching practices, while poor teaching practices may promote disruptive behaviour.

'Self-reliance', 'Co-operation with peers' and 'Child-Teacher relationships' converged into the third dimension, suggesting that the child who is particularly self-reliant has the social skills to co-operate with others. This dimension is referred to as *Child positivity*.

'Activity level' and 'Child positive affect' formed the fourth factor. We refer to this dimension as *Positive engagement* as this clustering indicates that children who were observed as being occupied also appeared to be happy.

Finally, the fifth factor to be extracted brought together 'Attention' and 'Over control' into a single dimension termed *Attention and control*. This is in many respects the inverse of the *Disorganisation* dimension where chaos and disruptive behaviour are replaced by control and attentive behaviour.

The COS-5 dimensions were divided into four levels of observed behaviour – below one standard deviation (sd) of the mean (Low) within one sd below the mean (Low-Medium) within one sd above the mean (Medium-High) and above one sd of the mean (high). Due to the smaller number of cases for the IEO sub-sample, the IEO dimensions were divided into just three groups – the bottom 20% (Low), middle 60% (Medium) and top 20% (High). These groupings were then used to construct a global measure of teaching/classroom quality based on the combined effect of the individual dimensions[9]. A global indicator of *Teaching quality* was created for the overall COS-5 instrument and for Literacy and Numeracy scales of the IEO. The combined indicators resulted in 21 categories.

The global indicators of *Teaching quality* were created in three stages. First, the individual dimensions were recoded such that scores below 1 sd of the mean received a value of (-1), scores within 1 sd of the mean received a value of (0), and scores above 1 sd of the mean received a value of (1). The recoded variables were then summed and the resulting distributions can be seen in table 2.1. Finally, as the extreme Low and the extreme high categories consisted of very few numbers, the bottom two and the top two categories were collapses for all three global indicators to produce 5 categories representing varying levels of performance for the COS-5 global indicator of *Teaching quality* and 3 categories for each of the IEO global indicators of quality.

Table 2.1: Distributions of the combined dimensions for each observation instrument

n of children by each summed category of teacher behaviour	-3.00	-2.00	-1.00	0.00	1.00	2.00	3.00	Total
COS-5	28	156	269	295	311	84	17	1160
IEO: Literacy	0	41	167	333	193	23	0	757
IEO: Numeracy	0	3	272	281	231	21	0	808

	Low	Low-medium	Medium	Medium-High	High
COS-5 Overall Indicator of *Teaching quality* (total n= 1160)	N= 184	N=269	N=295	N=311	N=101
	15.9%	23.2%	25.4%	26.8%	8.7%
IEO Overall Indicator of *Teaching quality* (total n= 757)	N= 208	N/A	N=333	N/A	N=216
	27.5%	N/A	44.0%	N/A	28.5%

In the next section we explore the relationship between these classroom measures (specific factors and the global quality indicators) and children's progress from Year 1 to Year 5.

[9] The individual (grouped) dimensions within each scale were summed up. The summation process produced 21 categories which were then reduced to five categories with roughly equal numbers.

Section 3: The Influence of Classroom Processes on Cognitive and Social/behavioural Development

In order to explore the potential influence of classroom processes on children's developmental progress we conducted further analyses using 'value added' multilevel models. The COS-5 and the IEO factors were entered individually into value added multilevel models developed to study children's progress and social\behavioural development across Year 1 to Year 5 (see Sammons et al., 2007a; 2007b for detailed descriptions of the main analyses of developmental progress for the whole sample). The value added models developed for the whole EPPE 3-11 sample were adapted to include only statistical predictors of the reduced child sample in the 125 focal schools so that the study of classroom measures controls for intake differences (in terms of prior attainment or prior social behaviour plus any significant child, family or home learning environment (HLE) measures). Therefore the estimates of the effects of the classroom measures are reported 'net' of the impact of background influences including prior attainments (for later Year 5 cognitive outcomes) in Year 1 or prior social behaviour (for later Year 5 social/behavioural outcomes). Due to the different numbers involved we report the results for the COS-5 factors first, as these are based on the larger sample of 1160 children. Appendix 2 gives details of the models for each of the Year 5 child outcomes.

3.1 The Classroom Observation System for Fifth Grade (COS-5, Pianta)

The influence of overall *Teaching quality*

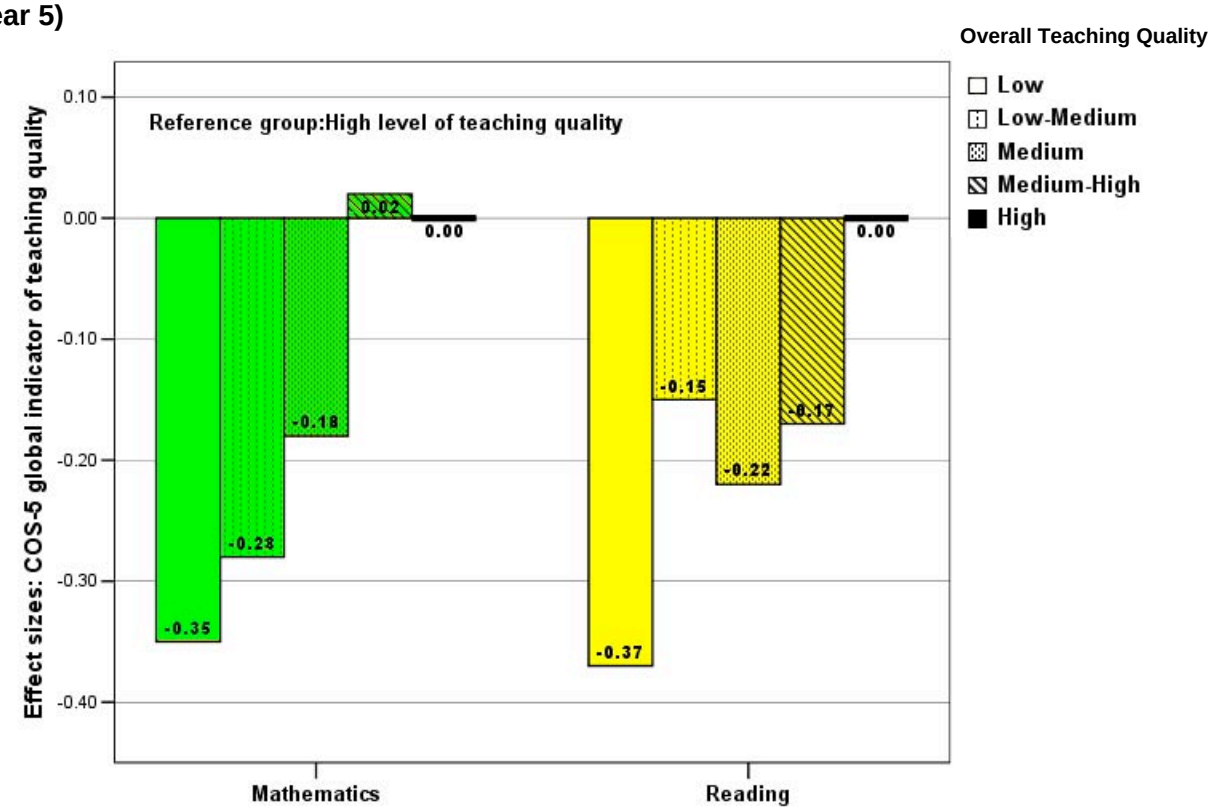
An overall global measure that is an indicator of *overall Teaching quality* (described earlier in Section 2) was developed based on the combination of high or lower scores across the various individual COS-5 factors. It may be hypothesised that children will make more developmental progress in schools and classes where overall *Teaching quality* is observed to be higher. To investigate this hypothesis we tested this overall quality indicator in the multilevel models of children's cognitive progress.

The overall indicator of *Teaching quality* was found to be a significant predictor of both Reading and Mathematics progress for the EPPE 3-11 children in the 125 focal schools. The patterns of association are shown in terms of effect sizes in Figure 3.1. The comparisons are made with the base category highest quality group. There is a clear stepped pattern for Mathematics progress, distinguishing the different quality groups, with the largest differences being found between the High and Medium-High group and other categories (ES=-0.35 between the highest and lowest categories). These differences are all net of the influence of child, family and HLE measures and prior attainment in Year 1. For Reading progress there are also significant differences although the pattern is less obviously stepped. The difference between the High and Low categories is equally large (ES 0.37) but it appears that there is a less obvious gradation between the three remaining groups (Low-Medium, Medium and Medium-High where ES range from 0.15-0.22).

Two important conclusions can be drawn from these results. First, it is possible to classify teachers in Year 5 classes in a meaningful way in terms of differences in overall *Teaching quality* across a range of different dimensions of classroom behaviour and practice based on observations. Second, overall *Teaching quality* is a significant predictor of better cognitive progress for children across the period Year 1 to Year 5, and this is particularly evident at the extremes. In other words, children in schools where Year 5 overall *Teaching quality* was observed to be High overall, do significantly better in both Reading and Mathematics than those attending schools where Year 5 overall *Teaching quality* was observed to be Low.

In contrast to the significant patterns for cognitive progress, there were no clear patterns between the different measures of children's social/behavioural development and the overall COS-5 measure of *Teaching quality* in Year 5 classes.

Figure 3.1: The effect of Overall *Teaching quality* on Children's Cognitive progress (Year 1 to Year 5)

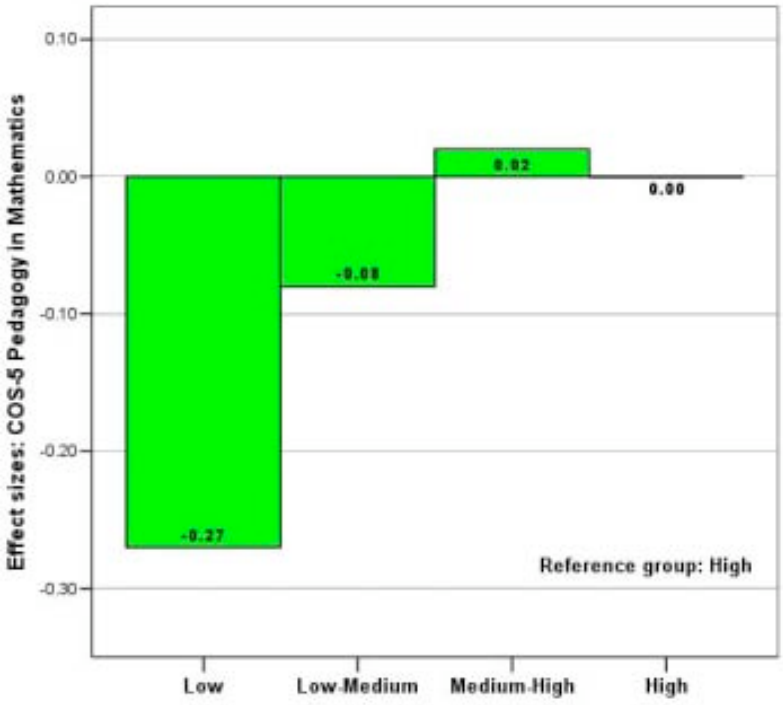


In addition to exploring overall *Teaching quality*, we tested the associations between each of the COS-5 factors separately and collectively. This enables us to establish whether particular features of practice show a stronger link with better child outcomes than others. The results for the overall quality measure tend to show a stronger pattern than the results for individual factors.

Quality of Pedagogy

The COS-5 dimension of *Quality of pedagogy* was significantly associated with better progress for children in Mathematics across Years 1 to 5. Here the main difference was between the lowest group and all other categories. The difference in effect size between the Low and high groups was largest at ES=-0.27. Again there was almost no difference between the Medium-High and the high groups in terms of impact on children's progress. However, there was no statistically significant relationship for Reading. This suggests that the *Quality of pedagogy* may be more influential for children's progress in Mathematics. This finding is in accord with much school effectiveness research that has found school differences in teachers' behaviour tend to be more marked for subjects such as Mathematics.

Figure 3.2: The effect of *Quality of Pedagogy* on Children's Cognitive Progress in Mathematics (Year 1 to Year 5)

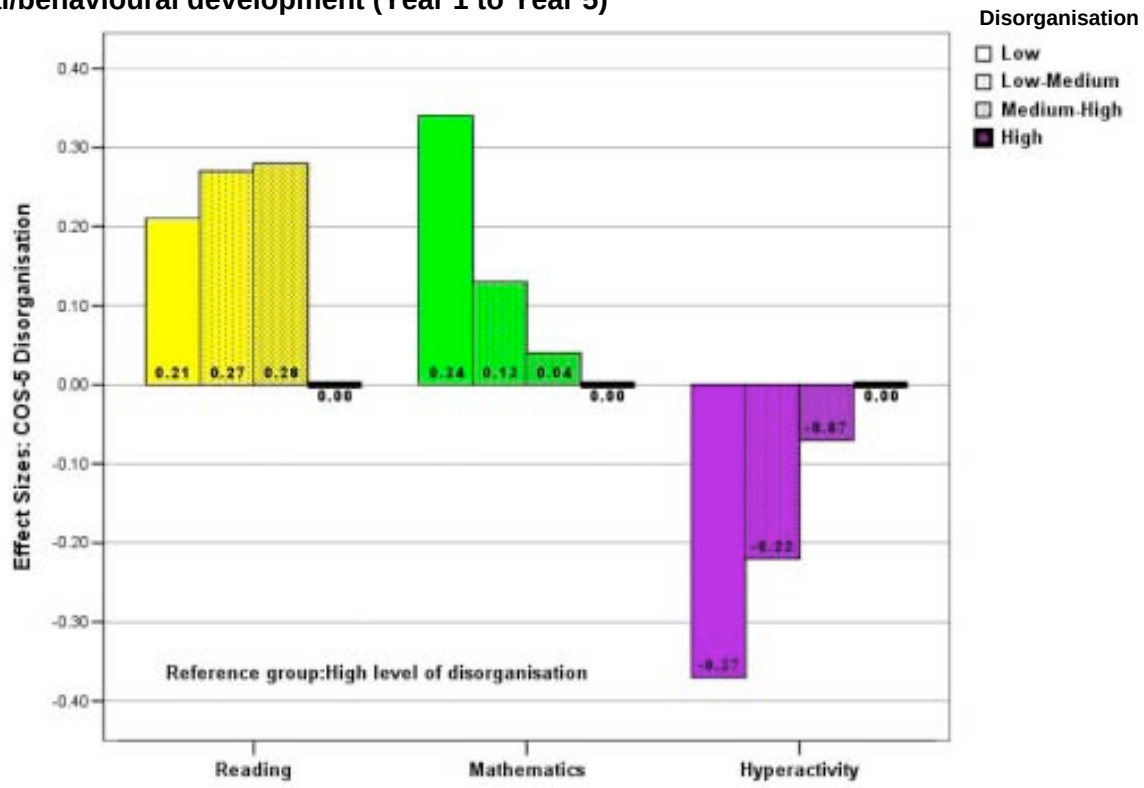


Disorganisation

The factor measuring *Disorganisation* was significantly associated with children's progress between Year 1 and Year 5 in both Reading and Mathematics as well as with developmental progress for hyperactive behaviour. In all cases poorer progress was associated with higher levels of observed *Disorganisation* in class. For Reading the main contrast was between high levels of *Disorganisation* and all other categories; High levels of *Disorganisation* were linked with significantly poorer Reading outcomes after control for other influences and prior attainment. However, there was little difference amongst the other categories with them all being similarly associated with better progress in contrast to the High Disorganisation group (ES range between 0.21-0.28). For Mathematics the pattern was more clearly stepped and linear, with the greatest progress associated with Low levels of *Disorganisation* and the worst progress with High levels of *Disorganisation* (ES=-0.35).

The pattern of results for Hyperactivity was similar to that found for Mathematics. High levels of *Disorganisation* were associated with significantly increased Hyperactivity in Year 5, taking account of prior social behaviour in Year 1 and background factors. The pattern of results is stepped and suggestive of a linear trend, with the greatest difference between the High and the Low group on *Disorganisation* (ES=-0.37). These results confirm the hypothesis that being taught in a class where children's behaviour is generally poor increases the risk of poorer outcomes, both cognitive and in terms of features of a child's own behaviour.

Figure 3.3: The net effects of *Disorganisation* on Children's Cognitive progress and social/behavioural development (Year 1 to Year 5)[10]

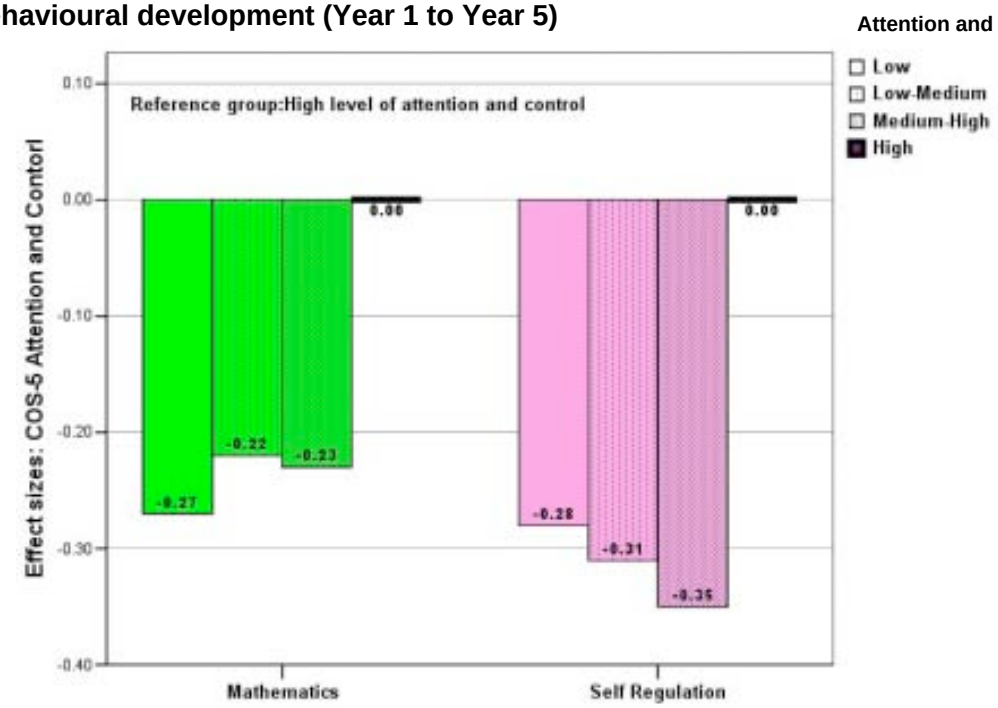


Attention and control

The factor *Attention and control* was also found to be significantly associated with better child outcomes for both cognitive and social/behavioural measures. The results indicate that where levels of classroom attention and control were observed to be high, children made more progress in Mathematics and had better Self-regulation outcomes in Year 5. The main difference identified distinguished the High group from all others, as can be seen in Figure 3.4. These results tend to support the view that higher levels of teacher attention and a proactive approach to classroom management may help to promote better learning and assist children to become better at managing their own learning behaviour (Self-regulation being the social/behavioural outcome most closely associated with attainment in Reading and Mathematics).

[10] The Hyperactivity chart shows that children in classes that scored highly on the Disorganisation factor had poorer developmental progress for the developmental measure Hyperactivity (increased over Years 1 to 6), while those in classes with low scores for the factor Disorganisation ad the best outcomes.

