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The Effective Provision of Pre-School Education (EPPE) Project: Final Report

A Longitudinal Study Funded by the DfES 1997-2004

The Effective Provision of Pre-School Education [EPPE] Project

Effective Pre-School Education

**A Longitudinal Study funded by the DfES
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EFFECTIVE PRE-SCHOOL EDUCATION

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Contents

page

Executive summary	i-viii
Section 1	1
Policy context of the EPPE study	
Section 2	2
Previous research on the effectiveness of pre-school education and care	
Section 3	4
Design of study	
Aims	5
The sample: regions, centres and children	5
Child assessments	6
Measuring child/family characteristics known to have an impact on children's development	6
Pre-school characteristics and processes	6
Setting the centres in context	7
Case studies	7
Analytical Strategy	7
Identifying individual centre effects and type of provision at entry to school	7
Identifying continuing effects of pre-school centres at Key Stage 1	8
The linked study in Northern Ireland	8
Summary	9
Section 4	10
What were the children and families like at the beginning of the study?	
Comparing the EPPE sample to the UK population	10
How do groups within the sample compare	11
What background variables are related to child development at the start of the study?	12
Section 5	15
The pre-school settings: Context and Quality	
Observational profiles of centres	15
Details of early childhood environmental rating scales	16
Overall profiles of quality	17
Comparison of pre-school environments by type of provision	17
The focus on curriculum in ECERS-E	18
Variation within type of provision	19
Quality characteristics	19
Caregiver interaction scale	19
Staffing	20
Qualifications and training	20
Quality and programmes	21
Summary of quality profiles	21
Section 6	22
The developmental progress of children over the pre-school period	
Background	22
Methodology	22
Main findings and implications for policy	22
Cognitive development	23
The impact of a child's background	23
Home learning environment	25
Variations in centre effectiveness	25
The impact of pre-school – quantity and quality	26
Type of provision	27
Ratios and staff qualifications	28

Social/behavioural development	29
The impact of a child's background	29
Home learning environment	29
Variations in centre effectiveness	30
The impact of pre-school – quantity and quality	31
Ratios and staff qualifications	31
Children who did not experience pre-school	32
Section 7	34
Case studies of practice	
Findings	35
Management and staff	35
Ethos and climate of the settings	35
Analyses of the quantitative findings with the qualitative case studies data	36
Adult-child interactions	36
Differentiation and formative assessment	37
Discipline and adult support in talking through conflicts	37
Parental partnership	37
Pedagogy	38
Knowledge of the curriculum and child development	38
Section 8	39
The effects of pre-school on children's attainment and progress up to the end of Year One	
The impact of a child's background	40
Home learning environment	40
The continued impact of pre-school – Duration, quality and effectiveness	40
Children with no pre-school experience	40
Section 9	42
Did pre-school experience lead to lasting gains in cognitive and social/behavioural development to the end of KS 1?	
The impact of a child's background	42
Home learning environment	43
The continued impact of pre-school – Duration, quality and effectiveness	43
Children who do not experience pre-school	44
Section 10	46
Children 'at risk' of Special Educational Needs	
Aims	46
The sample	47
Methodology	47
Concepts of Special Educational Need (SEN) and 'risk' for SEN	47
Distribution of 'at risk' children across different types of pre-school providers	48
SEN status at school	48
Characteristics of children identified in different 'at risk' categories	49
The impact of pre-school on 'at risk' status	51
Movement 'in' and 'out' of 'risk' by pre-school type	51
Pre-school centre quality, progress and development	52
Parents' perceptions and experiences of SEN	52
Summary and policy implications	53

Section 11	55
Summarising the findings: What are the messages for policy and practice?	
Major findings at entry to school	55
Major findings at end of Key Stage 1	57
Relationship of EPPE findings to other research	58
The impact of EPPE on policy and practice	59
References	61
Appendices	
A: Effective Pre-school Provision in Northern Ireland (EPPNI): Findings from the pre-school period: Summary of findings	69
B: Analyses of family salary data, pre-school duration, quality and Impact on child attainment and progress at entry to primary school	73
C: Effective Pre-School and Primary Education 3-11 (EPPE-3-11)	85
D: EPPE Technical Paper	87
Glossary	88

EXECUTIVE SUMMARY

Introduction

The Effective Provision of Pre-school Education (EPPE) project investigated the effects of pre-school education and care on children's development for children aged 3-7 years old. The EPPE team collected a wide range of information on 3,000 children who were recruited at age 3+ and studied longitudinally until the end of Key Stage 1. Data were collected on children's developmental profiles (at ages 3, 4/5, 6 and 7 years), background characteristics related to their parents, the child's home learning environment, and the pre-school settings children attended. Settings (141) were drawn from a range of providers (local authority day nurseries, integrated¹ centres, playgroups, private day nurseries, nursery schools and nursery classes). A sample of 'home' children, (who had no or minimal pre-school experience) were recruited to the study at entry to school for comparison with the pre-school group. In addition to investigating the effects of pre-school provision, EPPE explored the characteristics of effective practice (and the pedagogy which underpins it) through twelve intensive case studies of settings where children had positive outcomes. This research report summarises the empirical work published in eleven Technical Papers (See Appendix D). Those interested in statistical methods or detailed findings should consult the Technical Papers because only the main findings and implications for policy and practice appear in this report.

The Aims of EPPE

EPPE explored five questions:

What is the impact of pre-school on children's intellectual and social/behavioural development?

Are some pre-schools more effective than others in promoting children's development?

What are the characteristics of an effective pre-school setting?

What is the impact of the home and childcare history on children's development?

Do the effects of pre-school continue through Key Stage 1 (ages 6 and 7 years)?