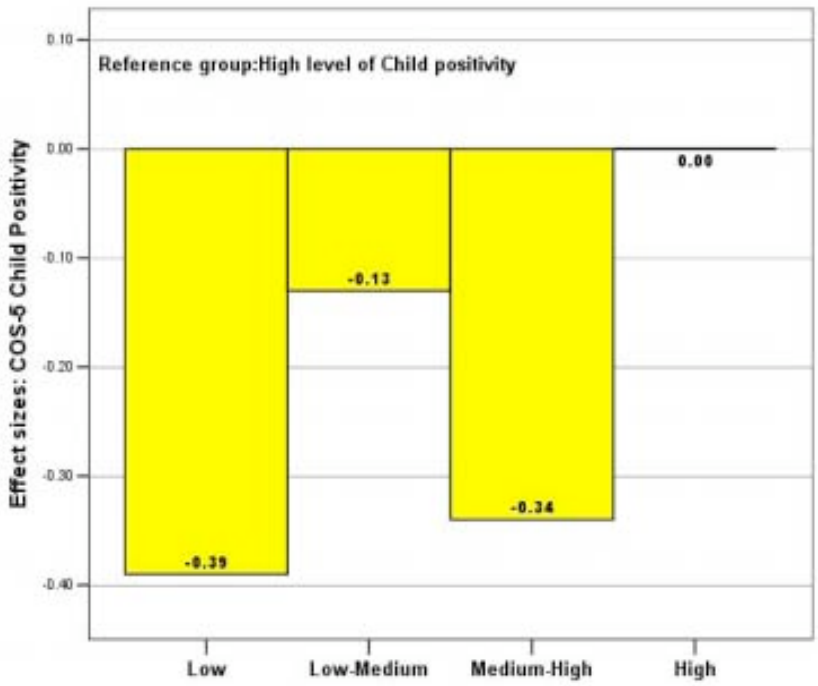
Figure 3.4: The effect of *Attention and control* on Children's Cognitive progress and social/behavioural development (Year 1 to Year 5)



Child positivity

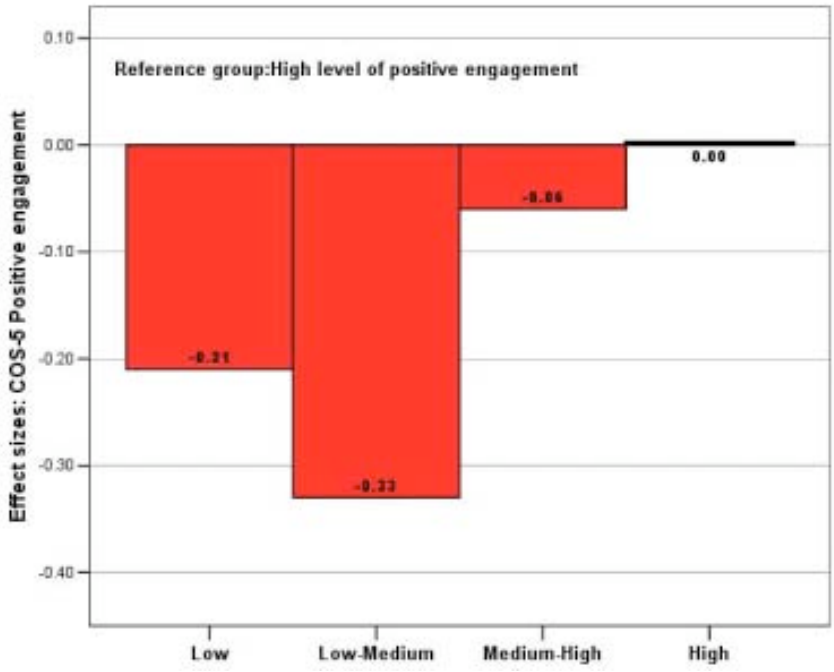
The factor *Child positivity* was found to be significantly associated with greater progress in Reading over the period Year 1 to 5, after control for prior Reading attainment and background characteristics. The pattern identified was not a clear linear trend, however, but overall indicated that children generally made more progress in schools where the Year 5 classroom observations noted the highest levels of positivity. The difference was largest (ES=-0.39) between the highest and lowest groups. However, this factor was not significantly related to any of the other outcomes studied.

Figure 3.5: The effect of *Child positivity* on Children's progress in Reading (Year 1 to Year 5)



Positive engagement
The factor *Positive engagement* showed a significant association with better Pro-social behaviour outcomes but not with any of the other outcomes studied. There were no significant differences between the High and the Medium-High groups but children in both these groups showed significantly better Pro-social development in comparison with the Low and Low-Medium groups (difference in ES -0.21 to -0.33).

Figure 3.6: The effect of Child *Positive engagement* on Children's progress in Pro-social behaviour (Year 1 to Year 5)



Taken together, the results suggest that it is the overall combination of teacher behaviours that can be used to identify differences in overall *Teaching quality* and provide the clearest distinctions in terms of predicting children's cognitive progress, rather than particular isolated features. For social behaviour, however, features related to pupil engagement and emotional climate seem to be more influential.

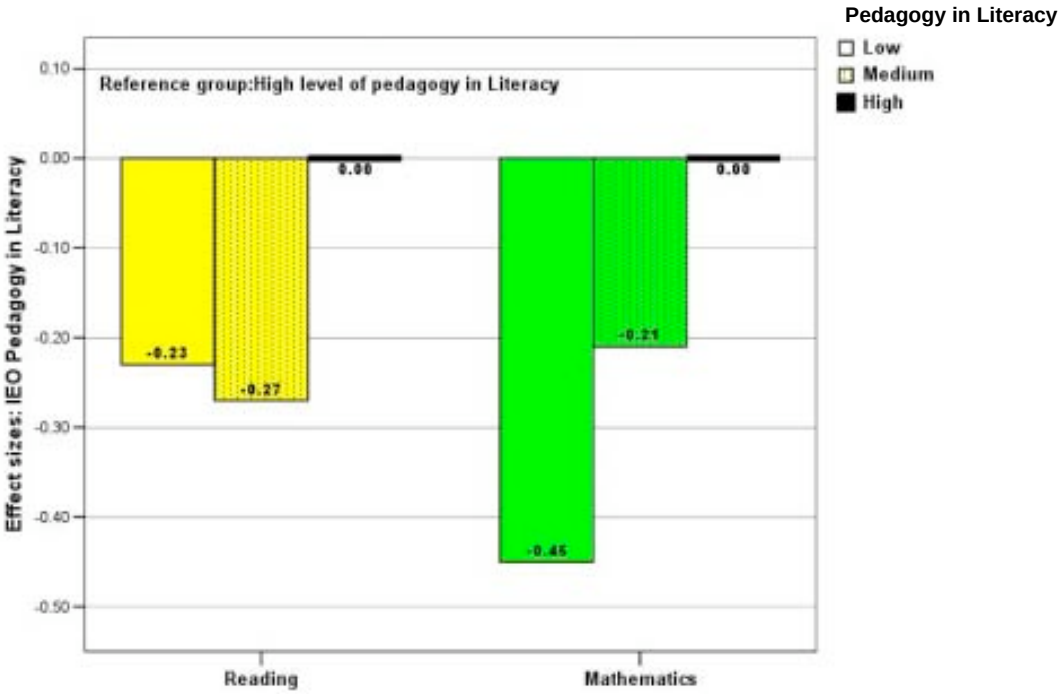
3.2 Instructional Environment Observation Scale (IEO, Stipek)

Further multilevel analyses were conducted on the sub-group of classes for which data from the IEO (Stipek) instrument was available. The IEO had been used to explore variations in teacher behaviour specifically focussed on literacy and numeracy lessons (n of classes=93). Due to the smaller numbers involved in this aspect of the observational study, the measures compared just three broad groups of classes (High, Medium and Low) based on specific features of practice. In contrast to the global indicator of overall *Teaching quality* developed from the COS-5 instrument, there was no clear pattern between the three groups identified from the IEO overall *Teaching quality* analyses.

Pedagogy in Literacy
Interestingly the measure of *Pedagogy in Literacy* was found to be significantly associated with better cognitive progress for children from Year 1 to 5 in both Reading and Mathematics, but the pattern was clearer and showed a stronger stepped pattern (suggesting a linear trend) for Mathematics. The difference between the highest and lowest category was moderately large (ES=-0.45) for Mathematics but smaller (ES=-0.23) for Reading. This suggests that elements of effective literacy teaching measured by the IEO instrument may be associated more broadly with

better teaching overall. For Reading (which covers only one aspect of literacy) the pattern of results mainly distinguished the High group from others and the effect sizes are less strong.

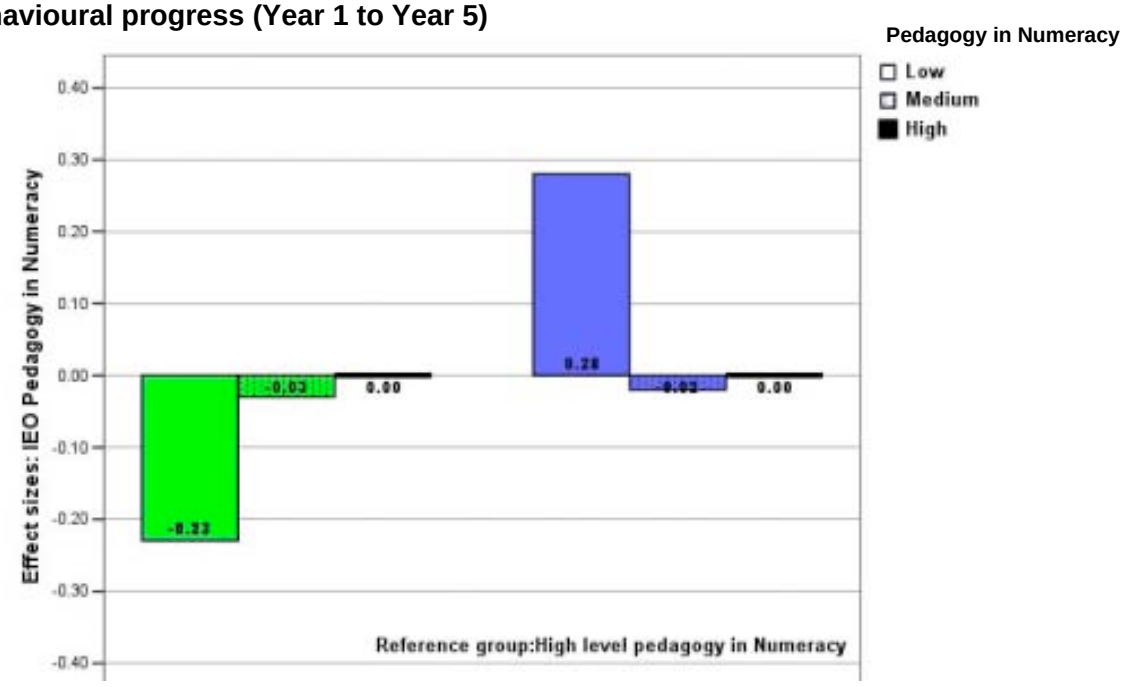
Figure 3.7: The effect of *Pedagogy in Literacy* on Children's Cognitive progress (Year 1 to Year 5)



Pedagogy in Numeracy

The factor related to *Pedagogy in Numeracy* was also found to be significantly but more weakly associated with children's progress in Mathematics than the *Pedagogy in Literacy* measure as can be seen in Figure 3.8. The main distinction is between the Low group of classes and the other groups, with an ES of -0.23 between the Low and High group. The *Pedagogy in Numeracy* factor was not associated with children's progress in Reading. It did however show a significant association with better outcomes for the Anti-social outcome. In other words, better scores on the *Pedagogy in Numeracy* factor were related to significantly reduced scores for Anti-social behaviour in Year 5, taking into account prior social behaviour and background influences (ES=0.28 between the Low and High groups).

Figure 3.8: The effect of *Pedagogy in Numeracy* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)



Subject development in Numeracy

The factor related to *Subject development in Numeracy* was not found to be significantly related to children's progress in Mathematics, but was linked with better progress in Reading. The best outcomes for Reading were found for pupils in schools where Year 5 classes were observed as scoring highly in *Subject development in Numeracy*, but the worst outcomes were for the Medium rather than the Low group. There were also differences for Hyperactivity, where the only significant difference found was a contrast was between the High and Low groups (ES=-0.28); the relationship however was in the opposite direction to the one that would have been predicted (lower levels of *Subject development in Numeracy* being associated with decreased Hyperactivity). Here are no obvious explanations for these findings although there may be a gender interaction (as boys tended to show significantly higher scores for Hyperactivity.

Figure 3.9: The effect of *Subject development in Numeracy* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)

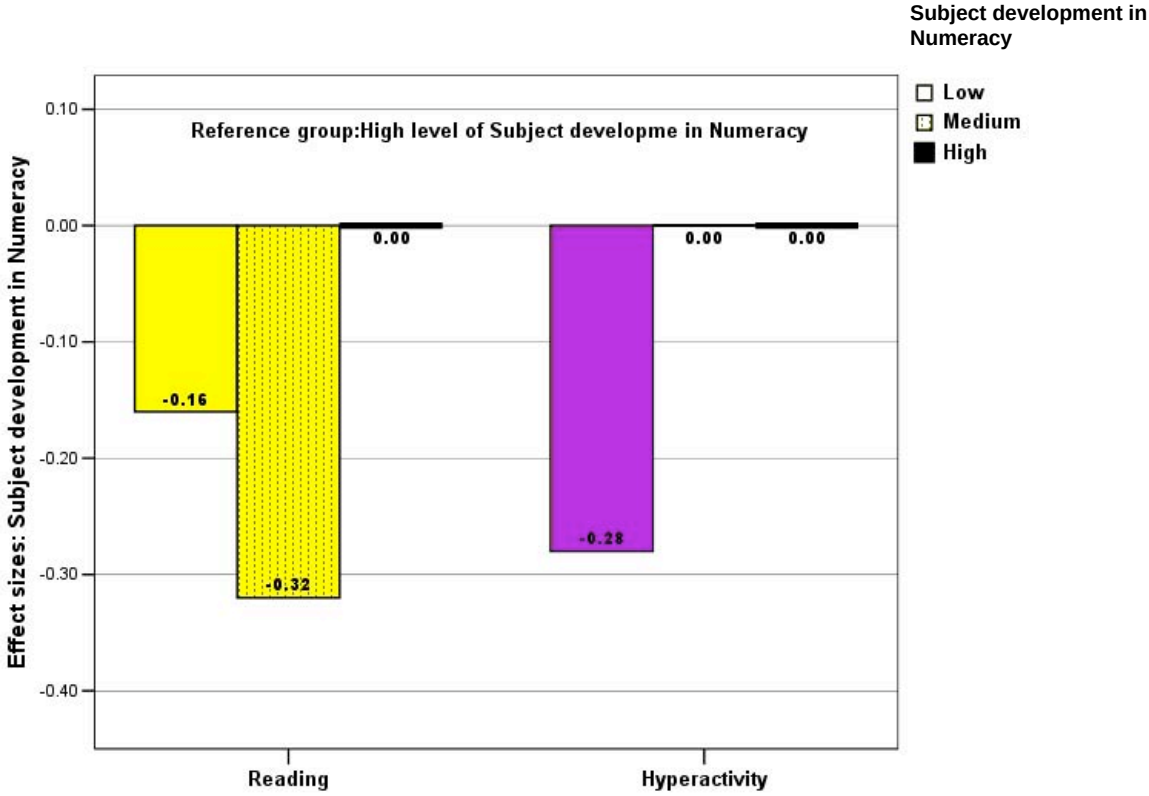


Table 3.1 summarises the main results from the multilevel models of children's cognitive progress and social/behavioural development from Years 1 to 5 in terms of the range of outcomes studied. It can be seen that the differences are moderately strong in the main. They are also generally in the directions predicted (higher scores for the various observed measures of quality being associated, as might be predicted, with better child outcomes taking account of other background influences and prior attainment or prior social behaviour). The results therefore broadly support the view that in schools where better practice was observed there were measurable benefits in terms of children's all round development.

Table 3.1: Summary of relationships between classroom processes and children's cognitive and social/behavioural outcomes in terms of net effect sizes

	Reading	Mathematics	Hyperactivity	Self-regulation	Pro-social	Anti-social
COS-5 (Pianta)						
Global indicator	0.37*	0.35*				
Quality of pedagogy		0.27*	0.28*	0.17*	0.27* Low-Med gp	
Disorganisation	0.21*	0.34*	0.37*			
Child Positivity	0.39*					
Positive engagement					0.33* Low-Med gp	
Attention and control		0.27*		0.28*		
IEO (Stipek)						
Literacy						
Global indicator						
Pedagogy	0.23*	0.45*				
Subject development						
Learning linkages						
Numeracy						
Global indicator						
Pedagogy		0.23*				0.28*
Subject development	0.32* Med gp		0.28*			
Learning linkages						
Reference group: High Effect sizes (ES) represent differences between the lowest and highest scoring groups unless stated otherwise						

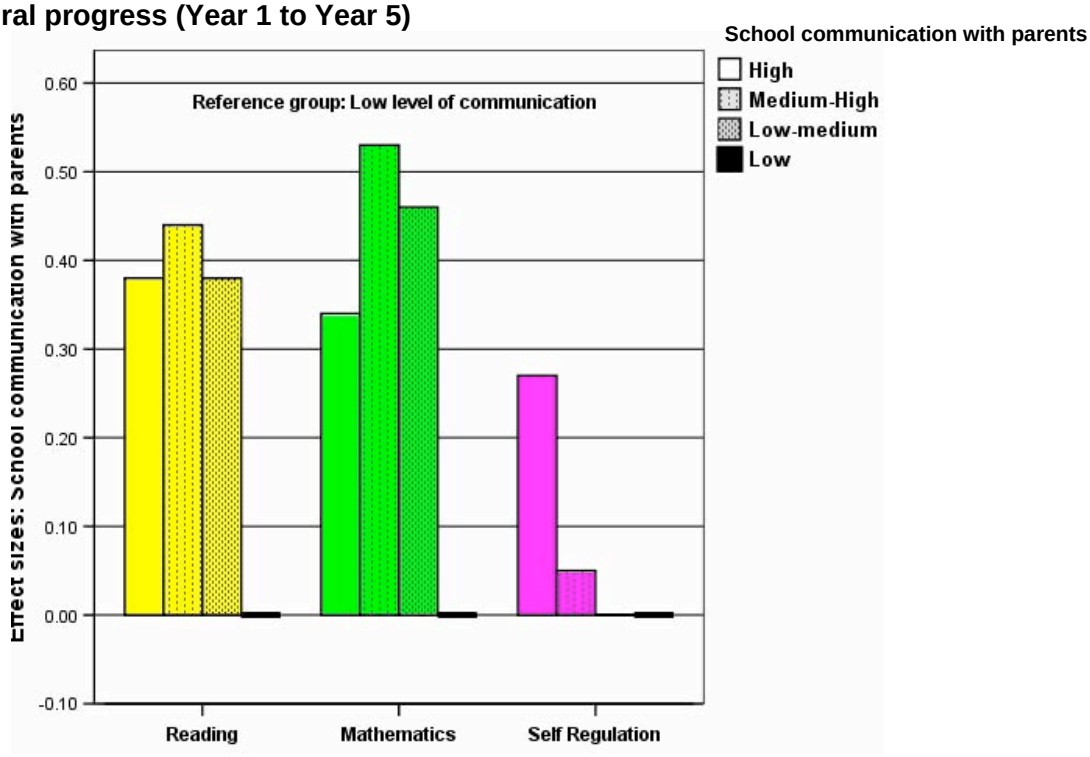
*p<0.05

3.3 Teacher Survey Results

In addition to classroom observation measures, a teacher survey was conducted to explore teachers' views and perceptions of different aspects of school and classroom processes and organisation. A number of underlying dimensions were identified (see Appendix 4 for factor structures). The 125 focal schools were divided into a number of groups ranging from Low to High based on the teacher's responses for each dimension. These were then tested in the multilevel models for the various child outcomes in Year 5. Two measures related to teachers' perceptions of overall *School communication with parents* and the extent of *overall Parental support of their child's learning* were found to be significant predictors of better outcomes for the EPPE 3-11 sub-sample in Year 5. Of the two, teachers' perceptions of *School communication with parents,* was the stronger predictor (see figures 3.10 and 3.11).

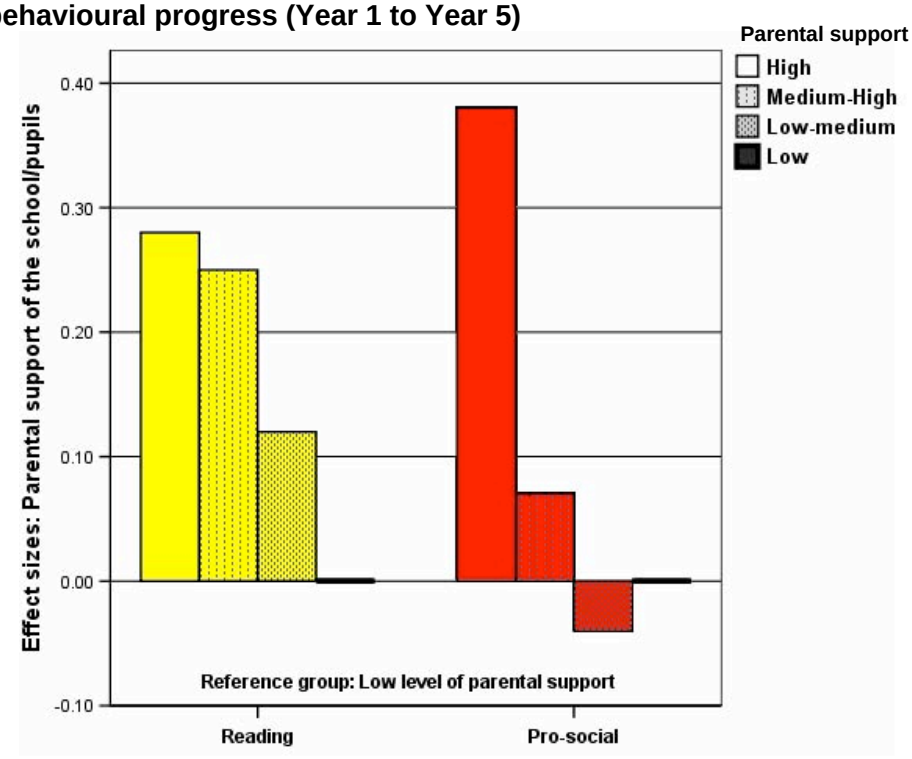
For Reading the ES between the High and Low groups for *School communication with parents* was moderately strong (ES=0.38); the effect was similar for Mathematics (ES=0.34). This indicates that, after taking account of other influences, children make better progress in schools where teachers report good communication with parents in aspects such as communicating expectations of pupils to parents, or regularly informing parents about their child's progress and achievements. The factor *School communication with parents* also predicted better developmental progress for Self-regulation (ES=0.27) when the Low and High groups were compared.

Figure 3.10: The effect of *School communication with parents* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)



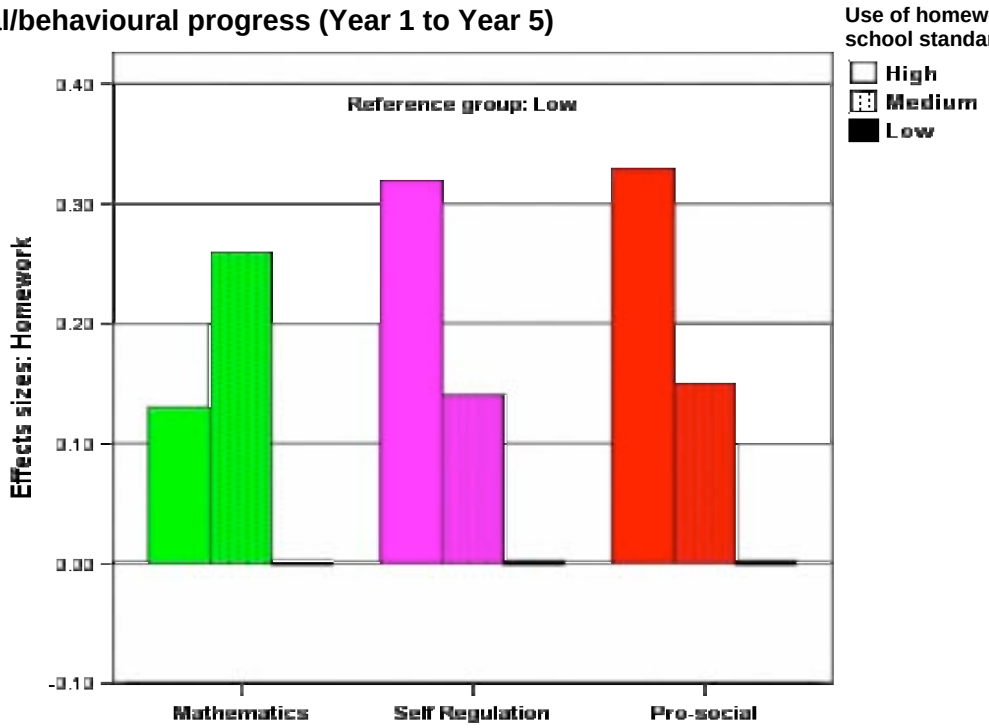
Teachers' judgements of overall level of *Parental support of their child's learning* also showed a relationship with pupils' progress in Reading (ES=0.28, see figure 3.11); however, it showed no significant association with progress in Mathematics. Interestingly, *Parental support of their child's learning* was strongly associated with children's Pro-social behaviour, most notably between the High and Low groups (ES=0.38); children in schools where teachers' judgements of parental support were high showed significantly higher levels of Pro-social behaviour relative to all other groups.

Figure 3.11: The effect of *Parental support of their child's learning* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)



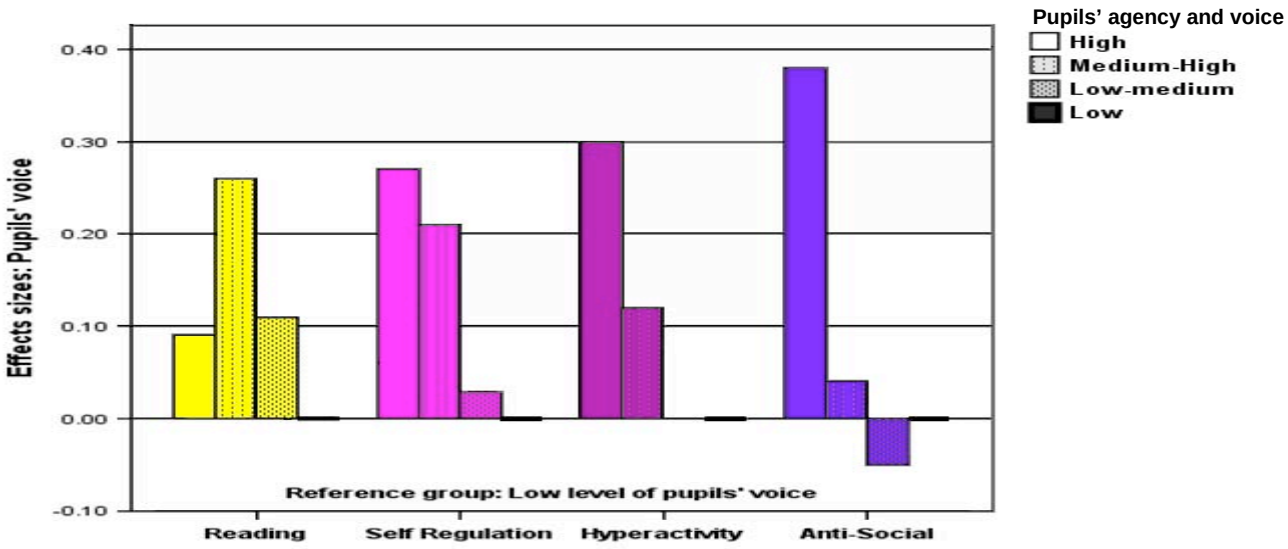
The dimension relating to teachers' reports on the *Use of homework and school standards* indicated a positive relationship with Mathematics progress although the strongest effects were for the Medium group (ES=0.27) followed by the High group (ES=0.13). Higher scores on this factor were also associated with improvements in Self-regulation (ES =0.32) and Pro-social behaviour (ES=0.33). For these two aspects of social behaviour, results were stronger for the high versus the low comparison groups. The items in this factor included; whether most teachers set homework every week for their class, whether most teachers mark and return homework promptly, and whether the overall standards set for pupils at the school were perceived to be high enough.

Figure 3.12: The effect of *Use of homework and school standards* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)



Progress in Reading was positively linked with the factor *Pupils' agency and voice* (see figure 3.13). This related to teachers' responses to items on whether pupils organise activities for themselves and whether pupils' views are listened to and taken seriously. Differences were largest between the Low and the Medium-High groups (ES=0.26); differences between the Low and High groups were not significantly different from zero.

Figure 3.13: The effect of *Pupils' agency and voice* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)

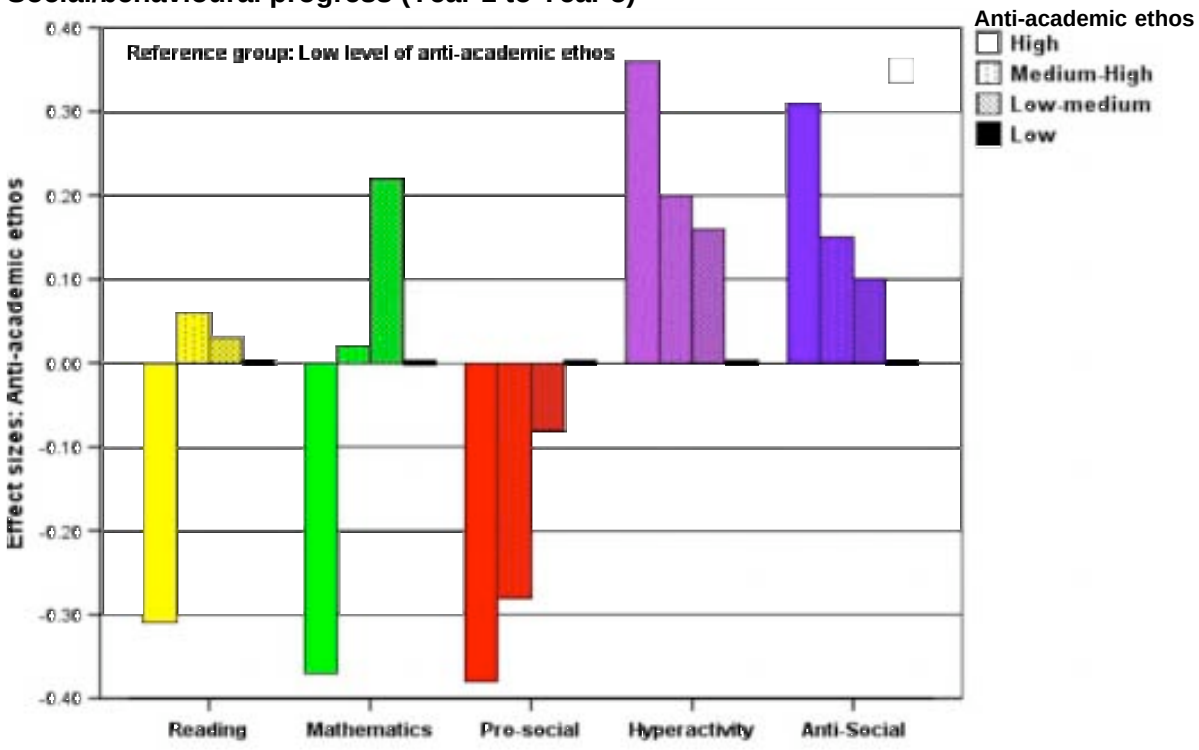


Overall, the findings associated with Reading seem to suggest that giving pupils a 'voice' (listening to pupils views and giving more opportunities for pupils to organise activities) may be most effective when done in moderation; Medium-High levels have a more positive impact on progress in Reading than either Low or High levels.

Developmental progress for the social/behavioural outcome Self-regulation was positively linked with the factor on *Pupils' agency and voice.* Children in schools where teachers indicated High (ES=0.27) or Medium-High (ES=0.21) levels of *Pupils' agency and voice* showed significantly increased levels of Self-regulation. Contrary to expectations, children's Hyperactive (ES=0.30) and Anti-social (ES=0.38) behaviour was also significantly increased in schools where teachers indicated High levels of *Pupils' agency and voice*. It was expected that children would show less *negative* social behaviour in schools where their views are listened to and accommodated, however the findings appear to suggest the opposite. It may be that schools are responding to bad behaviour by giving more support to pupils' voice, and thus rather than predicting bad behaviour, *Pupils' agency and voice* may be a constructive response to negative behaviour. Or, it may be that *moderation* in the levels of *involvement, autonomy* and 'voice' are allowed is optimal, and beyond a certain point, children, especially at younger ages, may not respond well to high levels of autonomy perhaps because they may link to a poorer disciplinary climate. Further research would be required to clarify these issues.

The factor related to teachers' perceptions of an *Anti-academic ethos* amongst pupils in the school were strongly related to cognitive progress as well as to social/behavioural development (see figure 3.14).

Figure 3.14: The effect of *Anti-academic ethos* on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)



Pupils in schools in which *Anti-academic eth*os was perceived by teachers to be high showed significantly poorer progress in Reading (ES=-0.31) and Mathematics (ES=-0.37); differences were mainly between the High and Low groups. The relationships between *Anti-academic ethos* and the social/behavioural dimensions were more graduated showing a steady decrease in Pro-social behaviour (ES=-0.38, -0.28, -0.08) and a steady increase in Hyperactive (ES=0.36, 0.20, 0.16) and Anti-social behaviour (ES=0.31, 0.15, 0.10) as a function of increasing *Anti-academic ethos* in the school.

Table 3.2: Interim summary: Teachers' perceptions and children's cognitive and social/behavioural development

	Reading	Mathematics	Hyperactivity	Self-regulation	Pro-social	Anti-social
School communication with parents	0.38*	0.34*		0.27*		
Parental support of their child's learning	0.28*				0.38*	
Use of homework and school standards		0.27* Medium grp		0.32*	0.33*	
Pupils' agency and voice	0.26~ Med-high grp		0.30~	0.27~		0.38*
Anti-academic ethos	0.31~	0.37~	0.36*		0.38*	0.31~
Reference group: High Effect sizes represent differences between the lowest and highest scoring groups unless otherwise stated						

*p<0.05;

~ Just missed significance level p=0.06-0.07

Section 4: The relationship between Ofsted judgements and Cognitive and Social / behavioural development

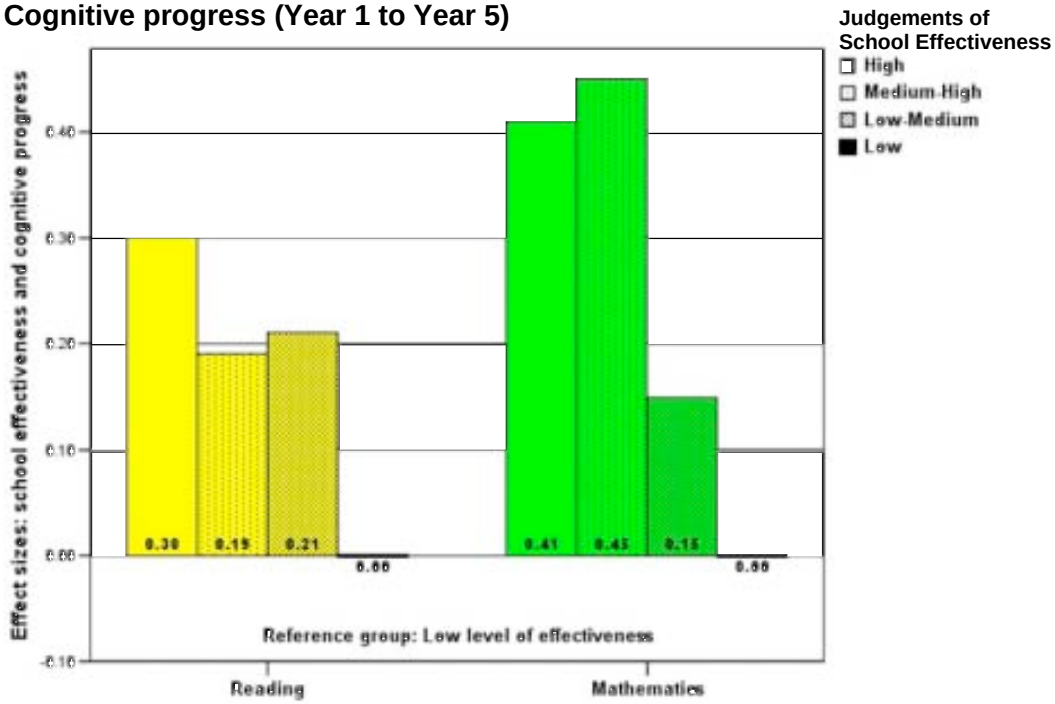
In addition to exploring the relationships between measures of teaching derived from direct observation it is of interest to establish whether more global measures of school and teaching quality and effectiveness independently derived from school's inspections by Ofsted help to predict the cognitive progress and social/behavioural development of children who attended different schools. It was hypothesised that children would make greater gains in schools that inspectors judged to be better. If this is the case it would suggest that the inspection process can identify important differences in quality and effectiveness that have an impact on children's outcomes. Ofsted judgements are made on a 7 point scale where 1 is the most favourable rating.

Schools were divided into four groups based on the ratings High (scoring 1-2), Medium-High (scoring 3), Low-Medium (scoring 4) and Low (scoring 5-6) for each measure (no schools received the lowest score of 7). When numbers were small due to missing data, the middle categories were combined to produce a single category of Medium. Overall, fifteen percent of children in the sample attended schools that were judged to be highly effective, while eight percent of children attended schools that received the lowest effectiveness judgements by Ofsted inspectors. These measures were tested in the multilevel models of children's progress from Year 1 to year 5 for the various cognitive and social/behavioural outcomes.

4.1 School effectiveness

The overall Ofsted judgement of *School effectiveness* proved to be a significant and positive predictor of better progress for the EPPE 3-11 sub-sample of children for both cognitive outcomes. The difference in effect sizes was greatest between the Low and the High group for Reading, in line with the hypothesis (ES=0.30). The differences between the Medium-High and Low-Medium group were marginal both showing similar size effects compared with the Low group (ES=0.19 and ES 0.21 respectively). However, differences were more striking for Mathematics progress, the difference between the High and the Low group reached ES=0.41 and the difference for the Medium-High group compared with Low was ES=0.45. These are fairly strong effects. It is interesting that both the High and the Medium-High effectiveness

Figure 4.1: Ofsted judgements of *School effectiveness* and net influence on Children's Cognitive progress (Year 1 to Year 5)

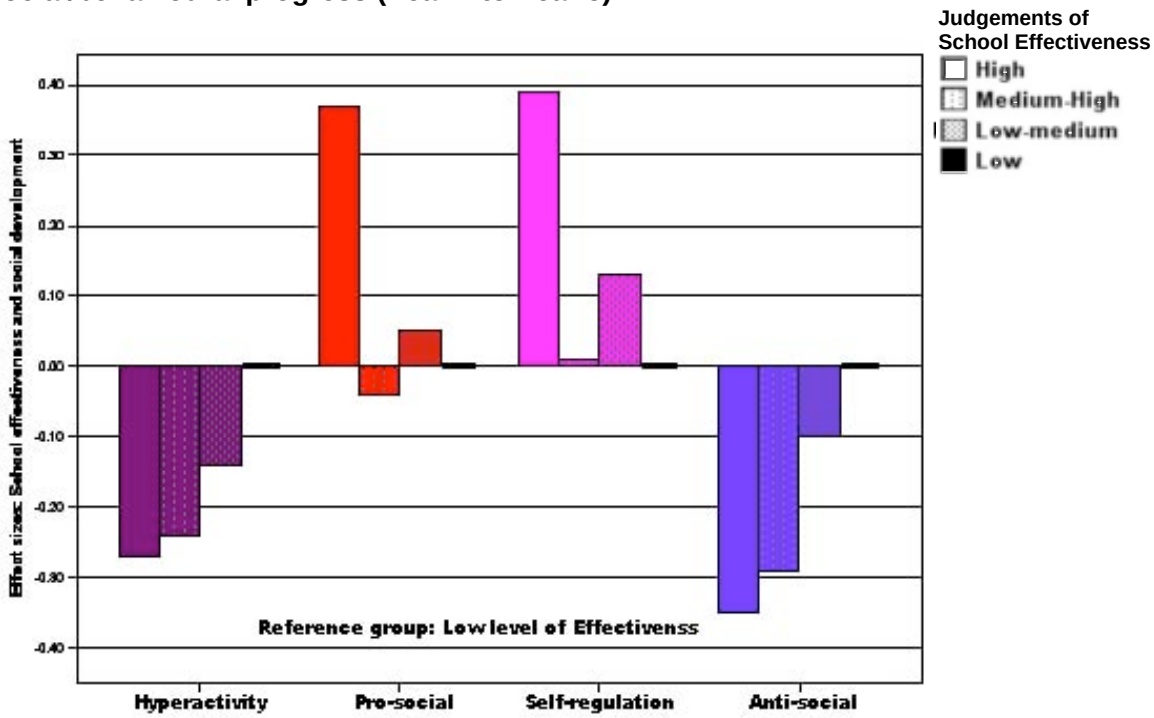


categories according to Ofsted judgements showed a similarly strong positive impact on the progress made by EPPE 3-11 children in Mathematics between Year 1 and Year 5 (see Figure 4.1).