Methodology

EPPE used the following sources of information: standardised child assessments taken over time, child social/behavioural profiles completed by pre-school and primary staff, parental interviews, interviews with pre-school centre staff, quality rating scales and case study observations and interviews. The case studies included detailed documentation of naturalistic observations of staff pedagogy, and systematic structured target child observations of children's learning. Information was also gathered and analysed using interviews with parents, staff and managers and through intensive and wide ranging documentary analysis and a literature review of pedagogy in the early years.

Many sources of data have been used in statistical analyses to explore the 'value added' by pre-school after taking account of a range of child, parent and home background factors. EPPE used multi-level modelling to establish the contribution to children's development by the pre-school settings they attended. EPPE studied a range of different types of pre-schools and 3,000 children from differing social backgrounds across England. An important element in the study has been to ensure that fair comparison can be made between individual settings and types of provision. Similarly, the study has taken into account the contribution to children's development of background factors such as birth weight, gender, parental qualification/occupations and the home learning environment. The pre-school effects reported in this paper are therefore 'net' of child and family factors. Only by taking account of background influences can fair comparison be made across settings.

EPPE researchers first assessed children at three to four years old when they joined the study. Assessments were undertaken to create a profile of each child's intellectual and social/behavioural development (their attainment) using standardised instruments along with

¹ 'Integrated' settings fully combine education and care and are referred to as 'combined' centres in some EPPE Technical Papers.

reports from the pre-school worker who knew the child best. Children were assessed again at entry to school and analyses were carried out to compare children's progress, taking into account the range of background factors referred to above. Further assessments were carried out at the end of Years 1 and 2. EPPE has produced rigorous and persuasive data for policy makers and provided practical guidance on quality for practitioners.

Key findings over the pre-school period

- *Impact of attending a pre-school*

- Pre-school experience, compared to none, enhances all-round development in children.
- Duration of attendance (in months) is important; an earlier start (under age 3 years) is related to better intellectual development.
- Full time attendance led to no better gains for children than part-time provision.
- Disadvantaged children benefit significantly from good quality pre-school experiences, especially where they are with a mixture of children from different social backgrounds.
- Overall disadvantaged children tend to attend pre-school for shorter periods of time than those from more advantaged groups (around 4-6 months less).

- *Does type of pre-school matter?*

- There are significant differences between individual pre-school settings and their impact on children, some settings are more effective than others in promoting positive child outcomes.
- Good quality can be found across all types of early years settings; however quality was higher overall in settings integrating care and education and in nursery schools.

- *Effects of quality and specific 'practices' in pre-school*

- High quality pre-schooling is related to better intellectual and social/behavioural development for children.
- Settings that have staff with higher qualifications have higher quality scores and their children make more progress.
- Quality indicators include warm interactive relationships with children, having a trained teacher as manager and a good proportion of trained teachers on the staff.
- Where settings view educational and social development as complementary and equal in importance, children make better all round progress.
- Effective pedagogy includes interaction traditionally associated with the term "teaching", the provision of instructive learning environments and 'sustained shared thinking' to extend children's learning.

- *The importance of home learning*

- For all children, the quality of the home learning environment is more important for intellectual and social development than parental occupation, education or income. What parents do is more important than who parents are.

Key findings at the end of Key Stage 1

- *Lasting effects*

- The beneficial effects of pre-school remained evident throughout Key Stage 1, although some outcomes were not as strong as they had been at school entry.

- *Duration and quality*

- The number of months a child attended pre-school continued to have an effect on their progress throughout Key Stage 1, although this effect was stronger for academic skills than for social behavioural development.

-Pre-school quality was significantly related to children's scores on standardised tests of reading and mathematics at age 6. At age 7 the relationship between quality and academic attainment was somewhat weaker but still evident, and the effect of quality on social behavioural development was no longer significant. High quality pre-school provision combined with longer duration had the strongest effect on development.

- *Effective settings*

- Individual pre-schools varied in their 'effectiveness' for influencing a child's development. The advantages for a child's development of attending a particularly 'effective' pre-school centre persists up to age 7. Of course this does not mean that contemporaneous experiences at primary school have no impact on children's lives – only that the individual pre-schools attended continued to have an influence.

- *Vulnerable children*

-A small group of children continued to 'at risk' of special educational needs (2.3% of the EPPE sample had full statements), with more of the 'home' children falling into this group even after taking into account background factors.

-Multiple disadvantage continued to have a negative affect on intellectual and social development up to the end of Key Stage 1. However, the impact of English as an additional language (EAL) is much reduced at age 7, compared to the strength of the effect at age 3 and 5.

- *Home learning environment*

-The effect of home learning activities during the pre-school period continues to be evident in children's developmental profiles at the end of Key Stage 1.

What pre-school experiences make a difference in children's development?

Duration of pre-school and timing of entry

A number of factors associated with attendance at pre-school were also explored. EPPE shows that a child's duration at pre-school (measured in months) was related to their intellectual gains at school entry and again at the end of Key Stage 1. An early start at pre-school (between 2 and 3 years) was also linked with better intellectual attainment and being more sociable with other children (Peer sociability). The benefits of an early start continue to be evident at the end of Key Stage 1. There was evidence that an early start in group settings, particularly before the age of 2, led to slightly increased behaviour problems for a small group of children when they were 3 and again at 5. There was no evidence that full-day attendance led to better development than half-day attendance.

Effect on different groups of children

The research explored whether pre-school had an impact on the progress of different kinds of children. Pre-school was particularly beneficial to children who are more disadvantaged. EPPE shows that one in three children were 'at risk' of developing learning difficulties at the start of pre-school, however, this fell to one in five by the time they started school². This suggests that pre-school can be an effective intervention for the reduction of special educational needs (SEN), especially for the most disadvantaged and vulnerable children.