These results support more general findings from a range of school effectiveness studies that show that differences in school effectiveness are stronger for subjects such as Mathematics and Science in comparison with Reading (see Scheerens & Bosker, 1997; Teddlie & Reynolds, 2000).

The analyses of children's social/behavioural development similarly point to the benefits of high effectiveness as measured by Ofsted judgements and better developmental progress in a range of social/behavioural measures (see Figure 4.2). The differences were strongest between the High and Low effectiveness group for Self-regulation (ES=0.39) and Pro-social behaviour (ES=0.37). There was a more stepped pattern suggestive of a linear trend for Hyperactivity and Anti-social behaviour. Again the best results (reductions in these behaviours) were found for the High effectiveness group of schools in comparison with the Low group. The effect size for reductions in Anti-social behaviour for the High effectiveness group of schools is relatively strong at ES=-0.35.

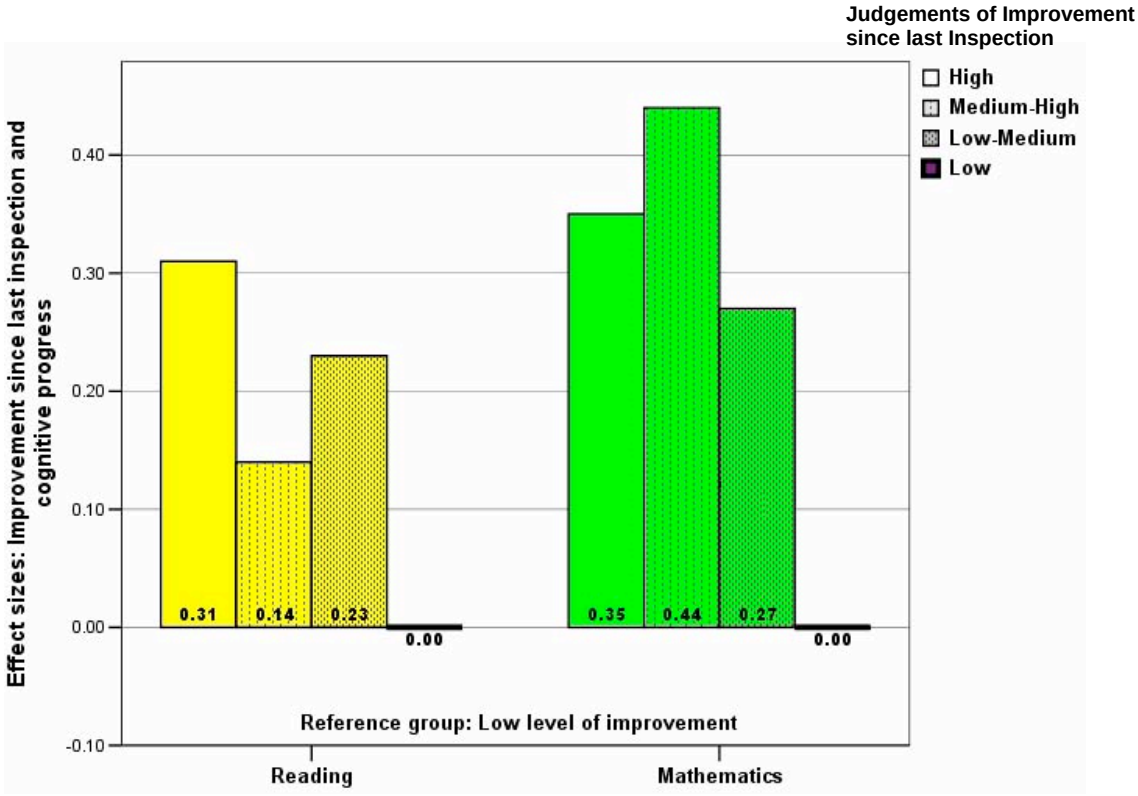
Figure 4.2: Ofsted judgements of *School effectiveness* and net influence on Children's Social/behavioural progress (Year 1 to Year 5)



4.2 Improvement since last inspection

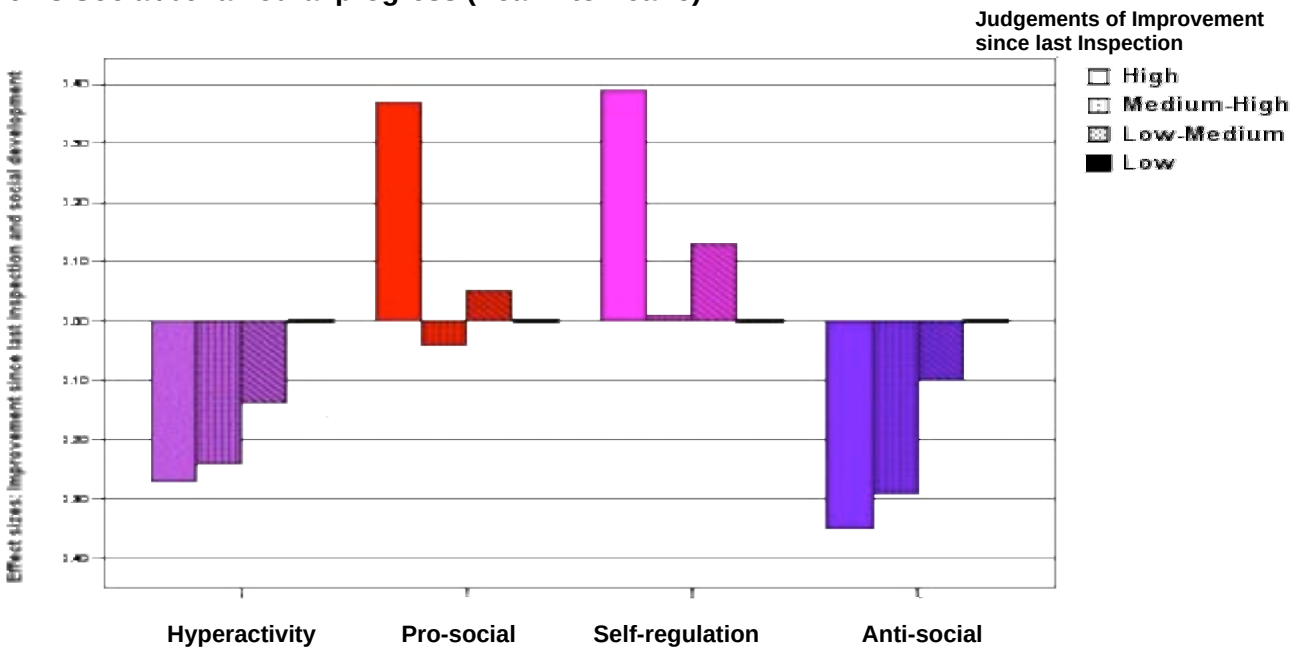
In line with the patterns identified for the Ofsted rating of *School effectiveness*, the measure of *Improvement since last inspection* was also tested in the multilevel models. For Reading the results indicated that there were significant differences in EPPE 3-11 children's progress between the most and least improved schools (ES=0.31). However, the pattern was less clear cut for the Low-Medium and Medium-High groups. For Mathematics both the High and the Medium-High groups showed strong positive effects in terms of EPPE 3-11 children's progress from Year 1 to Year 5 (ES 0.35 and 0.44 respectively) in comparison with the Low group (see Figure 4.3).

Figure 4.3: Ofsted judgements of *Improvement since last inspection* and net influence on Children's Cognitive progress (Year 1 to Year 5)



The results for social/behavioural development reveal moderately strong influences of the measure Improvement since the last inspection on all social/behavioural outcomes. The differences between the High and Low categories were especially marked for Self-regulation and Pro-social behaviour; the difference between the High and Low groups reached ES=0.49 for Self-regulation and ES=0.43 for Pro-social behaviour. There was also evidence of reductions in Anti-social and Hyperactive behaviour; the differences between the groups formed a more stepped pattern suggestive of a linear trend (see Figure 4.4).

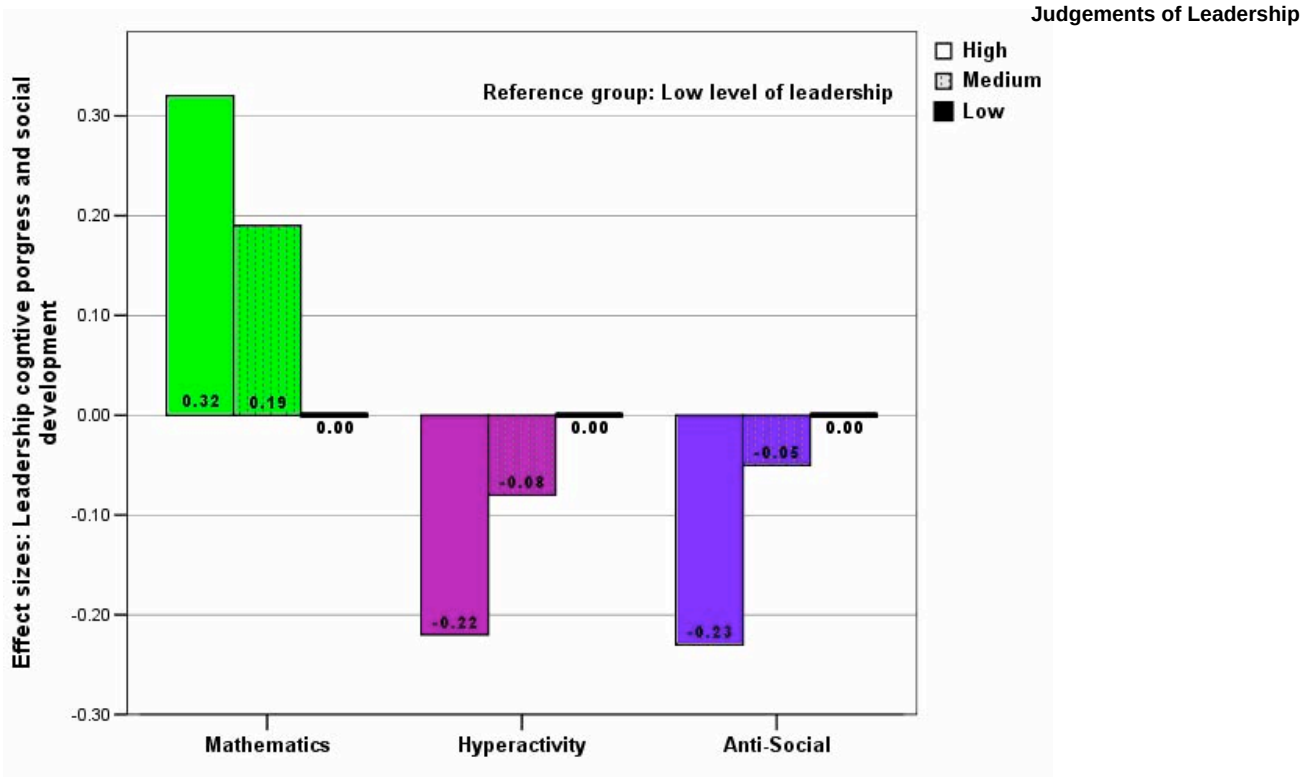
Figure 4.4: Ofsted judgements of *Improvement since last inspection* and net influence on Children's Social/behavioural progress (Year 1 to Year 5)



4.3 Leadership

Ofsted judgements of leadership were similarly tested in the multilevel models. The results pointed to the positive predictive power of attending a school judged by Ofsted to have better *Leadership* on children's cognitive progress in Mathematics (though results were not significant for Reading). Differences were most marked for the extreme groups (ES=0.32). The differences followed a similar pattern though were more modest for reductions in Hyperactivity and Anti-social behaviour as can be seen in Figure 4.5. These results suggest there is a measurable impact of *Leadership* on children's social/behavioural outcomes, although it may well be indirect (operating through an impact on a range of aspects such as teaching and learning and school climate that in turn influence children's outcomes).

Figure 4.5: Ofsted judgements of *Leadership* and net influence on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)



4.4 Quality of assessment

Figure 4.6 shows the results of testing the Ofsted judgements of the *Quality of assessment* in the multilevel models. Results were only significant for cognitive progress and the pattern was clearer and somewhat stronger for Mathematics, in line with findings for a number of observational dimensions (see Section 3). Once again there was a significant link between high ratings for *Quality of assessment* and better cognitive progress for the EPPE 3-11 sub-sample.

Figure 4.6: Ofsted judgements of *Quality of assessment* and net influence on Children's Cognitive and Social/behavioural progress (Year 1 to Year 5)

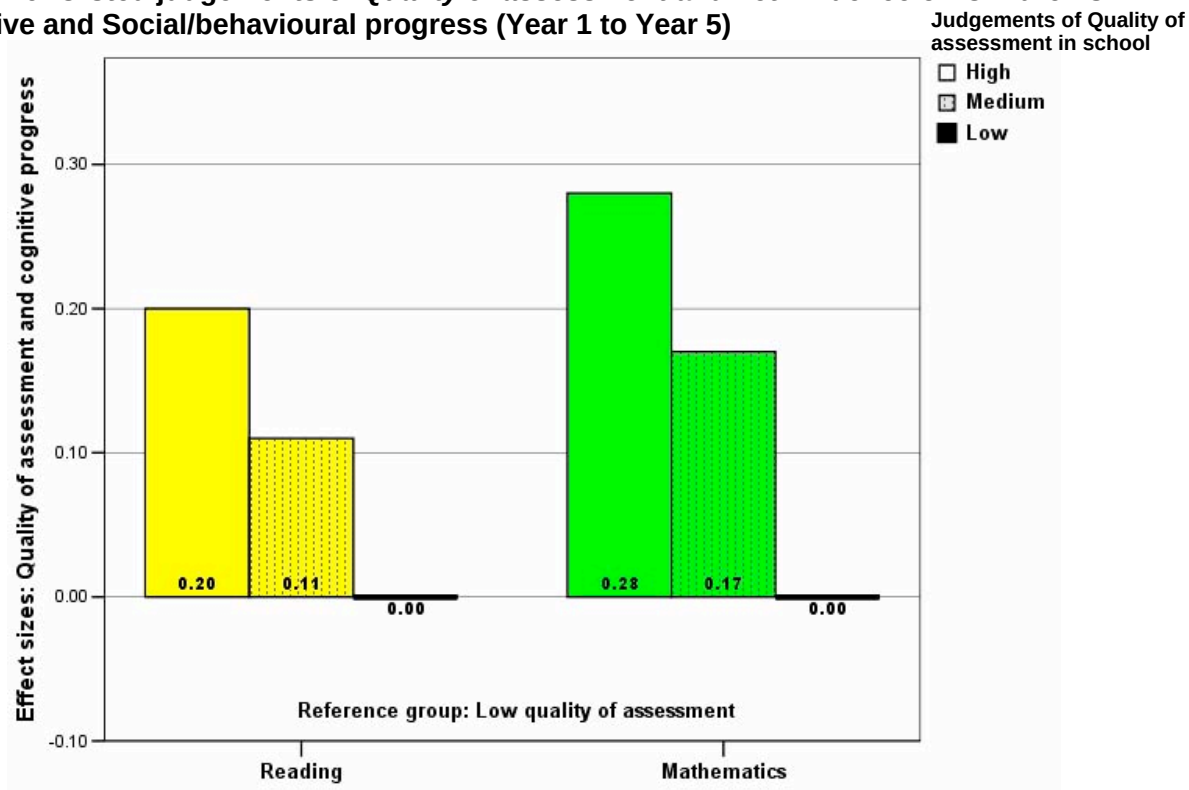


Table 4.1 summarises the findings from the multilevel analyses testing the predictive power of the Ofsted ratings in multilevel models of children's cognitive progress and social/behavioural development. It can be seen that the overall global Ofsted judgements of *School effectiveness* and *Improvement since last inspection* have the strongest predictive power and indicate that for children in the EPPE 3-11 sub-sample who attended a more effective and an improving school their all round social/behavioural development and their cognitive progress is likely to benefit (as measured by independent assessments used in the EPPE 3-11 research). Due to the relatively small number of schools for which inspection data were available (n=89 of 123 schools; 80%) effects needed to be strong to reach statistical significance. Some only verged on statistical significance, but all were in the positive direction predicted. For comparison, the results are shown for a contextual indicator commonly included in school effectiveness research, namely the percentage of pupils in the school eligible for free school meals (FSM) (a contextual indicator of social disadvantage). Past research has suggested that, in addition to the child's own characteristics, the level of social disadvantage in a school also affects progress rates, with less progress occurring where levels of disadvantage are higher (as measured by this indicator).

Table 4.1: Interim summary of net effect sizes: Ofsted judgements of quality and children's cognitive and social/behavioural progress (Year 1 to Year 5)

	Reading	Mathematics	Hyperactivity	Self-regulation	Pro-social	Anti-social
School effectiveness	0.30+	0.41*	0.27+	0.39*	0.37~	0.35~
Improvements since last inspection	0.31+	0.35*	0.34~	0.49*	0.43*	0.31*
Quality of assessment		0.28*				
Leadership		0.32*	0.22~			0.23~
Attendance						
% of pupils eligible for FSM		0.23^	0.25^	0.25^		0.29^
Reference group: High Effect sizes represent differences between the lowest and highest scoring groups in all cases results were more positive for the high and less favourable for the Low group on each measure.						

*p<0.05 ~ Just missed significance level p=0.06-0.08
^ Significant when comparing below & above the mean otherwise just misses significance levels
+ Not significant but effect sizes are high and patterns are linear and in the predicted direction

As would be predicted from past research, there are indications that EPPE 3-11 children in primary schools with a higher level of social disadvantage of pupil intake make somewhat lower levels of progress. However, it is interesting to note that the benefits of attending a more effective and more improved school tends to have stronger predictive power across a range of outcomes. This is not intended to minimise the role of social disadvantage but rather to demonstrate the importance of the overall quality of the school as measured by Ofsted inspection judgements.

Summary and Conclusions

The EPPE 3-11 study is the first large-scale longitudinal study to combine a wide range of data that explore the relationship between detailed measures of child, family and home learning environment (HLE) and children's progress (in both cognitive and social/behavioural outcomes) and to link this detailed information to what teachers do in the classroom and measures from inspection judgements (Ofsted). This has enabled the exploration of the predictive power of different measures in accounting for variation in children's progress across a wide range of outcomes, both academic and social behaviour.

This report has investigated the progress and social/behavioural development of a sub-sample of 1160 EPPE 3-11 children measured across Year 1 to 5 of primary education. The research builds on the earlier analyses of Year 5 outcomes for the full EPPE 3-11 sample (see Sammons, 2007a; 2007b) by investigating relationships between children's progress between Year 1 and Year 5 and measures of classroom process collected through direct observation of Year 5 classes in 125 focal schools chosen from the wider EPPE 3-11 data set. The analyses also explore patterns of association between children's progress and broader measures of school effectiveness, improvement and quality derived from Ofsted inspection reports for this sub-sample of schools. In addition, overall school characteristics have been derived from teacher questionnaires. It should be noted that the research was not able to study children's academic progress across one academic year because the prior attainment measures were collected in Year 1. This may reduce the ability to identify specific teacher/class effects as children are likely to have been taught by at least 4 different class teachers during this period. This does, however, increase the chance of identifying overall school influences.

Classroom Processes

An earlier report (Sammons et al., 2006) has provided a detailed analysis of the two classroom observation instruments used in this sub-study - the Instructional Environment Observation Scale (IEO, Stipek) and the Classroom Observation System for Fifth Grade (COS-5, Pianta). Year 5 was chosen for the observational component of the research because it would help to minimise any possible influences associated with the conduct of National assessments at the end of Key Stage 2. The initial analyses found that teachers' and children's observed behaviours differed significantly across the 125 Year 5 classes studied. The two observation schedules identified significant variations in observed quality indicating that children's educational experiences in Year 5 classes differed significantly with some benefiting from higher quality experiences. A number of important underlying dimensions of classroom processes were identified such as *Quality of Pedagogy*, *Disorganisation, Child positivity*, pupils' *Positive engagemen*t and the extent of *Attention and contro*l, as well as specific features of practice related to literacy and numeracy teaching. In this report these underlying dimensions have been tested in multilevel models to establish whether there is any evidence that variations in classroom experiences influence children's cognitive progress and social behavioural developmental outcomes.

It was anticipated that experiences in Year 5 classes would be most likely to show a relationship with outcomes measured in Year 5, after control for other influences. It should be noted, that the models of children's progress control for prior attainment (or prior social behaviour) measured in Year 1 using comparable instruments, as well as a wide range of child, family and home learning environment (HLE) influences. The progress/developmental gains are thus measured over a four year period in primary school. The outcomes studied include Reading and Mathematics (measured by NFER standardised tests) and four social/behavioural measures derived from teachers' ratings of individual children (Hyperactivity, Self-regulation, Anti-social behaviour and Pro-social behaviour).

It was hypothesised that higher quality classroom experiences in Year 5 would predict better child progress and development in Year 5, taking account of the impact of prior attainment/social behaviour and background factors. School effectiveness research has drawn attention to the importance of the classroom level in accounting for variations in student outcomes in many

studies but such research has generally only tested limited measures of classroom processes and usually only examined cognitive outcomes (Teddlie & Reynolds, 2000). This research has studied a more detailed set of classroom indicators and measures of children's outcomes and thus can explore the relative strength of different features on a wide range of outcomes.

What matters in the classroom

The results indicated that the overall measure of *Teaching quality* derived from the COS-5 instrument was a significant and moderate to strong predictor of both Reading (ES=0.37) and Mathematics progress (ES=0.35) for EPPE 3-11 children in the 125 schools. These differences refer to the contrast between the High and Low categories on the overall measure of *Teaching quality*. However, this overall measure did not show any clear pattern of relationships to the social /behavioural outcomes.

Two important conclusions can be drawn from these results. First, it is possible to classify teachers in Year 5 classes in a meaningful way in terms of differences in overall *Teaching quality* across a range of different dimensions of classroom behaviour and practice based on observational evidence. Second, overall *Teaching quality* is a significant predictor of better cognitive progress for children across the period Year 1 to Year 5, and this is particularly evident at the extremes. In other words, children in schools where Year 5 overall *Teaching quality* was observed to be high overall, do significantly better in both Reading and Mathematics than those attending schools where Year 5 quality was observed to be low. But this was not the case for social/behavioural outcomes. Therefore, it appears that the overall *Teaching quality* as measured by the instruments has a greater influence on children's academic progress, than on other outcomes.

The influence of *overall Teaching quality* on Reading and Mathematics is stronger than the net influence of some background factors such as gender and family disadvantage (measured by eligibility for free school meals - FSM), but weaker than the influence of Early Years Home Learning Environment (HLE) and mothers' qualifications.

Nonetheless, specific aspects of classroom processes were found to predict better cognitive progress and better social/behavioural development. The factor related to classroom *Disorganisation* was a significant predictor of poorer progress in Reading and Mathematics, for example, and also of increased Hyperactivity (higher levels of *Disorganisation* being linked with significantly poorer outcomes). This factor is related to the behavioural climate of the classroom and supports the findings of earlier teacher and school effectiveness studies that point to the importance of a calm and orderly climate to facilitate learning and teaching. Elsewhere we have shown associations between the level of social disadvantage in the primary school intake and the level of *Disorganisation* in Year 5 classes (see Sammons et al., 2006). It may be harder for teachers to maintain good order in class in schools serving higher proportions of disadvantaged children. It may also be the case that poorer classroom practice is one contributory factor in explaining the poorer outcomes of children in more disadvantaged communities. Quite likely both explanations may play a part. Our analyses have tested and controlled for (where significant) a wide range of significant background measures, including parents' qualifications, occupations and income. The results show that, over and above such influences, features of classroom experience such as *Disorganisation* seem to play an important role in shaping educational outcomes.

Other research (Ross & Hutchings, 2003; Darling-Hammond, 2002; Wirt et al., 2002; 2003) has suggested that schools in disadvantaged settings can find it harder to recruit and retain teachers. Given this and in the light of the findings from the EPPE 3-11 research, it is likely that a stronger emphasis on promoting overall *Teaching quality* and a more orderly classroom climate will be important features of programmes and initiatives to help promote better educational outcomes for pupils in schools that serve above average proportions of disadvantaged children.

While the overall *Teaching quality* was equally important for promoting better Reading and Mathematics progress, specific features of *Quality of Pedagogy* showed stronger relationships with children's Mathematics progress. *Quality of Pedagogy* It was also important for children's progress in terms of reducing Hyperactivity, and promoting Pro-social behaviour and Self regulation. Reviews of school and teacher effectiveness research have suggested that schools vary more in the effects on Mathematics than on Reading (Scheerens and Bosker, 1997; Muijs and Reynolds, 2005). The present results suggest that the overall *Teaching quality* seems to be equally important for both outcomes but that specific features of classroom processes, such as *Quality of pedagogy*, tend to be better predictors of children's progress in Mathematics.

The quality of *Attention and control* in the classroom was also found to be linked with better child outcomes in Self-regulation and Mathematics, while *Child Positivity*, a factor that relates more to self-reliance, co-operation and Child-Teacher Relationship was a predictor of better outcomes for Reading. In addition, the factor *Positive engagement* showed a significant association with better Pro-social behaviour outcomes; the contrast is between the Low (ES=-0.21) and Low-Medium (ES=-0.33) groups and the High group but the trend is not clearly linear.

In addition to classroom observation measures, a teacher questionnaire was conducted to explore teachers' views and perceptions of different aspects of school and classroom processes and organization. A number of underlying dimensions were identified. These dimensions were tested in the multilevel models for the various child outcomes in Year 5. Two measures related to teachers' perceptions of overall *School communication with parents* and the extent of *overall Parental support of their child's learning* were found to be significant predictors of better outcomes for the EPPE 3-11 sub-sample in Year 5; *School communication with parents* was the stronger predictor.

What matters in the school

The factor *School communication with parents* predicted better progress for Reading, Mathematics and Self-regulation from Year 1 to Year 5. Teachers' judgements of overall level of *Parental support of their child's learning* showed a significant relationship with pupils' progress in Reading but not in Mathematics; this factor was also found to be a strong and positive predictor of Pro-social behaviour.

The dimension relating to teachers' reports on the *Use of homework and school standards* indicated a relationship with Mathematics progress, although the strongest effects were for the Medium group. Higher scores on this factor were also associated with better developmental gains for Self-regulation and Pro-social behaviour. For these two aspects of children's social behaviour results were stronger for the High versus the Low group.

Progress in Reading was positively linked with the factor on *Pupils' agency and voice*. Differences were largest between the Low and the Medium-High groups; differences between the Low and High groups were not significantly different from zero. Overall, the findings associated with Reading seem to suggest that moderate levels of *Pupils' agency and voice* have a more positive impact on progress in Reading than either low or high levels.

Developmental progress for the social/behavioural outcome Self-regulation was positively linked with the factor on *Pupils' agency and voice.* Children in schools where teachers indicated High or Medium-High levels of *Pupils' agency and voice* showed significantly increased levels of Self-regulation. Contrary to expectations, children's Hyperactive and Anti-social (ES=0.38) behaviour was also significantly increased in schools where teachers indicated high levels of *Pupils' agency and voice*. We would have expected children to show positive social behaviour in schools where their views are listened to and accommodated, however the findings appear to suggest the opposite. It may be that schools are responding to bad behaviour by supporting pupils' voice, thus rather than predicting bad behaviour, *Pupils' agency and voice* may be a constructive consequence of negative behaviour. Alternatively, it may be that moderation in the levels of

involvement, autonomy and *say* pupils are allowed is crucial, especially at younger ages. Further analyses are required to clarify these associations.

The factor related to teachers' perceptions of an *Anti-academic ethos* amongst pupils in the school was strongly related to cognitive progress and social/behavioural development. Schools in which an *Anti-academic eth*os was high showed significantly poorer progress in Reading and Mathematics; differences were mainly between the high and low groups. The relationships between *Anti-academic ethos* and the social/behavioural dimensions were more graduated showing a steady decrease in Pro-social behaviour and a steady increase in Hyperactive and Anti-social behaviour as a function of increasing *Anti-academic ethos* in school.

Quality matters (Ofsted Inspection Measures)

In addition to investigating the impact of classroom processes based on detailed observations by researchers, further analyses were conducted to explore the predictive power of more global indicators of school quality based on professional judgements of Ofsted inspectors. Earlier analyses at the school level had already indicated that there were significant associations between these two sets of measures for the 125 focal schools (see Sammons et al., 2006). A number of the classroom process factors derived from the observations were found to be positively related to Ofsted measures of school effectiveness, improvement and leadership. This supported the conclusion that observed teaching quality tends to be higher in schools previously identified as showing better quality in terms of overall judgements of *School effectiveness*, *Improvement since last inspection* and *Leadership*.

It was hypothesised that children in the EPPE 3-11 sub-sample would make more cognitive progress and show more favourable social/behavioural development in schools that were rated more favourably on the various Ofsted indicators of quality. Ofsted measures were tested in the multilevel models of children's outcomes in Year 5 and the results supported the hypothesis.

The overall Ofsted measure of *School effectiveness* was a predictor of better outcomes for the sub-sample of EPPE 3-11 children, after control for other factors (prior attainment/social behaviour and background factors). Attending a more effective school (as judged by Ofsted inspectors) made a significant difference to all outcomes (Reading, Mathematics and all four social behavioural outcomes), particularly Mathematics, (ES=0.41), Self-regulation (ES=0.39), and Pro-social behaviour (ES=0.37). The judgement of overall school *Improvement since last inspection* showed a very similar pattern; results were particularly strong for Self-regulation (ES=0.49 and Pro-social behaviour (ES=0.43). The judgements related to the school *Leadership* also showed a more modest but positive relationship with three outcomes (the strongest prediction was for Mathematics progress ES=0.32).

These results are of policy interest as they show that going to a higher quality school (as identified by the Ofsted criteria) does make a significant difference to children's cognitive progress and social/behavioural developmental across the board. Children who attend more effective and improved schools showed longer term benefits in terms of a wide range of outcomes. The results can also be seen to provide some independent support for the validity of the Ofsted judgements, by confirming their predictive validity in terms of a wide range of outcomes.

Other influences

Where teachers reported the school was active in *communication with parents,* children made better academic progress, and showed better Self-regulation. Also where teachers reported strong parental support, children made better progress in Reading and Pro-social behaviour. The percentage of pupils eligible for FSM in a school was also associated with poorer children's progress in Mathematics, Hyperactivity, Self-regulation and Anti-social behaviour (comparing those in schools below and above the mean on this factor). However the effects are weaker than those found for the Ofsted measures of school effectiveness and improvement. Elsewhere we have shown that only one of the classroom observation measures was associated with level of

disadvantage (Sammons et al., 2006). Classroom *Disorganisation* was weakly negatively associated with overall social disadvantage of pupil intake to a school (% of pupils eligible for Free School Meals).

Taken together the findings from the current research provide further confirmation that there are significant variations in the observed quality of teaching in Year 5 classes, and that such variations are important predictors of children's cognitive progress in Reading and Mathematics. Specific features of teachers' practice and children's responses are also predictors of better social/behavioural outcomes. The overall quality of the school attended also matters. Children in the EPPE 3-11 sub-sample who had the advantage of attending schools independently judged by inspectors to be more effective showed benefits in all the outcomes studied. Similarly, Ofsted inspectors' judgements of level of school improvement since the previous inspection showed a significant and consistent pattern in predicting better progress and developmental outcomes for the EPPE 3-11 sub-sample. The results support the view that more effective schools tend to foster both better cognitive and better social/behavioural outcomes. The findings indicate that important educational influences (features of practice and organisation) play a significant part in shaping children's progress and developmental outcomes, in addition to their own personal, family and home learning environment characteristics and the level of social disadvantage of their schools.

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Appendix 1: Development of models

Background information

Background information about child, parent and family characteristics, was obtained through parent interviews conducted soon after children were recruited to the study. The parent interviews were designed to obtain information about a child's health and care history, details of family structure and parents' own educational and occupational backgrounds as well as some indications of parent-child activities and routines. Parents were assured of confidentiality and anonymity in presenting results. It should be noted, that most interviews were with children's mothers and usually took place at the child's pre-school centre, although for some working parents telephone interviews were found to be more convenient. All parents gave signed consent. An excellent response rate (97%) to the interview was achieved, although in some instances particular questions had a slightly lower rate of response (e.g. related to occupations). In most cases the parent interviews were conducted within 10 weeks of recruiting a child to the study, though for a small number of children in 'hard to reach' groups a longer time gap sometimes occurred.

Background information was again collected during KS1 using a questionnaire with a response rate of eighty-one per cent. Information obtained by the parents' questionnaire was used to update various background measures such as marital status, number of siblings, employment etc. In addition, the parents' questionnaire was used to collect additional measures of the HLE in Key Stage 1 when children were age 6, to complement information on the pre-school HLE, such as home computing and other activities (including Reading, play of various kinds, involvement in sport, music, dance etc.).

The measurement of cognitive attainment and the problem of the measurement of progress

In contrast to the situation in the natural sciences where we can often measure the characteristics of objects with objective and accurate measuring instruments on absolute scales, in educational studies we are faced with the problem of the measurement of complex constructs where measuring instruments have to be adjusted over time. Therefore it is easier to measure any physical characteristics like the height and weight of a child over years than to measure Reading, Mathematics or social/behavioural development over time. To have 'good Reading attainment' means something different for a child at age 6 than for a child at age 10, whereas the meaning of 'a height of 150 cm' remains the same over years.

Cognitive ability tests have been constructed that usually consist of a set of tasks or questions that are adjusted (standardised) to the expected attainment of children at a certain age. Obviously the tests cannot be the same at different time points. Children achieve discretionary scores in these tests, which are then transformed into standardised scores which are comparable irrespective of the age. A common standardisation is the use of IQ format scores, where the mean is 100 and the standard deviation is 15. The advantage of the use of these scores is, that they are easy interpretable and comparable. This means that a child who has a score of 115 is one standard deviation above the average in this specific sample at this specific time point whilst taking age effects into account. A child that achieves a score of 85 points is one standard deviation below average. With these standardisation procedures, performance is always measured relative to the norm for the sample. This has some advantages but also some disadvantages at the same time. For example, it is fairer to children who are relatively young for their year (e.g. summer born pupils) but no longer provides a criterion referenced measure of what children have achieved in terms of specific attainment at a particular point in time.

It also imposes some problems on the measurement of progress due to the lack of an absolute scale. If you look at standardised test scores of the same child at different time points, you can also only obtain progress relative to the sample. For example, if a child has a score of 100 at age 6 and age 10, this means that this child has made average progress, but not that raw

attainment is the same at the two time points. Also, if a child had a score of 100 at age 6 and a score of 90 at age 10 this means, that the progress of the child was relatively less than the average of the sample as a whole, but it does not mean that this child did not make any progress at all.

These facts are important to get the right interpretation on standardised cognitive test scores at different time points.

Cognitive measures in the EPPE 3-11 study

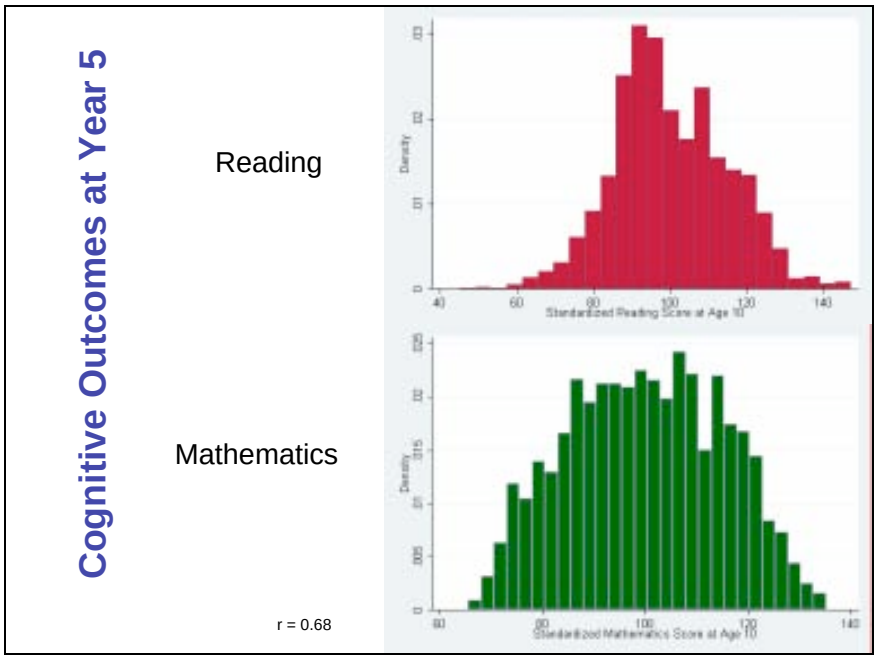
EPPE has collected various cognitive outcomes at different time points which are shown in Table A2. During the pre-school period the British Ability Scales (Elliot, Smith & McCulloch, 1996) in verbal and non-verbal measures have been used. This report focuses on progress of the children in primary school education where Reading and Mathematics outcomes are available for the EPPE children at the end of Year 1 (age 6), the end of Year 2 (age 7) and the end of Year 5 (age 10). At Year 1 and Year 5 teacher administered NFER-Nelson assessments have been used, whereas for the age of 7 National Assessment data have been collected for the sample.

Table A1: Cognitive outcomes in the EPPE study

	Pre-School Measures at Entry to the EPPE Study	**Exit from Pre-School (Entry to Reception) – Baseline**	**End of Reception**	**Year 1**	**Year 2**	**Year 5**
Age	3.0 to 4 years 3 months	rising 5 years	age 5	age 6	age 7	age 10
Verbal	BAS – Scales: Verbal Comprehension, Naming Vocabulary	BAS – Scales: Verbal Comprehension, Naming Vocabulary	BAS – Scales: Word reading	Primary Reading standardised score (Level 1 / NFER-Nelson)	National Assessments: Reading, Writing (decimalised)	Primary Reading standardised score (Level 2/ NFER-Nelson)
		Letter Recognition, Phonological Awareness (Pre-reading)	Letter Recognition, Phonological Awareness, Dictation Tests			
Non-Verbal	BAS – Scales: Block building, Picture Similarities	BAS – Scales: Block building, Picture Similarities, Early Number Concepts	BAS-Scale Early Number Concepts	Maths 6 Standardised score (Level 1 / NFER-Nelson)	National Assessments: Mathematics (decimalised)	Maths 10 Standardised (Level 2 / NFER-Nelson)
Cognitive General		GCAS	GCAS			

NFER-Nelson assessment scores: Standardisation procedures, reliability and internal validity

Figure A.1: Cognitive outcomes at Year 5



The NFER-Nelson assessments provide a manual to transform raw test scores into age standardised scores. However, for the EPPE sample (which is not UK representative but relatively underachieving due to slightly higher numbers of disadvantaged children in the sample) the manual standardisation procedure does not account for variation especially found in younger age and under average achieving groups. Therefore it has been decided to apply a complex internal age standardisation and normalisation procedure to the cognitive outcomes in Year 1 and Year 5. This resulted in approximately normally distributed outcomes which do not show a correlation with age.

Figure A.2 shows the distribution of the standardised and normalised Reading and Mathematics scores at Year 5. The mean of the measures is 100 with a standard deviation of 15 (IQ format scores).

Reliability

Reliability in the psychometric sense refers to the necessary requirement for a good instrument, that an instrument should measure exactly the same if applied several times on the same subject and should be consistent. Reliability is a necessary pre-condition for validity. However, as there might also be changes over time in the outcome to be measured the concept of retest-reliability hits its borders especially in developmental studies.

For Reading we find a correlation of 0.56 between the assessments of Year 1 and Year 5, for Mathematics the correlation between Year 1 and Year 5 assessments is 0.65. These results lead to two conclusions:

1. Prior cognitive attainments are fairly good predictors of later attainments.
2. We can assume good retest-reliability.

Internal validity

The attainments in Reading and Mathematics in Year 1 show a correlation of 0.58 and in Year 5 a correlation of 0.68. These moderate to high correlations indicate that children who do well in Reading are more likely to also show high attainment in Mathematics and vice versa. The relationship is more distinct Year 5 than in Year 1. As both measures are cognitive outcomes, these correlations are also indicators of high internal validity (in the sense of psychometric validity).