Different groups of children have different needs. Results suggest that specialised support in pre-schools, especially for language and pre-reading skills, can benefit children from disadvantaged backgrounds and those for whom English was an additional language. Disadvantaged children are more likely to have adverse social profiles at age 3 and at school entry. The slightly higher levels of anti-social behaviour seen in a small group of children starting pre-school before age 3, can be reduced by high quality pre-school in the period 3-5 years. Whilst not eliminating disadvantage, pre-school can help to ameliorate the effects of social disadvantage and can provide children with a better start to school. Therefore, investing in good quality pre-school provision can be seen as an effective means of achieving targets concerning social exclusion and breaking cycles of disadvantage.

It is also interesting to note that at entry to pre-school girls generally show better social development than boys, especially in co-operation/conformity and independence and concentration. Girls also show better cognitive outcomes than boys.

Quality effects

An important question for the EPPE research was whether higher quality pre-school provision makes a difference to the intellectual and social behavioural development of young children. If so, what is essential in ensuring quality? Information from observations on the quality of each setting, using standardised rating scales, showed a significant link between higher quality and better intellectual and social/behavioural outcomes at entry to school. For example, children in high quality centres showed more independence and reduced anti-social/worried behaviour by the time they enter primary school. The quality of the interactions between children and staff

² See the Early Transition and Special Education Needs (EYTSEN) Institute of Education, for more detail on SEN in the early years.

were particularly important; where staff showed warmth and were responsive to the individual needs of children, children made more progress.

Pre-school quality was significantly related to children's scores on standardised tests of reading and mathematics at age 6. At age 7 the relationship between quality and academic attainment was somewhat weaker but still evident, and the effect of quality on social/behavioural development was no longer significant. High quality pre-school provision combined with longer duration had the strongest effect on development.

Quality and staff qualifications

Quality makes a difference to children's development. There was a significant relationship between the quality of a pre-school centre and improved child outcomes. There was also a positive relationship between the qualifications of staff and ratings of quality. Children made more progress in pre-school centres where staff had higher qualifications, particularly if the manager was highly qualified. Having trained teachers working with children in pre-school settings (for a substantial proportion of time, and most importantly as the curriculum leader) had the greatest impact on quality, and was linked specifically with better outcomes in pre-reading and social development at age 5.

Balance in the curriculum

One of the rating scales used to assess quality measured four of the developmental domains in the Foundation Stage Curriculum. Centres which put particular emphasis on literacy, maths, science/environment and children's 'diversity' (catering to children of different genders, cultural backgrounds and abilities or interests) promoted better outcomes for children in their subsequent academic attainment, especially reading and mathematics at age 6. EPPE found that settings strong on the intellectual aspects of the curriculum tended to be strong on the social-emotional side as well.

Type of pre-school

Even after taking account of a child's background and prior intellectual skills, the type of pre-school a child attends has an important effect on their developmental progress. Integrated centres that fully combine education with care and have a high proportion of trained teachers, along with nursery schools, tend to promote better intellectual outcomes for children. Similarly, fully integrated settings and nursery classes tend to promote better social development even after taking account of children's backgrounds and prior social behaviour.

Good quality pre-school education can be found in all kinds of settings, however the EPPE data indicates that integrated centres and nursery school provision have the highest scores on pre-school quality, while playgroups, private day nurseries and local authority day nurseries have lower scores. The integrated centres in the EPPE sample were all registered as nursery schools but had extended their provision to include flexible hours for childcare along with substantial health and family support services.

Social mix

Disadvantaged children do better in settings with a mixture of children from different social backgrounds rather than in settings catering mostly to children from disadvantaged families. This has implications for the siting of centres in areas of social disadvantage.

The impact of the home learning environment on children's development

In addition to the child assessments and pre-school centre information, interviews were conducted with parents when their child entered the study (with follow-up questionnaires when the children were in school). These were used to collect detailed information about childcare histories, characteristics of children, their families and home environments. This wealth of information has enabled the research study to investigate some of the influences affecting young children that have a significant relationship with their later intellectual and social/behavioural development. These factors clustered around demographic influences, the home learning environment and patterns of childcare before entering the study.

What parents and carers do makes a real difference to young children's development. The EPPE project developed an index to measure the quality of the home learning environment (HLE). There are a range of activities that parents undertake with pre-school children which have a positive effect on their development. For example, reading with the child, teaching songs and nursery rhymes, painting and drawing, playing with letters and numbers, visiting the library, teaching the alphabet and numbers, taking children on visits and creating regular opportunities for them to play with their friends at home, were all associated with higher intellectual and social/behavioural scores. These activities could also be viewed as 'protective' factors in reducing the incidence of SEN because children whose parents engaged regularly in home learning activities were less likely to be at risk for special educational needs. The home learning environment was only moderately associated with parents' educational or occupational level and was more strongly associated with children's intellectual and social development than either parental education or occupation. In other words what parents do with their children is more important than who parents are. Poor mothers with few qualifications can improve their children's progress and give them a better start at school by engaging in activities at home that engage and stretch the child's mind. This EPPE finding underpins the work in programmes such as Local Sure Start and Children's Centres that target areas of high social disadvantage.

EPPE demonstrated a strong relationship between children's outcomes and parental factors but this was somewhat weaker for child social/behavioural development than for cognitive development. Research has consistently indicated that there are strong associations between certain factors related to disadvantage (such as low socio-economic status or SES, low income, mother's educational levels etc.) and children's poor intellectual attainment at school. However, few large-scale research studies have been able to explore the very wide range of background factors considered in the EPPE study, especially daily activities in the home.

The parent, family and home characteristics of children are inter-related and causal attributions cannot be made. For instance the higher incidence of lower attainment amongst children with young mothers is also likely to reflect other factors, including lower qualification levels and reduced employment levels for this group. Bearing this in mind, our findings indicate that there is a strong relationship between a child and family background characteristics at entry to pre-school but this reduces (though is still strong) by the time a child enters primary school. This indicates that pre-school, whilst not eliminating differences in social backgrounds, can help to reduce the disadvantage children experience from some social groups and can help to reduce social exclusion.

The influence of early childcare before entry to the EPPE study

Our parental interviews discussed childcare 'history' before their child entered the study. This revealed that non-parental childcare before three years of age had several effects:

High levels of 'group care' before the age of three (and particularly before the age of two) were associated with slightly higher levels of anti-social behaviour for a small group of children when assessed at age 3. This effect was largely restricted to children attending Local Authority and Private Day nurseries where substantial numbers of children attended from infancy onwards. If children with higher anti-social behaviour attended a high-quality setting between 3 and 5 years, then their anti-social behaviour decreased.

Although moderate levels of childminder care were not associated with increased anti-social behaviour, extremely high levels were. Where there was substantial care from a relative (usually grandmothers) there was less anti-social behaviour and more co-operative behaviour in children.

Revealing practice through 12 Case Studies

Through analysing the progress of children during the pre-school period, researchers identified individual settings that promoted children's developmental outcomes beyond what would be expected given the child's developmental profile at age 3 and their social background. EPPE conducted intensive case studies in 12 centres identified in the middle and upper range of effectiveness. 'Effectiveness' was based on the amount of progress children made at each centre, after controlling for pre-test and social background. The purpose of the case studies was to explore the practices that might explain why children fared so well in some of them. This has important implications for all those working directly with young children as it describes practices linked to children's developmental gains (see EPPE Technical Paper 10, Siraj-Blatchford et al, 2003).

The case studies identified six areas that are particularly important when working with children aged 3 to 5 years.

1. *The quality of adult-child verbal interactions.* More 'sustained shared thinking' was observed in settings where children made the most progress. 'Sustained shared thinking' occurs when two or more individuals 'work together' in an intellectual way to solve a problem, clarify a concept, evaluate an activity, extend a narrative etc. Both parties must contribute to the thinking and it must develop and extend the understanding. It was more likely to occur when children were interacting 1:1 with an adult or with a single peer partner and during focussed group work. In addition to sustained shared thinking, staff engaged in open-ended questioning in the settings where children made the most progress and provided formative feedback to children during activities. Adult 'modelling' skills or appropriate behaviour was often combined with sustained periods of shared thinking; open-ended questioning and modelling were also associated with better cognitive achievement.

RECOMMENDATION: Encourage episodes of 'sustained shared thinking' with the children

2. *Initiation of activities.* In effective settings, the balance of who initiated the activities, staff or child, was about equal. Similarly in effective settings the extent to which staff members extended child-initiated interactions was important. Almost half the child-initiated episodes that contained intellectual challenge included interventions from a staff member to extend the child's thinking. Freely chosen play activities often provided the best opportunities for adults to extend children's thinking. It may be that extending child-initiated play, coupled with the provision of teacher-initiated group work, are the most effective vehicles for learning. Children's cognitive outcomes appear to be directly related to the quantity and quality of the teacher/adult planned and initiated focused group work.

RECOMMENDATION: Work towards an equal balance of child and adult initiated activity.

3. *Knowledge and understanding of the curriculum.* Pre-school workers' knowledge of the particular curriculum area that is being addressed is vital. Curriculum knowledge is just as important in the early years as it is at any later stage of education

4. *Knowledge about how young children learn:* The knowledge of child development underpins sound practice but is often weak among early years staff. This gap could be reduced through initial training and continuous professional development. Staff, need a good grasp of the appropriate pedagogy for a child's understanding and interests to develop fully. There has been a long debate about the extent to which pre-school education should be formal or informal, often summarised by the extent to which the curriculum is 'play' based. EPPE concludes that in most effective centres 'play' environments were used to provide the basis of instructive learning. However, the most effective pedagogy combine both 'teaching' and providing freely chosen yet potentially instructive play activities Effective pedagogy for young children is less formal than for primary school but its curricular aims can be both academic as well as social/behavioural.

RECOMMENDATION for 3 and 4: Ensure staff have both curriculum knowledge as well as knowledge and understanding of child development. Improve the child development content of both initial and continuing professional development courses.

5. *Adult skills to support children.* Qualified staff in the most effective settings provided children with more curriculum-related activities (especially language and mathematics) and they encouraged children to engage in challenging play. The most highly qualified staff also provided the most instruction, and were the most effective in their interactions with the children, using the most sustained shared thinking. Less qualified staff were significantly better at supporting learning when they worked with qualified teachers.

RECOMMENDATION: Aim at a good proportion of trained teachers on the staff.

6. *There were more intellectual gains for children in centres that encouraged high levels of parent engagement in their children's learning.* The most effective settings shared child-related information between parents and staff, and parents were often involved in decision making about their child's learning programme. More particularly, children did better where the centre shared its *educational* aims with parents. This enabled parents to support children at home with activities or materials that complemented those experiences in the Foundation Stage.

RECOMMENDATION: Engage parents in their children's learning and share educational aims with them.

7. *The most effective settings adopted discipline/behaviour policies in which staff supported children in rationalising and talking through their conflicts.* In settings that were less effective in this respect, our observations showed that there was often no follow up on children's misbehaviour and, on many occasions, children were 'distracted' or simply told to stop.