Social behavioural measures

An extended version of the Strengths and Difficulties Questionnaire (Goodman, 1997) was used to measure different features of children's social/behavioural development in Year 5. This social/behavioural child profile was completed by the class teacher who knew the child well. A principal component analysis was used to identify the main underlying dimensions of social behaviour [11] (see Appendix 3 for a more detailed description of the methodology). In this report we focus on four aspects of social behaviour – 'Hyperactivity', 'Self-regulation', 'Pro-social' behaviour and 'Anti-social' behaviour. The specific questionnaire items found to be associated with each of the four social/behavioural dimensions are presented in Box 1, the full factor solution can be found in Appendix 3.

Box A.1: The specific items associated with each social/behavioural dimension in Year 5 (age 10)

'Hyperactivity'

1. Restless, overactive, cannot stay still for long
2. Constantly fidgeting or squirming
3. Easily distracted, concentration wanders
4. Thinks things out before acting
5. Sees tasks through to the end, good attention span
6. Quickly loses interest in what she/he is doing
7. Gets over excited
8. Easily frustrated
9. Impulsive, acts without thinking
10. Can behave appropriately during less structured sessions
11. Fails to pay attention
12. Makes careless mistakes

'Self-regulation'

1. Likes to work things out for self; seeks help rarely
2. Does not need much help with tasks
3. Chooses activities on their own
4. Persists in the face of difficult tasks
5. Can move on to a new activity after finishing a task
6. Open and direct about what she/he wants
7. Confident with others
8. Shows leadership in group work
9. Can take responsibility for a task

'Anti-social'

1. Often fights with other children or bullies him
2. Often lies or cheats
3. Steals from home, school or elsewhere
4. Vandalises property or destroys things
5. Shows inappropriate sexual behaviour toward others
6. Has been in trouble with the law

'Pro-social'

1. Considerate of other people's feelings
2. Shares readily with other children (treats, toys, etc.)
3. Helpful if someone is hurt, upset or feeling ill
4. Kind to younger children
5. Often volunteers to help others (teachers, other children)
6. Offers to help others having difficulties with a task
7. Sympathetic to others if they are upset
8. Apologises spontaneously

The factor scores from the principal component analysis were used in subsequent analyses. For the whole sample factor scores are normalised to an average of 100 with a standard deviation of 15[12].

Higher scores indicate better behaviour for the factors 'Self-regulation' and 'Pro-social' behaviour. By contrast, lower scores indicate better behaviour (in terms of lower incidence reported by teacher ratings) for 'Hyperactivity' and 'Anti-social behaviour'. Note that scores on all social/behavioural measures are skewed towards the more desirable end of the scale. This is especially important for the more negative aspects of social behaviour where raised scores indicating potential maladaptive behaviour (using the cut-off point suggested by Goodman) are only evident for a small minority of children (6.1%). This shows that most children are rated positively by their teachers in terms of these features of social behaviour and the results are in line with other research on social behaviour and with the distribution of scores for social/behavioural measures for the EPPE sample at younger ages.

[11] A number of data reduction methods were applied to the data, and structural equation modelling was used to compare the different models derived. The best fitting model was a 7 factor solution with Promax rotation (RMSEA=0.6; CMIN=14635.647 with 1463 df). The most important four factors were used in subsequent analyses.

[12] We normalised the data for ease of interpretation, because the distribution of scores produced by the factor analyses is standardised (with a mean of 0 and a standard deviation of 1) and involves negative values. See Appendix 4 for details of normalisation procedures.

Appendix 2: Results of Multilevel Analyses

Table A.2.1: Mathematics Contextualised value added Model

*Statistically significant at 0.05 level; # Just failed to reach statistical significance at 0.05 level

Mathematics	Estimate	SE	Effect Size
Year 1 Mathematics	0.603*	0.024	1.83
Gender (girls compared to boys)	-0.952	0.680	-0.10
Ethnic group (compared to White UK Heritage)			
White European Heritage	-0.962	1.743	-0.10
Black Caribbean Heritage	0.615	2.160	0.06
Black African Heritage	-1.105	2.615	-0.11
Any other ethnic minority Heritage	1.736	2.801	0.18
Indian Heritage	8.608*	2.417	0.88
Pakistani Heritage	-0.148	1.810	-0.02
Bangladeshi Heritage	-2.550	2.731	-0.26
Mixed race	-2.956#	1.575	-0.30
Mother's highest level of qualification (compared to none)			
Missing data	-2.053	2.564	-0.21
Vocational	2.014*	1.149	0.21
Academic age 16	2.406*	0.956	0.25
Academic age 18	3.660*	1.504	0.37
Degree	6.139*	1.581	0.63
Higher Degree	6.040*	2.467	0.62
Other	5.421*	2.539	0.56
Father's highest level of qualification (compared none)			
Missing data	2.475	3.549	0.25
Vocational	1.402	1.225	0.14
Academic age 16	1.446	1.047	0.15
Academic age 18	2.653#	1.542	0.27
Degree	3.623*	1.506	0.37
Higher Degree	2.363	2.345	0.24
Other	1.243	3.165	0.13
Missing (father absent)	0.184	1.076	0.02
Early years HLE (compared to 0 - 13)			
Missing data	5.274	2.550	0.54
14-19	0.677	1.281	0.07
20-24	3.031*	1.303	0.31
25-32	1.903	1.293	0.19
33-45	3.625*	1.570	0.37
Expressive Play (compared to very high)			
Missing	0.216	1.385	0.02
Low	3.134*	1.205	0.32
Moderate	2.004*	1.014	0.21
High	1.386	0.967	0.14

Table A.2.2: Reading Contextualised value added Model

*Statistically significant at 0.05 level; # Just failed to reach statistical significance at 0.05 level

Reading	Estimate	SE	Effect Size
Y1 Reading	0.485*	0.026	1.32
Gender (girls compared to boys)	-0.553	0.694	-0.05
Developmental problems (compared to none)			
1	-2.066*	1.115	-0.19
2+	-10.964*	4.141	-1.03
Free School Meal Eligibility (FSM) (compared to not eligible)	-2.006*	0.896	-0.19
Mother's highest level of qualification (compared to none			
Missing data	-3.057	2.830	-0.29
Vocational	3.220*	1.208	0.30
Academic age 16	3.298*	0.976	0.31
Academic age 18	4.711*	1.571	0.44
Degree	8.846*	1.462	0.83
Higher Degree	10.149*	2.184	0.96
Other	3.118	2.642	0.29
Early years HLE (compared to 0 - 13)			
Missing data	3.040	2.938	0.29
14-19	0.382	1.321	0.04
20-24	3.325*	1.338	0.31
25-32	3.534*	1.318	0.33
33-45	6.531*	1.603	0.62

TableA.2.3:
Null models showing primary school and child level variance of Year 5 cognitive outcomes for the sub-sample of children attending the focal schools

	Reading Estimate (standard error)	Mathematics Estimate (standard error)
School level variance estimate (se)	25.12903(6.04)	38.310(7.90)
Child level variance (se)	180.2907(7.99)	178.808(7.97)
Intra-school correlation	0.122	0.176
Number of children	1052	1123
Number of schools	123	123

Table A.2.4:
Contextualised value added analysis of cognitive progress from the end of Year 1 in primary school to the end of Year 5 showing primary school and child level variance

	Reading (Year 5) standardised score Estimate (standard error)	**Mathematics (Year 5) standardised score** Estimate (standard error)
School level variance estimate (se)	6.097729(2.81)	11.790(3.28)
Child level variance (se)	112.5746(5.21)	95.28696(4.48)
Intra-school correlation	0.05	0.11
% Reduction in school level variance	75.73	69.2
% Reduction in child level variance	37.56	46.7
% Reduction total variance	42.23	50.7

Table A.2.5:
'Hyperactivity' Contextualised value added Model
*Statistically significant at 0.05 level; # Just failed to reach statistical significance at 0.05 level

'Hyperactivity'	Estimate	SE	Effect Size
Y1 Hyperactivity	0.447*	0.027	0.07
Age	-0.015*	0.007	-0.14
Gender (Compared to girls)	-0.450*	0.053	-0.60
Behavioural problems (compared to none)			
1	0.081*	0.084	0.11
2+	0.612*	0.189	0.81
Mother's highest level of qualification (compared to none)			
Missing	-0.254	0.222	-0.34
Vocational	0.111	0.089	0.15
Academic age 16	-0.099	0.074	-0.13
Academic age 18	-0.110	0.114	-0.15
other	-0.230	0.301	-0.30
Degree and Higher degree	-0.168	0.105	-0.22
Family salary (Compared to 'no salary')			
Missing data	-0.300	0.207	-0.40
2,500-17,499	-0.139	0.160	-0.18
17,500-29,499	-0.354*	0.157	-0.47
30,000-37,499	-0.267	0.165	-0.35
37500-67,499	-0.169	0.151	-0.22
67,500-132,000+	-0.088	0.173	-0.12
Marital status (Compared to Married)			
Single never married	0.172*	0.086	0.23
Living with partner	0.102	0.071	0.14
Separated/Divorced	0.215*	0.090	0.29
Other	-0.244	0.300	-0.32
Enrichment outing (compared to very high)			
Missing data	0.220	0.176	0.29
Low	-0.167	0.110	-0.22
Moderate	-0.161*	0.096	-0.21
High	-0.245*	0.091	-0.32
Expressive Play (compared to very high)			
Low	0.220*	0.094	0.29
Moderate	0.137*	0.079	0.18
High	0.174*	0.075	0.23

Table A.2.6:
'Self-regulation' Contextualised value added models
*Statistically significant at 0.05 level; # Just failed to reach statistical significance at 0.05 level

'Self-regulation'	Estimate	SE	Effect Size
Y1 Self-regulation	0.45*	0.03	0.07
Age	0.00	0.01	0.02
Gender (Compared to girls)	0.02	0.06	0.02
Behavioural problems (compared to none)			
1	-0.21*	0.09	-0.26
2+	-0.13	0.36	-0.16
Free School Meal Eligibility (FSM) (compared to not eligible)			
Eligible for FSM	-0.18*	0.07	-0.21
Mother's highest level of qualification (compared to no qualifications)			
Missing	0.26	0.24	0.32
Vocational	0.19*	0.10	0.23
Academic age 16	0.11	0.08	0.13
Academic age 18	0.16	0.13	0.20
Other	0.30	0.34	0.36
Degree and Higher degree	0.28*	0.12	0.34
Father's highest level of qualification (compared to no qualifications)			
Missing	-0.12	0.44	-0.14
Vocational	0.10	0.10	0.12
Academic age 16	0.25*	0.09	0.30
Academic age 18	0.18	0.13	0.21
Degree and	0.19	0.12	0.23
Higher degree	0.23	0.18	0.28
Other	-0.08	0.29	-0.09
Missing (father absent)	0.30*	0.09	0.36
Family salary (Compared to 'no salary')			
Missing data	0.0355	0.0681	0.04
2,500-17,499	0.0751	0.0675	0.08
17,500-29,499	0.2038*	0.0724	0.22
30,000-37,499	0.2282*	0.0830	0.25
37500-67,499	0.2142*	0.0762	0.23
67,500-132000+	0.2290*	0.1033	0.25
Early years HLE (compared to 0 - 13)			
Missing	-0.11	0.23	-0.13
14-19	0.03	0.11	0.04
20-24	0.04	0.11	0.04
25-32	0.09	0.11	0.11
33-45	0.27*	0.13	0.33

Table A.2.7:
'Pro-social' Contextualised value added Model
*Statistically significant at 0.05 level; # Just failed to reach statistical significance at 0.05 level

'Pro-social'	Estimate	SE	Effect Size
Y1 Pro-social	0.291*	0.030	0.07
Age	0.016*	0.008	0.13
Gender (Compared to girls)	0.521*	0.056	0.62
Mother's highest level of qualification (compared to no qualifications)			
Missing	0.160	0.216	0.19
Vocational	0.139	0.097	0.17
Academic age 16	0.292*	0.078	0.35
Academic age 18	0.107	0.125	0.13
Other	0.071	0.333	0.08
Degree and Higher degree	0.183	0.118	0.22
Social Class (Compared to Low)			
Medium	0.0874	0.0681	0.10
High	0.0704	0.0556	0.08
Family salary (Compared to 'no salary')			
Missing data	0.103	0.105	0.12
2,500-17,499	-0.038	0.083	-0.04
17,500-29,499	0.268*	0.092	0.32
30,000-37,499	0.265*	0.110	0.31
37500-67,499	0.237*	0.101	0.28
67,500-132000+	-0.100	0.178	-0.12

Table A.2.8:
'Anti-social' Contextualised value added Model 5 standardised Mathematics attainment)
*Statistically significant at 0.05 level; # Just failed to reach statistical significance at 0.05 level

'Antisocial'	Estimate	SE	Effect Size
Y1 Antisocial	0.268*	0.035	0.08
Age	-0.008	0.008	-0.06
Gender (Compared to girls)	-0.305*	0.056	-0.34
Free School Meal Eligibility (FSM) (compared to not eligible)			
Eligible for FSM	0.169*	0.072	0.19
Absent father (Compared to non absent fathers)	0.359	0.288	0.40
Key Stage 1 HLE			
One to one Interactions (compared to very high) Missing data	0.277*	0.124	0.31
Low	0.236*	0.109	0.27
Moderate	0.131	0.094	0.15
High	0.215*	0.088	0.24

Table A.2.9:
Null model showing primary school and child level variance of Year 5 Social/ behavioural outcomes for the sub-sample of children attending the focal schools

	'Hyperactivity'	'Self-regulation'	'Pro-social'	'Anti-social'
	Estimate (standard error[13])	**Estimate (standard error)**	**Estimate (standard error)**	**Estimate (standard error)**
School level variance estimate (se)	0.079 (0.025)	0.066 (0.023)	0.130(0.032)	0.072(0.024)
Child level variance (se)	0.910 (0.040)	0.964(0.043)	0.898(0.040)	0.840(0.037)
Intra-school correlation	0.081	0.064	0.12	0.079
Number of children	1114	1114	1114	1114
Number of schools	123	123	123	123

Table A.2.10:
Contextualised value added models of social/behavioural measures at Year 5 showing primary school and child level variance for the sub-sample of children attending the focal schools

	Hyperactivity Estimate (standard error)	**Self-regulation** Estimate (standard error)	**Pro-social** Estimate (standard error)	**A** Estimate (standard error)
School level variance estimate (se)	0.054(0.0218)	0.084(0.022)	0.104(0.027)	0.053(0.021)
Child level variance (se)	0.570(0.027)	0.684(0.023)	0.712(0.033)	0.786 (0.036)
Intra-school correlation	0.10	0.11	0.13	0.06
% Reduction in school level variance	37.3	28.9	16.5	26.2
% Reduction in child level variance	20.8	29.0	21.3	6.4
% Reduction total variance	36.0	25.3	20.7	7.9

[13] The standard error provides a measure of the confidence limits associated with each estimate and is used to establish the statistical significance of the results.

Appendix 3: EPPE 3-11 imputation of missing data

In order to conduct analysis on as large a sample as possible from the EPPE 3-11 data, a select number of variables were subject to 'imputation' of values where item level data were missing, either due to item or wave non-response. The imputation methods employed as was 'last observation carried forward'. Specifically, the 'last observation' was data from the initial EPPE parent interview, conducted when the children were in pre-school, aged about three years old or in the case of most 'Home' children four years old.

The variables subject to imputation used in the analyses for this report were: Sibling count; Socio-economic status (SES) of mother / father.

Such data, where appropriate, was used to complete missing items from the Parent Questionnaire conducted at Key Stage 1, when the children were age 6 to 7 years old. In each case the variables in the source were comparable, in terms of scale or possible item response categories, with those in the target. This was not the case for parents' qualifications, and hence as yet this measure has not been subject to such imputation.

Appendix 4: Teacher questionnaire - Parent and Pupil factors

Parents' factors explaining 68.1% of the variance in the data

	Component	
Parental support of their child's learning (Cronbach α = 0.78)	**1**	**2**
for the pupils in this class the home environment adversely affects their learning	-.697	
There is a high level of parental support for their child's learning at school	.924	
Parents give a lot of support to the work of the school	.870	
School communication with parents (Cronbach α = 0.72)		
the school is good at communicating its expectations of pupils to parents		.886
parents are regularly informed about their child's progress and achievements		.861
if a pupil seriously infringes school rules parents will be informed immediately		.663

Pupil factors explaining 68.4% of the variance in the data

	Component		
Pupil's behaviour (Cronbach α = 0.89)	**1**	**2**	**3**
teachers and pupils get on well at this school	.874		
pupils show respect to teachers and all other staff	.774		
most pupils at this school are interested in learning	.909		
most pupils at this school want to do well in their school work	.876		
there are very few pupils at this school whose behaviour in class prevents other pupils from learning	.519		
most pupils behave well in class	.878		
there is not much bullying or name-calling of other pupils	.632		
Anti-academic ethos (Cronbach α = 0.73)			
Many pupils don't do as well as they could because they are afraid that other pupils won't like them		.908	
most pupils who get good marks or work hard are teased by other pupils		.914	
Pupils in this school only work hard if carefully supervised		.586	
Pupils' agency and voice (Cronbach α = 0.68)			
Pupils organise activities for themselves			.956
Pupils' views are listened too and taken seriously			.814

Appendix 5: IEO (Stipek)

Literacy Scoring Sheet

LITERACY SCORING SHEETS		Score
General Classroom Management and Climate Scales One for each of the lessons observed		
A	**Classroom Climate**	
B	**Classroom Routines**	
General Instruction Scales One for each of the lessons observed		
C	**Cross-Disciplinary Connections**	
D	**Linkage to life beyond the classroom**	
E	**Social support for student learning**	
F	**Student engagement**	
Reading Instructional Scales		
L	**Reading as meaning making**	
M	**Basic skills development in the context of reading**	
Writing Instructional Scales		
N	**Higher order thinking in writing**	
O	**Purposeful development of writing skills**	
Instructional Conversations		
P	**Instructional conversations**	

(Adapted from IEO, Stipek, 1999)

Numeracy Scoring Sheet

NUMERACY SCORING SHEETS		Score
General Classroom Management and Climate Scales **One for each of the lessons observed**		
A	**Classroom Climate**	
B	**Classroom Routines**	
General Instruction Scales **One for each of the lessons observed**		
C	**Cross-Disciplinary Connections**	
D	**Linkage to life beyond the classroom**	
E	**Social support for student learning**	
F	**Student engagement**	
Mathematical Instructional Scales		
G	**Use of Maths analysis**	
H	**Depth of knowledge and student understanding**	
I	**Basic skill development in the context of problem solving**	
J	**Maths discourse and communication**	
K	**Locus of Maths authority**	

(Adapted from IEO, Stipek, 1999)

Appendix 6: The COS-5 (NICHD/Pianta) Instrument

Frequency of Behaviour

1 CHILD-LEVEL SETTING	**MINUTE INTERVAL**									
Whole class	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Large group >6	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Small group 6 or fewer	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Individual	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
11 CONTENT OF TC ACTIVITY										
Literacy/Language Arts	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Word-level Activities	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Comprehension	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Part of Literacy hour 1 2 3 4*	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Part of Literacy hour W / S / T	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Mathematics	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Computation	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Concept Development/Problem Solving	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Part of NNS O / M / P*	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Science	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Social Science	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Enrichment	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Computers/Technology	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Free time	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Transitions/Management/Business	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
111 TEACHER BEHAVIOUR										
Attends to TC	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Teaching Basic Skills/facts	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Teaching Analysis/Infer/Plan	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Managerial instructions	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Monitoring/Checking work	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Display Positive Affect	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Displays Negative Affect	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Disciplines	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
1V CHILD ACADEMIC BEHAVIOUR										
Engaged in learning	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Highly Engaged	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Unproductive/Spaced Out /Disengaged	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Off-task – Alternative Academic Activity	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Learning/Performing Basic Skills/Facts	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Learning/Performing Analysis/Inference etc.	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Collaborative Work	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Requests Attention/Help/Information	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Volunteers	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
V CHILD SOCIAL BEHAVIOUR										
Positive /Neutral Engagement with Peers	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Negative/Aggressive Engagement with Peers	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Positive Affect Toward Teacher	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Negative Affect Toward Teacher	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
General Disruptive Behaviour	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***

END-OF-BEHAVIOURAL RATINGS:

Classroom level setting **1…..Whole, 2…..Groups, 3…..Individual, 4…..mixed**

Teacher suggests/offers collaborative activity **…….A lot …….Somewhat …….Never**

Test/Quiz administered during any portion of observation N Y

(Adapted from NICHD FSV01G5)