RECOMMENDATION: Encourage behaviour policies in which staff support children's behaviour management through reasoning and talk.

The EPPE findings in the context of other research studies

The EPPE findings are similar to other research studies and this increases confidence in its conclusions.

Related studies have shown:

- Short-term, positive effects of pre-school education have been shown conclusively in the U.S., Sweden, Norway, Germany, Canada, Northern Ireland and New Zealand (See Melhuish, 2004a).
- The effects of greater staff training and qualifications have been shown in the U.S. (Peisner-Feinberg and Burchinal 1997) and in Northern Ireland (Melhuish et al. 2000).
- The contribution of quality to children's developmental progress has been shown in many studies, often using the ECERS observational scale (Melhuish 2004a and b).
- The US National Institute of Child Health and Development Study (NICHD) found that family characteristics have a greater impact on outcomes for children than pre-school factors. However, the effect of attending pre-school (versus not) on developmental progress is greater than the effect of social disadvantage. In addition, for children attending pre-school, the effect of attending a specific centre is about half that of all social background factors (NICHD, 2002).
- Early day care was found in EPPE to relate to increased cognitive outcomes better Independence and Peer Sociability at 5 years but also to increased anti-social behaviour. These findings are similar to those in the US and Northern Ireland (NICHD, 2002; Melhuish et al. 2001, 2002).
- The findings on disadvantage are mirrored elsewhere (see Melhuish, 2004a) and are the basis of policy initiatives all over the world (Young, 1996).
- EPPE is one of few studies (the only in the UK) to demonstrate the role of pre-school education as an effective means of early intervention in SEN (Sammons et al. 2002).
- EPPE is the first large-scale multi-level modelling study to show convincingly that individual pre-school centres have lasting effects on children's development.

Using research to inform policy and practice

This study has demonstrated the positive effects of high quality pre-school provision on children's intellectual and social behavioural development up to the end of Key Stage 1 in primary school. The EPPE research indicates that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children, in particular, a better start to primary school. The findings indicate pre-school has a positive impact on children's progress over and above important family influences. The quality of the pre-school setting experience as well as the quantity (more months but not necessarily more hours/day) are both influential.

The results show that individual pre-school centres vary in their effectiveness in promoting intellectual progress over the pre-school period, and indicate that better outcomes are associated with certain forms of provision. Likewise, the research points to the separate and significant influence of the home learning environment. These aspects (quality and quantity of pre-school and home learning environment) can be seen as more susceptible to change through policy and practitioner initiatives than other child or family characteristics, such as SES.

The EPPE project has become well known for its contribution to 'evidence based policy' in early years education and care. Its findings are robust because they are based on sound and innovative research methods. The implications for policy of the EPPE project have been spelled out clearly and are being discussed – and acted upon – at national and local level. EPPE set out to contribute to the debate about the education and care of young children; the EPPE mixed-method research design targeted issues that could 'make a difference' to the lives of young children and their families. The research is now extended in the continuation study, EPPE 3-11 also funded by the DfES, to find out if the effects of early education that were so evident at ages 5 and 7 continue through to the age 11. Moreover, the team are investigating the way in which educational experiences in Key Stage 2 interact with the earlier pre-school experiences in the shaping of cognitive and social/behavioural outcomes for children at the transition to secondary school.

Section One: Policy context of the EPPE Study

EPPE began in 1997, at a time when the main educational priority at national and local level was for children in statutory schooling (aged 5 – 16 years). At this time, early years policy and research were considered to be in a ‘backwater’ compared to statutory schooling. The Rumbold Report (DES, 1990) highlighted the potential for pre-school education to give children a better start at school. This was followed by the Start Right Report (Ball, 1994), in which Sylva made a convincing case for the mid- and long-term effects of early education on motivational as well as academic outcomes. By 1996 the time was ripe for a large-scale longitudinal study on the effects of pre-school on children’s developmental outcomes.

Since 1997 the UK government has been consistently committed to expanding early years services. There are two thrusts to this commitment: (a) the need to prepare all children, especially those from disadvantaged backgrounds, for the challenging National Curriculum which lies ahead, and (b) the contribution of child care to helping workless families move out of poverty and into paid employment (Inter-departmental Childcare Review, 2002). Both of these aims sit well with the social inclusion and raising standards agenda.

The 2002 Inter-departmental Review promised that ‘the way in which policy is made and services are delivered will be transformed.... through joining up (Early Childhood) services and merging the relevant services within central government’ (p.4). But will these policies ‘work’? The EPPE study was cited prominently in the review as evidence for optimism: ‘There is strong evidence that certain types of early years education and childcare can play an important role in raising cognitive and social/behavioural outcomes and thereby increase the ability to learn’ (p.30). Moreover, the advantage of integrating child-care and education was supported by the EPPE findings on child impact and is one justification for the new move towards Children’s Centres¹.

This report describes the longitudinal research on effective pre-school provision funded by the UK Department for Education and Skills (DfES) over a six-year period. Further details appear in a series of Technical Paper (see Appendix D). The background and design is described in depth in Technical Paper 1 (Sylva, Sammons, Melhuish, Siraj-Blatchford & Taggart, 1999).

There are many initiatives in different countries intended to improve educational outcomes for young children. Will these initiatives meet the ambitious aims of policy makers? Will they enable children to enter school ‘more ready’ to learn, or achieve more at the end of primary schooling? Which are the most effective ways to educate young children? The research project described in this report is part of the government’s emphasis on ensuring ‘a good start’ for children through basing policy and practice on rigorous research evidence.