A - Measures of Quality -
Child Codes

1	2	3	4	5	6	7
Uncharacteristic		Minimally characteristic	Norm Exception: 5	Very characteristic		Extremely characteristic

Child code Scores should reflect global classroom observations related to TC's point of view.	**Rating**						
1 Positive Affect (1-7)	1	2	3	**4**	5	6	7
2 Self Reliance (1-7)	1	2	3	**4**	5	6	7
3 Sociable/Cooperative with Peers (1-7)	1	2	3	**4**	5	6	7
4 Attention (1-7)	1	2	3	**4**	5	6	7
5 Disruptive (1-7)	**1**	2	3	4	5	6	7
6 Activity Level (1-7)	1	2	3	**4**	5	6	7
7. Child-Teacher Relationship (1-7)	1	2	3	**4**	5	6	7

End-of-cycle ratings:
(Adapted from NICHD FSV01G5)

General Observations on the whole class				
1	The children respected by peers.	1 None/Some of the time	2 Most of the time	3 All of the time
2	Children are responsible for time and materials (**independence**) tangible responsibility	1 None/Some of the time	2 Most of the time	3 All of the time
3	The **learning** intentions of the lesson/activity is clear to children	1 Not clear	2 Clear to some	3 Clear to all
4	Children could reflect on their learning through review	1 No evidence	2 Some evidence	3 Very evident
5	The teacher's materials/resources were well organised/managed and 'fit for purpose'	1 Not well organised	2 Some organisation	3 Well organised

B - Measures of Quality -
Classroom Codes

1	2	3	4	5	6	7
Uncharacteristic		Minimally characteristic	Norm	Very characteristic		Extremely characteristic

Classroom codes Scores should reflect global classroom observations	Rating						
1 Richness of Instructional Methods (1-7)	1	2	3	**4**	5	6	7
2 Over-Control (1-7)	**1**	2	3	4	5	6	7
3 Chaos (1-7)	**1**	2	3	4	5	6	7
4 Detachment / Teacher (1-7)	**1**	2	3	4	5	6	7
5 Positive Classroom Climate (1-7)	1	2	3	**4**	5	6	7
6 Negative Classroom Climate (1-7)	**1**	2	3	4	5	6	7
7 Productive Use of Instructional Time (1-7)	1	2	3	**4**	5	6	7
8 Evaluative Feedback (1-7)	1	2	3	**4**	5	6	7
9 Teacher Sensitivity (1-7)	1	2	3	**4**	5	6	7

End-of-cycle ratings:

1 The teacher is clear about what she expects the children to do in their activities.

1	**2**	**3**	**4**	**5**
Not clear, very confusing to all	Clearer but, majority of children still confused	Some clear and some confused	Mostly clear	Extremely clear to all

2 The teacher ensures that concepts/ideas are clear to the children.

1	**2**	**3**	**4**	**5**
Not clear, very confusing to all	Clearer but, majority of children still confused	Some clear and some confused	Mostly clear	Extremely clear to all (Excluding SEN child)

Appendix 7: Training and Reliability

Training

The COS-5 and IEO instruments are complex requiring intensive training to prepare researchers for their use in Year 5 classrooms. Ten Research Assistants were recruited and all had extensive experience of working in primary schools both as practitioners and researchers.

A total of 12 days were needed to complete the training for both the IEO and COS-5 instruments, excluding time for researcher review of materials and classroom and video training. The training programme covered:

a) review of the documentation associated with the instruments
b) familiarisation with definitions
c) instructions on administration
d) video training on scoring
e) reviews of scoring
f) individual and paired observations in naturalistic settings.

Following initial in-house and video training, the researchers then tested the instrument in the field with both individual and paired observations. These observations were completed in Year 5 classrooms of schools unrelated to the project. At each stage of the training, researchers had to compare assessments and give justifications for their judgements. This was seen as an important part of validating the reliability of the observations. Both the COS-5 and the IEO rely on numerical ratings and qualitative justifications.

Reliability

Checks on inter-observer reliability were conducted at each stage of the training in order to ensure consistency across coders. Final inter-observer reliability was achieved after the extensive training period. The format for reliability was video tapes of whole lessons which observers coded in isolation. This follows the procedures used by the NICHD for reliability. In EPPE 3-11 ten researchers coded eleven lessons for the COS-5 instrument and six lessons for the IEO. The lessons covered Literacy, Mathematics, Geography and Start of the afternoon.

For the COS-5 instrument inter-observer reliability was available from the NICHD study (reliability for the IEO was unavailable). The NICHD (2001) reported “average exact agreement with the gold-standard videotape test for the time-sampled codes, estimated by correlation with master-coders scores, was .848…….average live reliability across all global ratings, estimated using correlations was .714” (NICHD, 2001, p 6). In the EPPE 3-11 reliability inter-rater agreement was also assessed using simple correlations for comparison with the NICHD data, exact agreement with the gold standard was r=0.82- with a range of 0.75-0.87, and average exact agreement across all raters was r=0.80 with a range of 0.68 – 0.95.

In addition inter-observer agreement was assessed for each instrument using the Kappa statistics. Each observer was compared against a gold standard for each lesson type; nine pairs of comparisons were calculated for each lesson type within each instrument. The derived scores were then averaged across lessons and across observers for each instrument. Inter-observer agreement was high for both the COS-5 (weighted Kappa scores, 0.56 - 0.920; with a mean of 0.80) and the IEO (weighted Kappa scores, 0.55 - 0.84 with a mean of 0.74) instruments.

Appendix 8: Data Entry and Analysis

Data Entry

As noted above, the Frequency of Behaviour Coding observations consisted of ten 60-second intervals, which included 30-seconds of uninterrupted observation and 30 seconds of recording. Each of these intervals was entered as an individual variable receiving either a value of 1 (observed) or 0 (not observed). For example, 'Small group setting 1' would refer to the child working in a small group during the first minute (interval) of the 10 minute observation. All individual intervals within a specific code were then added together to create a single score out of 10 for that code for a given cycle (e.g. If 'Small group setting' was observed occurring in 6 of the 10 intervals, it would receive a score of 6). This procedure was applied for each of the Frequency of Behavioural Coding cycles in each school. Only the total scores for each code were used for further analysis.

The 'Other Pedagogical Strategies' and the 'Measuring of Quality Coding System' were each entered as a single variable which could take any value between 1 and 7, corresponding to the seven-point Likert-like rating scale on which these observations were based. Data files were then aggregated to yield a mean score for each individual Year 5 class.

Data for the IEO were entered separately as these scales were applied once in each classroom. The IEO scales were applied in both a Literacy and Numeracy session; however the categories applied in each of these subject settings were different and therefore treated as two separate scales. Each code of the Numeracy and Literacy Scale was entered as a single variable with values corresponding to the scales on which the observations were based (1 to 5 point Likert scale). These variables were than merged with the aggregated COS-5 codes file.

After the fieldwork was completed (Summer 2005), the Research Assistants were consulted at the data entry stage to ensure consistency across the data. This was seen as an essential part of the Research Assistants' role, particularly in ensuring common understandings by the data enterers of the meanings of professional terms and descriptions.

Appendix 9: Indicators of classroom behaviours using the COS-5 (Pianta) Measures of Quality

Child Codes

1 Positive Affect
Reflects happy mood and pleasant state of TC seen during interactions-personal contentment. Rating based on quantity and quality of behaviour.
High = sparkle/radiate/smiles/laughter/enthusiasm.
Mid = 4 – overall content/neutral but with engagement.
Low = flat/not content/no positive mood/disengaged/glum/bored/detached.

2 Self-Reliance
Display autonomy, responsibility, initiative, self-direction, leadership, and assertiveness.
High = need little adult direction, willingness to take risks, assertive with peers.
Low = lacks confidence, needs adult help before trying, dependent, passive, hesitant.

3 Sociable/Co-operative with Peers
Positive engagement, seeks contact, initiates and responds to others initiation
High = joins in – initiates talk and interaction, co-operates, sociable – shares, helps peers.
Low = withdrawn, disengaged, no interest in peers, no compromise, negative engagement, stubborn, bossy, obstructive, dominate.

4 Attention
Level of sustained, focused or directed attention to ongoing classroom activities. If unsure code midpoint 4.
High = sustained forms, tuned in, on task.
Low = easily distracted, creates diversions, fidget, play aimless, disengaged, daydreams, needs teacher prompting, unfocused.

5 Disruptive
Movement up the scale will depend on the number of children and adults affected by the child's behaviour
A score of 5 or higher would suggest an increasingly disruptive child. For instance a child that shouts out continuously, causing the teacher to have to stop the lesson or hindering other children's capacity to work.
A score of 3-4 would be recorded for the TC who has a couple, brief instances of inappropriate behaviour that disrupts others (the more children affected the higher the score)
A score of 2 would be recorded for the child who has one disruptive moment, which has no lasting effects on others and a score of 1 would be given to the child who displays no disruptive behaviours throughout the observed lesson.
This scale should not take as evidence the child that does not remain on task – but rather the degree his behaviour effects those around him.
High = does not follow rules, makes noises, calls out, taps pencil – these behaviours must annoy and disrupt others in order for a score of 5 or more.
Mid = (4) a couple/few instances of inappropriate behaviour causing disruption to others
Low = compliant, not disruptive at all, can be inattentive if quiet but does not disrupt others

6 Activity level
High = overactive, hyper – lots of movement, not sit still, moves around.
Mid = 4 = some movement but appropriate to situation so some fidget and shuffle = normal.
Low = inactive passive.

7 Child-Teacher Relationship
High = positive response to teacher, co-operates, comply, enthusiastic response, respect, initials teacher responses, affection seen.

Mid = limited interaction but child follows rules and instructions.
Low = negative engaged, rejects, defiance, ignore, misbehave, argue demand, criticise

Classroom Codes

1 Richness of Instructional Methods
- High = 7= range skills, hypothesis, variety, depth strategies, intellectually engaging, thought provoking, reciprocal discussion, model explain.
- Mid = no higher level thinking skills used.
- Low = basic format.

2 Over-Control
- High = 7 = rigid structure, regimented, driven by teacher needs and agenda not child's needs or interests. Little movement, whole class activities, quiet no individualisation, teacher not child talk, stifled not creative, teacher directed, not necessarily successful.
- Low = respect child autonomy and responsibility, see child as an active participant.

3 Chaos
- High = noise, confusion, unruly, chaotic, cant see instruction or learning, ineffectual control, misbehaviour especially during transitions, ignore sanctioned activity, disruptive behaviour, inappropriate behaviour, rude, poor discipline.
- Low = organised, respectful, attentive, clear expectations

4 Detachment/Teacher.
- Degree teacher = detached from class or child activity or child understanding or interest level.
- High = lack of assistance, feedback, not responding, no notice of task or poor behaviour, teacher sits as desk, lack of interest, not monitoring children's work or behaviour.
- Low = involved and responsive and alert to child's needs.

5 Positive Classroom Climate
- Emotional and social tone of classroom respectful, safe, welcoming, friendships, happy place.
- High = listen politely, genuine respect to teacher and child.
- Low = neutral climate, flat, dysfunctional, fearful, disrespect, negative.

6 Negative Classroom Climate
- Capture climate that is hostile, angry, and punitive.
- High = hostile, angry, punitive, controlling, teacher angry, hostile, irritable, lacks concern. Also consider child behaviour to each other. Shame, humiliation, sarcasm, abruptness.
- Low = shows little of above

7 Productive Use of Instructional Time
- How well time is managed.
- High = smooth transitions, routines automised by all, good planning, preparation materials, efficient routines when finished work, transition and management time limited activities for all therefore productive, no waiting, no disruption.
- Low = time wasted, little of above.

8 Evaluative Feedback
- Consider frequency and quality to all class.
- Should be in response to a child's performance on a particular task or skill
- Presence of embellishments (repetition of child's skills; extension of child's skill)
- High = feedback to extend child knowledge and understanding and skills to consolidate, reinforce, done often and dependably.
- Low = perfunctory, occasional, lack of depth and information.

9 Teacher Sensitivity
- High = aware of child needs, moods, interests, capabilities, uses sensitive discipline, takes interest in child, responses facilitate child's learning.
- Low = none demonstrated.

Appendix 10: Indicators of classroom behaviours using the IEO (Stipek) scale

General Classroom Management and Climate Scales

A Classroom Climate: extent classroom is a place pupil's feel safe and respected. Look at how teacher and children speak to one another, friendships amongst pupils, how rules are made and enforced (discipline), the pace of the lesson observed, opportunity for collaboration, how decisions are made, how individual ideas are expressed and used (accepted/rejected).
HIGH: children and adults use respectful tones when speaking, smiles are shared, children, staff and visitors are made to feel welcome, friendships are visible between children, evidence of willingness to share and help each other, individual ideas (ways of approaching a maths question or opinions about a book character etc) are welcomed and accepted, disagreements are academic and not personal, teacher uses sensitive discipline and deals with the behaviour rather than signalling out child, children have some autonomy etc.
LOW: classroom is dysfunctional, threats are overheard, disciplines are overt and personal, children are singled out when errors are made, a tendency to always promote 'bright' children, children show negative affect to teacher and/or to each other. There is little to no evidence of respect between children or between children and adults in the room. Children are verbally attacked when expressing ideas, there is screaming and evidence of annoyance in the tones of adults and children, random acts of violence etc.

B Classroom Routines: The use of instructional time. Look at how transitions are managed both within and between lessons, structure/organisation of the day, pace of the lessons, level of preparation of materials, how children are involved in the routine business of the day (including start of day, taking register, collecting money), do children manage materials etc.
HIGH: the classroom resembles a 'well oiled machine', transitions are smooth with little to no time lost to instruction, teacher's expectations are clear and the children understand what they should be doing, children are responsible for materials and involved in completing class activities (collecting dinner money, taking register, preparing materials and they know where they are and have access to them at all times of the day), learning assistants are available and their role is clearly defined etc.
LOW: All or most of the transitions are chaotic, children walk around aimlessly as teacher sorts out register or other start of day activities, teacher expectations are unclear, learning assistant is used to run errands for the teacher (photocopying, putting up displays) and is therefore not available for the children etc.

General Instruction Scales
C Cross-Disciplinary Connections: Extent to which lesson/activity is connected to multiple subject areas. Look for *explicit* and *explored* connections made between subjects.
High: Explicit connections are made between subjects and these connections are explored by the children. For instance, skills developed in maths are used as a tool to support learning in Science, where the skills are directly linked back to maths. Evidence where the study of one subject enriches the study of the other. The connections are explored in depth and are used to generate meaning and extend pupils' understanding.
LOW: Subjects are studied in isolation. Connections are either mentioned in passing or not mentioned or realised by children at all, even though connections exist.

D Linkage to life beyond the classroom: Extent to which lesson/activity is connected to competencies or concerns beyond the classroom. Look for attempts made to connect children's outside lived experiences or current issues with in-school events.
HIGH: students worked on at least one topic/lesson that was directly connected to their personal experience or a contemporary/current event outside of school. The connection is made explicit and the children recognise the connection, as demonstrated through their verbal contributions. These connections are explored in depth and used in a way to create personal meaning and

significance in the subject. The adult helps make the skill relevant to child's life beyond the worksheet or classroom activity. There is the creation of concrete/tangible evidence of their attempt to understand a topic or solve the problem.
LOW: there are no clear connections to anything beyond the classroom itself. All activities are approached with the expectation of doing well in class rather than locating the relevance of the activities outside the classroom setting. Connections between classroom skill and outside classroom functions are not explored or presented.

E Social support for student learning: Extent classroom learning environment is characterised by an atmosphere of high academic expectations for all students coupled with mutual respect and support among teacher and pupils. Look at how children are supported by teacher and each other.
HIGH: children are supported by high expectations conveyed and set by the teacher for ALL children. Children are encouraged to take risks, seek and explore challenges and learn from errors. The adults value all children and see everyone as capable of contributing. Everyone's contributions are taken seriously and any errors are explored and used as a point of departure rather than glossed over in search of the 'correct' answer. All children are encouraged, not only the 'strongest.'
LOW: The teacher used put-downs when referring to children's academic efforts, product over process, pupils interfere with each other's efforts to learn (constant interruptions, noise level etc). In general, social support is negative. Children are discouraged to take risks because of the fear of put-downs or being laughed at. Mistakes are glossed over or ignored.

F Student engagement: To what extent are students engaged in lessons. Look for evidence of engagement.
HIGH: There is serious engagement identified by on-task behaviour, attentiveness, completion of tasks, displays of enthusiasm, initiative taken by children and accepted and extended by teacher, children contribute both in whole class and group discussions and activities. This would describe the majority of the time.
LOW: For the majority of the observation children are disengaged, to the point of distraction. There is little attention and the disruption of others makes those who would like to attend to task incapable of doing so. There is a lot of evidence of daydreaming, off-task talk and general disruptive behaviour. Children show little to no interest in lesson/activity.

Mathematical Instructional Scales
G Use of Maths analysis: What extent do children use maths analysis? Look for evidence of Higher order thinking.
HIGH: Involves inventing original procedures where children construct original ways to solve maths problems and these methods are explored and tested seriously by class/teacher. Children also are involved in searching for maths patterns, making maths conjectures with justifications, organising, evaluating (other pupils as well as their own strategies to see if they are valid), arguing and defending one's work/ideas/methods and making models to represent ideas/answers.
LOW: Thinking is restricted to mechanically recording or reporting of maths facts, rules, definitions or mechanically applying algorithms. There is a lot of receiving, reiterating, reciting and performing routine procedures. There is little or no evidence of maths analyses observed.

H Depth of knowledge and student understanding: Extent to which maths knowledge is treated deeply in class.
HIGH: Evidence of the development of relatively complex understanding of lesson's concepts. There is evidence of the development of relatively systematic, integrated or holistic understandings of maths concepts. Students are seen to produce new knowledge when connecting maths topics to one another, when solving problems, making conjectures, justifying their hypotheses and making conclusions. The teacher structures lessons so that most students are engaged in at least one of the following: demonstrating their understanding of the

problematic nature of information or ideas, demonstrating complex understanding by arriving at a reasoned, supported conclusion or explain how they solved a *complex* problem.
LOW: Knowledge is thin as concepts are treated superficially and as non-problematic (e.g. only one way to solve a problem etc). Children are able to present mainly fragmented pieces of information. Pupils cannot or do not use knowledge to make clear distinctions, arguments, solve problems. There is little or no attempt to make connections between maths concepts (rote memorisation). The teacher may attempt to elicit deeper understanding, but the children are unable or unwilling to respond beyond basic recitation. There is fragmentation in the way maths knowledge is presented.

I Basic skill development in the context of problem solving: Extent to which students learn basic skills in the context of problem solving. Look for evidence of basic skills teaching and note if this is done in isolation or in the context of solving a problem (may or may not have basis in real world context).
HIGH: Students take time out from solving problems to learn the meaning of specific terms in the problem, how to use a particular tool, how to represent quantities symbolically, how to perform a basic skill which is then used in solving a problem. There is evidence of in depth attempt to link basic skills teaching within the context of problem solving. The teacher makes the link explicit and the children are able to see the link.
LOW: Basic skills might simply not be taught at all. Or if they are taught, the teaching is done in isolation from problem solving. The teacher might drill children using flash cards or rapid verbal questioning. There is often a focus on memorisation or recitation. Children are also often involved in repetitive computations (worksheets/sums) without any visible attempt to link this skill development to actual problem solving.

J Maths discourse and communication: The extent to which classroom discourse in maths is devoted to creating or negotiating shared understandings of maths. Look for evidence of pupil talk- is it superficial, short, and brief? Or does it contain opportunities to make meaning and facilitate understanding?
HIGH: Discourse is sustained and leads to shared understanding in this class. There is considerable teacher pupil and pupil-pupil discourse about maths ideas, this interaction is reciprocal and it promotes the extension of understanding towards a shared understanding of concepts being taught. The following MUST be in evidence in order to give the class a high score:
a. talk is about maths and includes higher order thinking (HOT) – including making distinctions, applying ideas, forming generalisations and raising questions.
b. There is a sharing of ideas (not scripted as in teacher led recitation). Evidence: participants explain themselves or ask questions in complete sentences, when speaker responds directly to the previous speaker's comments/answer (expanding on each other's ideas and explanations).
c. Dialogue builds coherently to promote improved, shared understanding of math topic (similar to b)
LOW: In this class, the discourse consists of mainly a lecture from teacher with recitation. It appears the communication is scripted, where the teacher controls the destination of the lesson and ideas. There is often a question (initiated by teacher) followed by a chosen child's response and then a teacher feedback statement. The children are mainly engaged in reporting experiences, facts, definitions and/or procedures. Oral equivalent of fill in the blank or short answer questions.

K Locus of Maths authority: Extent to which the lesson supports a shared sense of authority and responsibility for validating students' maths reasoning. Who is involved in validating student's maths reasoning? * Does not measure students' control over the content – the teacher may still determine what, is important and worthwhile content wise, without lowering the 'Locus of Maths authority'.
HIGH: In this classroom, the teacher and the students hold each other accountable for convincing themselves and each other that their reasoning is sound and the answers are correct. There is a shared maths authority. The teacher often answers a question with a question or

offers instrumental help (good scaffolding), pushing students to make their own decisions. Children turn to themselves or each other for help, before consulting the teacher.
LOW: In the main, only the teacher and/or the text book are considered the legitimate source of maths authority. They provide the validation of correct methods, explanations and answers. At times there seems no one has a means of validating an answer or explanation. Children only accept an answer as correct once the teacher has validated it. At times the teacher becomes annoyed when asked questions by children because s/he has an expected destination and considers such questions a digression. This sort of behaviour (child questioning or pupil voice) is prevented by her control of the discourse and validation of the correct response. Children turn to teacher for help, rather than each other.

Reading Instructional Scales
L Reading as meaning making: Extent to which students try to derive meaning from the texts they read – look for evidence of children making meaning and children trying to understand the substance of what they are reading. H.O.T – involving text: making meaning that goes beyond decoding words, choral reading, and recitation, memorising or applying phonics rules.
HIGH: In this classroom, children are engaged in reading that involves trying to understand the meaning of the text. They are trying to guess the meaning of words based on context when encountering unfamiliar words, using prior knowledge about a situation to help predict what will happen next, arguing and hypothesising or looking for patterns amongst works from an author or between authors. There are often long discussions that emerge from issues encountered in the text, such as the nuances of a new word. The teacher asks open ended questions that allow for speculation and diverse responses, she encourages students to read things that interest them and lead to an atmosphere of reading as an activity of meaning making.
LOW: In this classroom the children are mainly engaged in activities which require decoding, choral reading, recitation, memorisation or application of phonics rules. Skills are taught in isolation and based on low-level skills, such as decoding. There is little focus on the meaning of what is being read. When reading with small groups, teacher tends to focus on decoding rather than content and meaning (for example corrects children misreading of words, but does not discuss the word's meaning).

M Basic skills development in the context of reading: Extent to which students learn basic reading skills within the context of reading for meaning. Skills needed in order to understand what you read, conventions of reading: phonics, voice, tense, sentence, structure, syllabification, syntax, grammar, (rich) vocabulary, word recognition, meaning of verbs, nouns, adjectives, adverbs, pronouns and other parts of speech. * an episode of basic skills instruction does not necessarily lead to a lowering of this score – the issue is whether the skills taught are ever explicitly stated within the activity of reading for meaning.
HIGH: in this class, children take time out of reading a passage to figure out the meaning of a word, phrase, literary devices (metaphors, similes etc) based on the text (rather than looking in a dictionary or the teacher providing the answer). Students have their own dictionary made up of words that they encounter during their reading. There are times when the teacher commences a lesson with the instruction of basic skills, which then appears in the passage that is to be read. This connection is made explicit and is explored (furthering the lesson).

LOW: reading skills are taught in isolation or simply not taught at all. There are connections between the skills instruction and the texts being read but these connections are neither mentioned by the teacher nor do they seem to be recognised by the students. Connections that are made are not explored or used to develop the lesson or understanding.

Writing Instructional Scales
N Higher order thinking in writing: Extent to which students plan for, edit, revise and otherwise engaged in H.O.T when they write something, beyond merely practicing how to spell words, the rules for grammar and filling in the blanks with pre-specified answers. *NOTE: Higher order thinking in writing = construction of original text

HIGH: Children in this class try to decide on the substance of what they want the reader to read. They have an intention, a story to tell, a point to make or a message to communicate to a desired audience. They consider, prior to writing, how to get that point, story, message across (planning). Pupils are often engaged in creating outlines to follow or are in the process of editing and revising work. They are using their prior knowledge or experience to help them to compose their new piece of writing. Teacher provides age-appropriate and skill appropriate opportunities for different kinds of writing for different purposes. They provide appropriate scaffolding for students, such as supporting them to create drafts of their texts, giving substantive feedback (on ideas, not only grammar and spelling), and encouraging the writers to share with others. Children are engaged in listening to and offering suggestions for improving their peers' work.
LOW: The children in this class are often involved in lower-order thinking, which might include skills taught in isolation from larger enterprise of writing. Students are often found practicing and drilling on a long list of vocabulary and spelling words but never given opportunity to use them in a substantive way. Students practice fill-in-the-blank activities without using them to actually write something meaningful.

O Purposeful development of writing skills: Extent to which students learn basic writing skills as they write. A wide range of skills are needed in order to write, the conventions of writing: spelling, voice, tense, sentence, structure, syllabification, syntax, grammar, rich vocabulary etc. Writing for a purpose, a story vs. a poem vs. a memo, vs. an essay etc.
HIGH: The pupils in this class take time out to correct an invented spelling while writing. Lessons may begin with instruction of a particular type of writing skill, such as grammar or capitalisation, but this skill is directly and explicitly linked to the activity children will be engaged in after instructions. Students are often seen writing new words into a personal dictionary or using this dictionary to support their writing.
LOW: Writing skills are taught in isolation as bits of information whose purpose, according to the students' perspective, is vague. Sometimes, writing skills simply are not taught. There may be connections between basic skills instruction and writing but these connections remain unexplored or unmentioned by teacher. Children are often found memorising lists of vocabulary or spelling but never rely on this list when engaged in their own writing.

P Instructional conversations: extent which classroom conversations are devoted to creating or negotiating shared understandings of the content. Consider both content and nature of the conversation. Look at who controls the conversation, are children actively involved or are they simply passive respondents? Note: read bottom of page 25 for notes on this scale.
HIGH: In this class there is considerable teacher-pupil and pupil-pupil interaction about the ideas of a topic, this interaction is reciprocal and promotes shared understanding. The talk in this class is about the content being studied. Children are often found making distinctions, applying ideas, forming generalisations and raising questions (beyond procedural). The conversations involve a sharing of ideas and are not completely scripted or controlled by one party. This sharing is evidenced in the pupils' explanations of themselves or in their asking of questions in complete sentences and also when they respond to others directly. There is a building on from one another's ideas. There are sustained explorations of content in this class.
LOW: Children are often involved in simply reporting experiences, facts, definitions or procedures. The teacher controls the conversation in this classroom. The teacher is often seen asking closed questions and the children are seen responding in short answers. Seems like a fill in the blank conversation rather than a dialogue.

Appendix 11: Methodology for the social/behavioural analysis

Overall, questionnaires were not returned for 651 children. Of those children for whom the questionnaire was returned, 2079 had a complete set of scores for the social/behavioural items, i.e., a valid value for all 56 items. The remaining children (441) had one or more missing values in the 56-item set. For these 441 cases missing values were substituted with the child's own mean.

The social/behavioural instrument consists of a wide range of items (56) rated on a 3-point scale, (1 = not true; 2 = somewhat true; 3 = certainly true) some of which are measuring more adaptive social behaviour, e.g., 'considerate of other peoples feelings', and some measuring maladaptive behaviour e.g., 'has many fears, easily scared'. For the purpose of the missing substitution analysis, the items were divided into two sub-groups; of
1. Adaptive (29) and
2 Maladaptive behaviour (26items) and questions were substituted with the child's mean of items belonging to the same sub-group. One item was substituted with the overall mean as it was considered neutral 'gets on better with adults than with children'. The items with the missing substitution were then used for all subsequent factor analysis.

A number of data reduction methods were applied to the data, these included Principal Components Analysis (PCA) with varimax (orthogonal) rotation and PCA with promac (opaque) rotation. The exploratory analysis yielded 8 factors explaining 54.9% of the variance with both types of rotation. However, the last factor was relatively weak, i.e., with very few items loadings, consequently two further analyses were conducted forcing a 7 factor solution on the data. The resulting analysis accounted for 53.2% of the variance. Structural equation modelling was used to compare between the different models derived. The best fitting model was the 7 factor solution with promac rotation (RMSEA=0.6; CMIN=14635.647 with 1463 df). The factor scores produced by this analysis were normalized and used in further analyses. For the whole sample the average factor score is 100 with a standard deviation of 15. (see Appendix 3 for details on normalization procedures).

	Component						
F1 – Hyperactivity scale	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2:restless, overactive, cannot stay still for long	997						
10:constantly fidgeting or squirming	.995						
15:easily distracted, concentration wanders	.844						
21:thinks things out before acting	-.474						
25:sees tasks through to the end, good attention span	-.557		.498				
27:quickly loses interest in what she/he is doing	.671						
36:gets over excited	.817						
39:is easily frustrated	.496			.312			
45:is impulsive, acts without thinking	.787						
50:can behave appropriately during less structured sessions	-.468						
54:fails to pay attention	.751						
56:makes careless mistakes	.572		-.324				
F2 – 'Pro-social' behaviour scale							
1:considerate of other people's feelings		.493					
4:shares readily with other children (treats, toys pencils, etc.)		.445					

9:helpful if someone is hurt, upset or feeling ill		.817					
17:kind to younger children		.743					
20:often volunteers to help others (teachers, other children)		.927					
51:offers to help others having difficulties with a task		.730					
52:is sympathetic to others if they are upset		.848					
29:apologises spontaneously		.448				.361	
F3 – 'Self-regulation'							
32:likes to work things out for self; seeks help rarely		-.372	.791			.317	
35:does not need much help with tasks			.800				
38:chooses activities on their own			.715			.427	
41:persists in the face of difficult tasks	-.306		.575				
44:can move on to a new activity after finishing a task			.579				
46:is open and direct about what she/he wants	.414		.430				
47:is confident with others	.365		.503				
53:shows leadership in group work			.552				
55:can take responsibility for a task			.622				
F4 –Emotional symptoms scale/Anxious							
3:often complains of headaches, stomach-aches and or sickness				.504			
8:many worries, often seems worried				.703			
13:often unhappy, down-hearted or tearful				.470	.345		
16:nervous or clingy in new situations, easily loses confidence				.667			
24:many fears, easily scared				.726			
F5 – Peer problems scale (Goodman)/ Social isolation							
6:rather solitary, tends to play alone					.677		
11:has at least one good friend					-.795		
14:generally liked by other children					-.619		
19:picked on or bullied by other children					.613		
23:gets on better with adults than with other children					.812		
34:can play or work easily with others					-.429		
F6 – Positive social							
5:often has temper tantrums or hot tempers (Goodman's conduct problems scale)	.337					-.403	
31:is calm and easygoing						.445	
33:shows wide mood swings	.310					-.466	
37:says 'please' and 'thank you' when reminded						.603	
40:gets over being upset easily						.708	
42:waits his/her turn in games and activities						.358	
43:co-orperates with requests						.341	

F7 – Conduct problems scale (Goodman)/ 'Anti-social' behaviour							
12:often fights with other children or bullies him							.320
18:often lies or cheats							.477
22:steals from home, school or elsewhere							.729
26:vandalises property or destroys things							.676
28:shows inappropriate sexual behaviour toward others							.642
30:has been in trouble with the law							.663
Less than 0.4 loadings							
5:often has temper tantrums or hot tempers							
7:generally obedient, usually does what adults request (Goodman's conduct problems scale)	-.364						
48:teases other children, calls them names	.314						
49:in social activities just tends to watch others				.317	.346	.331	

Goodman items are in bold. All the Goodman factors fit well in this analysis, apart from the conduct problems scale keep together within the same factor, the conduct problems scale splits between 3 factors but 3 of the 5 items are together loading on the 'Anti-social' scale.

Appendix 12: Effect Sizes

To illustrate the impact of different factors on attainment or social behaviour in Year 1 effect sizes (ES) were calculated. Effect sizes are most commonly used in experimental studies and essentially measure the strength of mean differences. Glass et al., (1981) define ES as:

ES = (mean of experimental group)-(mean of control group)/pooled standard deviation

Or $\Delta = \frac{X_{Exp} - X_{Cont}}{SD_{pooled}}$

Effect sizes were calculated for different child outcomes, using both the child level variance and coefficients for predictors included in the multilevel statistical models adopting the formulae outlined by Tymms et al., (1997).

For categorical predictors (e.g. gender or ethnicity) the effect size was calculated as:

ES = categorical predictor variable coefficient / √child level variance

Or

$\Delta = \frac{\beta_1}{\sigma_e}$

For continuous predictor variables (e.g. child age in months), the effect size describes the change on the outcome measure produced by a change of +/-one standard deviation on the continuous predictor variable, standardised by the within school SD, adjusted for covariates in the model – the level 1 SD:

$\Delta = \frac{2\ \beta_1 * SD_{x1}}{\sigma_e}$ where $_{x1}$=continuous predictor variable

Effect sizes can be useful for comparisons between different studies but interpretations must be made with caution and with reference to the outcomes concerned and controls used in models (Elliot & Sammons, 2004). For further discussion of effect sizes see Coe (2002). Effect sizes for some categorical measures in the EPPE research are large but apply to small numbers of children (e.g. the very low birth weight group or specific ethnic groups).

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Published: 2006

Effective Pre-school and Primary Education 3-11 (EPPE 3-11): The Effectiveness of Primary Schools in England in Key Stage 2 for 2002, 2003 and 2004, Research Brief No. RBX06-06. Nottingham: DfES Publications.
Published: 2006

Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11): Influences on Children's Attainment and Progress in Key Stage 2: Cognitive Outcomes in Year 5. Full Report. London: Institute of Education, University of London. http://www.ioe.ac.uk/schools/ecpe/eppe/eppe3-11/eppe3-11pubs.htm
Published: 2007

Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11) Summary Report: Influences on Children's Attainment and Progress in Key Stage 2: Cognitive Outcomes in Year 5. Research Report No. RR828. Nottingham: DfES Publications. **Published: 2007**

Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11): Influences on Children's Attainment and Progress in Key Stage 2: Cognitive Outcomes in Year 5. Research Brief No. RB828. Nottingham: DfES Publications.
Published: 2007

Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11): Influences on Children's Development and Progress in Key Stage 2: Social/behavioural Outcomes in Year 5. Research Report No. DCSF-RR007. Nottingham: DfES Publications. **Published: 2007**

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Published: 2006

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Related Publications

The Early Childhood Environment Rating Scale: Revised Edition (1998). Harms, Clifford and Cryer ISBN: 08077 3751 8 Available from Teachers College Press. Columbia University. 1234 Amsterdam Avenue. New York. NY10027

Assessing Quality in the Early Years, Early Childhood Environment Rating Scale Extension (ECERS-E): Four Curricular Subscales (2003) Sylva, Siraj-Blatchford and Taggart (2003) Trentham Books ISBN Number: 1 85856 315 1
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Glossary of terms

Age standardised scores Assessment scores that have been adjusted to take account of the child's age at testing. This enables a comparison to be made between the performance of an individual pupil, and the relative achievement of a representative sample of children in the same age group throughout the country or, in this case, the relative achievement of the EPPE sample.

Baseline measures Assessments taken by the EPPE child at entry to the study. These assessment scores are subsequently employed as prior attainment measures in a value added analysis of pupils' cognitive progress.

Birth weight 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 1001-1005 grams and low birth weight is classified as 1501-2500 grams (Scott and Carran, 1989).

British Ability Scales (BAS) This is a battery of assessments specially developed by NFER-Nelson to assess very young children's abilities. The assessments used at entry to the EPPE study and entry to reception were:
Block building - Visual-perceptual matching, especially in spatial orientation (only entry to EPPE 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 children without English
Verbal comprehension – Receptive language, understanding of oral instructions involving basic language concepts.

Centre/School level variance The proportion of variance in a particular child outcome measure (i.e. Pre-reading scores at start of primary school) attributable to differences between individual centres/schools rather than differences between individual children.

***Child background* factors** Child background characteristics such as age, gender, ethnicity.

***Confidence intervals at the 95%* level** A range of values which can be expected to include the 'true' value in 95 out of 100 samples (i.e. if the calculation was repeated using 100 random samples).

Contextualised models Cross-sectional multilevel models exploring children's cognitive attainment at entry to primary school, controlling for child, parent 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 that ranges form + 1 to -1.

Duration In terms of the value added models, the duration of pre-school covers the time period between date of BAS assessment at entry to the EPPE study until entry to primary school. Note that the number of months of pre-school attended before the child entered the EPPE study is not included in this duration measure. A separate 'duration' measure of amount of time in pre-school

prior to entering the study was tested but was not found to be significant (note that this 'duration' measure is confounded with prior attainment). In the contextualised models, duration of pre-school refers to the time period between entry to the target pre-school until entry to primary school. These duration measures provide a crude indication of length of pre-school experience.

ECERS-R and ECERS-E The American Early Childhood Environment Rating Scale (ECERS-R) (Harms et al., 1998) is based on child centred pedagogy and also assesses resources for indoor and outdoor play. The English rating scale (ECERS-E) (Sylva et al., 2003) was intended as a supplement to the ECERS-R and was developed specially for the EPPE study to reflect the Desirable Learning Outcomes (which have since been replaced by the Early Learning Goals), and more importantly the Curriculum Guidance for the Foundation Stage which at the time was in trial stage.

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 sizes (ES) Effect sizes (ES) provide a measure of the strength of the relationships between different predictors and the child outcomes under study. For further discussion see Appendix 5 and Elliot & Sammons (2004).

Family factors Examples of family factors are mother's qualifications, father's employment and family SES.

General Cognitive Ability (GCA) A measure of children's overall cognitive ability, incorporating non-verbal and verbal BAS sub-scales.

Hierarchical nature of the data Data that clusters into pre-defined sub-groups or levels within a system (i.e. young children, pre-school centres, LAs).

Home learning environment factors Measures derived from reports from parents (at interview) about what children do at home, for example, playing with numbers and letters, singing songs and nursery rhymes.

Intervention study A study in which researchers 'intervene' in the sample to control variables i.e. control by setting, the adult:child ratios in order to compare different specific ratios in different settings. EPPE is not an intervention study in that it investigates naturally occurring variation in pre-school settings.

Intra-centre/school correlation The intra-centre/school correlation measures the extent to which the scores of children in the same centre/school resemble each other as compared with those from children at different centres/schools. The intra-centre/school correlation provides an indication of the extent to which unexplained variance in children's 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.

Multiple Disadvantage Based on three child variables, six parent variables, and one related to the home learning environment which were considered 'risk' indicators when looked at in isolation. A child's 'multiple disadvantage' was calculated by summing the number of indicators the child was at risk on.

Multilevel modelling A methodology that allows data to be examined simultaneously at different levels within a system (i.e. young children, pre-school centres, LAs), essentially a generalisation of multiple regression.

Multiple regression A method of predicting outcome scores on the basis of the statistical relationship between observed outcome scores and one or more predictor variables.

Net effect The unique contribution of a particular variable upon an outcome while other variables are controlled.

Pre-reading attainment Composite formed by adding together the scores for phonological awareness (rhyme and alliteration) and letter recognition.

Prior attainment factors Measures which describe pupils' achievement at the beginning of the phase or period under investigation (i.e. taken on entry to primary or secondary school or, in this case, on entry to the EPPE study).

Quality Measures of pre-school centre quality collected through observational assessments (ECERS-R, ECERS-E and CIS) made by trained researchers.

Sampling profile/procedures The EPPE sample was constructed by:
– Five regions (six LAs) randomly selected around the country, but being representative of urban, rural, inner city areas.
– Pre-schools from each of the 6 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.

Significance level Criteria for judging whether differences in scores between groups of children or centres 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 child's ability to 'socialise' with other adults and children and their general behaviour to others.

Socio Economic Status (SES) Occupational information was collected by means of a parental interview when children were recruited to the study. 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.

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.

Total BAS score By combining 4 of the BAS sub-scales (2 verbal and 2 non-verbal) a General Cognitive Ability score or Total BAS score at entry to the study can be computed. This is a measure of overall cognitive ability.

Value added models Longitudinal multilevel models exploring children's cognitive progress over the pre-school period, controlling for prior attainment and significant child, parent and home learning environment characteristics.

Value added residuals Differences between predicted and actual results for pre-school centres (where predicted results are calculated using value added models).

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