¹ The Children’s Centre programme is an innovative Government initiative to develop centres, which combine a range of services for children ‘under one roof’. They combine a core service delivering health, family support and outreach work linked with a Children’s Information Service.

Section Two: Previous Research on the Effectiveness of Pre-School Education and Care.

The vast majority of longitudinal research on early education has been carried out in the U.S. Two of the studies cited most often are the Abecedarian Project and the Perry Pre-school Programme (Ramey & Ramey, 1998; Schweinhart and Weikart, 1997). Both used randomised control trial methods to demonstrate the lasting effects of high quality early intervention. These landmark studies, begun in the 1970s, have been followed by further small scale 'experiments' (see the Early Headstart, Love et al., 2001) and larger cohort studies (See Brooks-Gunn, 2003; Melhuish, 2004a, for reviews). This huge body of literature points to the many positive effects of centre-based care and education.

Attention has turned away from establishing the simple effects of early education and *towards* an understanding of the familial and educational processes that underlie change in the developmental trajectories of young children. Brooks-Gunn (ibid) shows how poverty, low education and low socio-economic status work together to create a home environment of low hope, low expectations and few of the kinds of parenting interactions that stimulate young minds. It is important for current research into the effects of early education to take into account aspects of the child's home environment; children's outcomes are the joint product of home and pre-school and any research on the effects of early education will have to take into account influences from the home. This was a major element of the EPPE research.

There has been little large-scale, systematic research on the effects of early childhood education in the UK. The 'Start Right' Enquiry (Ball 1994; Sylva 1994) reviewed the evidence of British research and concluded that small-scale studies suggested a positive impact but that large-scale research was inconclusive. The Start Right enquiry recommended more rigorous longitudinal studies with baseline measures so that the 'value added' to children's development by pre-school education could be established. EPPE has responded to this with a 'value added' design.

Feinstein, Robertson & Symons (1998) attempted to evaluate the effects of pre-schooling on children's subsequent progress, but birth cohort designs may not be appropriate for the study of the influence of pre-school education. The absence of data about children's attainments at entry to pre-school means that neither the British Birth Cohort Study (Butler, 1980) nor the National Child Development Study (Davie, 1972) can be used to explore the effects of pre-school education on children's progress. These studies are also limited by the time lapse and many changes in the nature of pre-school provision that have occurred. Before EPPE no research using multilevel models (Goldstein, 1987) had been used to investigate the impact of both type of provision **and** individual centre effects. Thus little research in the UK had explored whether some forms of provision have greater benefits than others. Schagen (1994) attempted multilevel modelling of pre-school effects in large samples but did not have adequate control at entry to pre-school.

In the UK there is a long tradition of variation in pre-school provision both between types (e.g. playgroup, local authority, private nursery or nursery classes) and in different parts of the country reflecting Local Authority funding and geographical conditions (i.e. urban/rural and local access to centres). A series of reports (House of Commons Select Committee 1989; DES Rumbold Report, 1990; Ball, 1994) have questioned whether Britain's pre-school education is as effective as it might be and have urged better co-ordination of services and research into the impact of different forms of provision (Siraj-Blatchford, 1995). The EPPE project is thus the first large-scale British study on the effects of different kinds of pre-school provision and the impact of attendance at individual centres. In line with the recent American research, EPPE studied both the effects of pre-school experience and also the effects of family support for children's learning at home. To understand children's developmental trajectories it is necessary to take both into account.

Four issues are of particular relevance to policy:

- 1 Do early effects 'fade' over time?
- 2 Do the beneficial effects of early education pertain across diverse sectors of the population?
- 3 Do different types of pre-school education have the same effects on children?
- 4 Are the effects of pre-school mediated by changes brought about in parents or are they due to enhanced cognitive profiles at the very start of school?

EPPE contributes to all of these questions although its extension study; Effective Pre-School and Primary Education 3-11 (EPPE 3-11, 2003 - 2008) will answer the first more securely. The EPPE 3-11 will be able to answer questions relating to mechanisms for lasting change: is it increased family participation/expectation that underlies the effects of early education or is it the enhanced profile of competence which children show when they start out at school? The report cannot answer questions about mechanism but EPPE was designed to collect the kind of data that would enable the researchers to answer questions later on about mechanisms of change.

Section Three: Design of Study

There are two major ways to establish the effects of early education and care on children; randomised controlled trials such as the Perry Pre-school Project and educational effectiveness designs such as EPPE. Although the former has been admired for decades for its internal validity, the EPPE team opted for a value added, longitudinal cohort study because of its generalisability across regions in the country, across social class and home language, and its capacity to describe the effects of a range of Early Years provision, e.g., ordinary playgroups, nurseries and rapidly expanding integrated centres. The team based their research design on the British tradition of 'school effectiveness' studies (Sammons, 1996) that took as their central question -

What is the contribution of Pre-school/School X to the development of children who attend it (after taking into account familial and other background factors)?

An answer to this question requires assessment of the development of children followed between the ages of 3 and 7 years and statistical control for background influences. Initially 114 centres from four types of provision were selected for the study, but in September 1998 an extension to the main study was implemented to include nursery schools and the UK's newest and most innovative forms of provision; 'integrated centres' (centres that combined education and care). Approximately 3,000 children were recruited overall to the study over the period January 1997 to April 1999 from 141 pre-school centres.

The EPPE project was designed to study three issues that have important implications for policy and practice:

- the effects of sessional pre-school education and care on children in the age range 3 – 5;
- the 'structural' (e.g. staffing profiles) and 'process' characteristics (e.g. interaction styles) of more effective pre-school centres; and
- the contribution of child and family characteristics to children's development.

The educational effectiveness design enabled the research team to investigate the progress and development of individual children (including the impact of personal, socio-economic and family characteristics), and the effect of individual pre-school centres on children's outcomes at both entry to school (aged 4+) and at the end of Key Stage 1 (age 7+). Such research designs are well suited to social and educational research with an institutional focus (Paterson & Goldstein, 1991). The growing field of school effectiveness research has developed an appropriate methodology for the separation of intake and school influences on children's progress using so called 'value added' multilevel models (Goldstein, 1987 1995). Prior to the EPPE study such techniques had not been applied to the pre-school sector, although examples of value added research for younger ages have been provided (Tymms et al., 1997; Sammons & Smees 1998; Jesson et al., 1997; Strand, 1997; and Yang & Goldstein, 1997) at the time when EPPE was being designed.

School effectiveness research during the 1970s and 1980s addressed the question "*Does the particular school attended by a child make a difference?*" (Mortimore et al., 1988; Tizard et al., 1988). The question of internal variations in effectiveness, teacher/class level variations and stability in effects of particular schools over time assumed importance during the 1990s (e.g. Luyten 1994; 1995; Hill & Rowe 1996; Sammons 1996). This is the first research to examine the impact of individual pre-school centres using multilevel approaches. The EPPE project is designed to examine both the impact of type of pre-school provision as well as allow the identification of particular pre-school characteristics that have longer-term effects. It is also designed to establish whether there are differences in the effects of individual pre-school centres on children's progress and development. In addition, the project explores the impact of pre-school provision for different groups of children and the extent to which pre-schools are effective in promoting different kinds of outcomes (cognitive and social/behavioural).

The 8 aims of the EPPE Project

- To produce a detailed description of the 'career paths' of a large sample of children and their families between entry into pre-school education and completion (or near completion) of Key Stage 1.
- To compare and contrast the developmental progress of 3,000+ children from a wide range of social and cultural backgrounds who had differing pre-school experiences.
- To separate out the effects of pre-school experience from the effects of primary schooling.
- To establish whether some pre-school centres are more effective than others in promoting children's cognitive and social/behavioural development.
- To identify the individual characteristics (structural and process) of pre-school education in those centres found to be most effective.
- To investigate differences in the progress of different groups of children, e.g. children who do not have English as their first language, children from disadvantaged backgrounds and both genders.
- To investigate the medium-term effects of pre-school education on educational performance at Key Stage 1 in a way which will allow the possibility of longitudinal follow-up at later ages to establish long-term effects, if any.
- To investigate the role of pre-school provision in combating social disadvantage and exclusion.

The sample: regions, centres and children

In order to maximise the likelihood of identifying the effects of individual centres and also the effects of various types of provision, the EPPE sample was stratified by type of centre and geographical location.

- Six English Local Authorities (LAs) in five regions were chosen strategically to participate in the research. These were selected to cover provision in urban, suburban and rural areas and a range of ethnic diversity and social disadvantage. (The parallel study in Northern Ireland [Melhuish et al., 2000a], enables comparison of findings across different geographical contexts).
- Six main types of provision are included in the study (the most common forms of group/sessional provision) playgroups, local authority or voluntary day nurseries, private day nurseries, nursery schools, nursery classes, and integrated centres (that combine care and education). Centres were selected randomly within each type of provision in each authority.

In order to enable comparison of centre and type of provision effects the project was designed to recruit 500 children, approximately 20 in each of 20-25 centres, from the six types of provision, thus giving a total sample of approximately 2800 children and 141 centres. Within each LA, centres of each type were selected by stratified random sampling and, due to the small size of some centres in the project (e.g. rural playgroups), more of these centres were recruited than originally proposed, bringing the sample total to 141 centres and over 2800 children. More than 300 children with no or minimal pre-school (i.e. sessional) attendance were recruited in the same reception class as the EPPE children (at school entry). These children are referred to as the 'home' children throughout this report. This brought the sample to 3,171. It proved difficult to recruit home children due to the increased provision and take-up of pre-school places during the period of the research. The 'home' group were especially disadvantaged, making statistical control even more important when comparing their progress to children who attended pre-school.

Children and their families were randomly selected in each centre for the research. All parents gave signed consent and participated in a detailed interview when their children were enrolled in the study. This was followed up with questionnaires/interviews once the children were in school. The 'home' group were recruited from the reception classes that EPPE children entered.

Details about length of sessions, number of sessions normally attended per week and child attendance were collected to enable the amount of pre-school education experienced to be quantified for each child. Two complicating factors are that a substantial proportion of children moved from one form of pre-school provision to another (e.g. from playgroup to nursery class) and some attended more than one centre in a week. Careful records are necessary in order to examine issues of stability and continuity, and to document the range of pre-school experiences to which individual children were exposed.

Child assessments

At (or just after) their third birthday (mean age was 3 years 3 months), each child was assessed by a researcher on four cognitive tasks: verbal comprehension, naming vocabulary, knowledge of similarities seen in pictures (non-verbal comprehension), and block building (spatial awareness). A profile of each child's social and emotional adjustment was completed by the pre-school educator who knew the child best. If the child changed pre-school before school entry, s/he was assessed again. At school entry, a similar cognitive battery was administered along with knowledge of the alphabet, rhyme/alliteration and early number concepts (for details of the assessments see EPPE Technical Paper 1). The teacher who knew the child best completed the social/behavioural profile.

Further assessments were made at exit from Reception (for only half the sample to reduce the costs) and at the end of Years 1 and 2 (for the whole sample). In addition to standardised tests of reading and mathematics, information on National Assessments were collected along with attendance data and information on a child's special needs status. At age 7, children were invited to complete a questionnaire about themselves, their attitudes to school and themselves as learners.

Measuring child/family characteristics known to have an impact on children's development

- 1) Information on individual 'child factors' such as birth weight, gender, language, birth order, health and development problems was collected at parent interview.
- 2) Family factors were also investigated. Parent interviews provided detailed information about parent education, occupation and employment, family structure etc. In addition, details about parental attitudes and involvement in educational activities in the home (e.g. reading to child, teaching nursery rhymes, television viewing etc.) were collected and analysed.
- 3) A child's care history (who looked after them, at what age & for how long) before the age of 3 years was recorded during the parent interview.

Pre-school Characteristics and Processes

EPPE Regional Researchers liaised in each authority with an LA Regional Coordinator, a senior local authority officer with responsibility for Early Years who arranged 'introductions' to centres and key staff. The Regional Researchers conducted extensive interviews with the centre managers that included information on child/staff ratio, staff training, aims, policies, curriculum, parental involvement, etc.

'Process' characteristics such as the day-to-day functioning within settings (e.g. child-staff interaction, child-child interaction, and structuring of children's activities) were also studied. The Early Childhood Environment Rating Scale (ECERS-R Harms, Clifford & Cryer, 1998) and the Caregiver Interaction Scale (Arnett, 1989) were also administered. The ECERS-R included the following sub-scales:

- Space and furnishings
- Personal care routines
- Language reasoning
- Activities
- Interaction
- Programme structure
- Parents and staffing

The Caregiver Interaction Scale (CIS) assessed: positive relationships, permissiveness, detachment and punitiveness of the main pre-school worker. In order that the more educational aspects of English centres could be assessed, EPPE researchers developed four additional ECERS sub-scales; ECERS-Extension (Sylva, Siraj-Blatchford and Taggart, 2003) describing educational provision in terms of: Language, Mathematics, Science and the Environment, and Diversity.

Setting the centres in context

At interview centre managers were asked about their links to local authority policy and training initiatives and services. Senior local authority officers from both Education and Social Services were also interviewed to find out how each local authority implemented Government early years policy, especially the Early Years Development Plans that were established to promote education and care partnerships across different kinds of providers (Siraj-Blatchford et al, 1999).

Case Studies

In addition to the range of quantitative data collected about children, their families and their pre-school centres, detailed qualitative data was collected using case studies of a range of settings ('good' to 'effective') chosen retrospectively on the basis of the multilevel analyses of intake and outcome measures over the pre-school period. This added the fine-grained detail about how processes within centres articulate, establish and maintain good practice (Siraj-Blatchford et al, 2003).

The methodology of the EPPE project is thus mixed (combining both qualitative and quantitative data). These detailed case studies used a variety of methods of data gathering, including documentary analysis, interviews and observations to illuminate the characteristics of more successful pre-school centres and assist in the generation of guidance on good practice. Particular attention was paid to parent involvement, teaching and learning processes, child-adult interaction and social factors in learning. Inevitably there are difficulties associated with the retrospective study of process characteristics of centres identified as more or less effective after children in the EPPE sample have transferred to school, field notes and pre-school centre histories were conducted to establish the extent of change during the study period. Only settings whose ECERS-E scores had not changed in the last 2 years were selected as case studies.

Analytic Strategy

The EPPE research was designed to enable the linking of three main sets of data: (1) information about children's attainment and development (at different points in time), (2) information about children's personal, social and family characteristics (e.g. age, gender, socio-economic status [SES] etc), and (3) information about pre-school experience (type of centre and its characteristics).

Identifying individual centre effects and type of provision at entry to school

Longitudinal research is essential to enable the impact of child characteristics (personal, social and family) to be disentangled from any influence related to the particular pre-school centre attended. Multilevel models investigate the clustered nature of the child sample, children being nested within centres and centres within regions. The first phase of the analysis adopted these levels in models that attempt to identify any pre-school centre effects at entry to reception class.

Given the disparate nature of children's pre-school experience it was vital to ensure that the influences of age at assessment, amount and length of pre-school experience and pre-school

attendance record are accounted for when estimating the effects of pre-school education. This information is also important in its own right to provide a detailed description of the range of pre-school provision experienced by different children and any differences in the patterns of provision used by specific groups of children/parents and their relationship to parents' labour market participation. Predictor variables for attainment at entry to reception included prior attainment (verbal and non-verbal sub scales), social/emotional profiles, and child characteristics (personal, social and family). The EPPE multilevel analyses incorporated adjustment for measurement error and examined differences in the performance of different groups of children at entry to pre-school and again at entry to reception classes. The extent to which differences in the attainment of particular groups (e.g. disadvantaged children or those with English as an Additional Language [EAL]) increased/decreased over this period was fully explored, enabling equity issues to be addressed.

After controlling for intake differences, the estimated impact of individual pre-school centres was used to select 12 'outlier' centres from the 141 in the project for detailed case studies. 'Outlier' centres were those in which children made more developmental progress than would be expected by their social background or the developmental profiles at entry to the study. In addition, multilevel models tested the relationship between particular process quality characteristics of centres and children's cognitive and social/behavioural outcomes at the end of the pre-school period (entry to school). The extent to which it is possible to explain (statistically) variation in children's scores on outcome measures assessed at entry to school, provides evidence about which particular forms of provision have greater benefits for children. Multilevel analyses tested the impact of measures of pre-school processes, such as the scores on various ECERS scales and structural characteristics such as type. This provides evidence as to which family or educational variables are associated with better cognitive and social/behavioural outcomes in children.

Identifying continuing effects of pre-school centres at KS1

The follow up of the pre-school and home sample across Key Stage 1 has been used to explore any continuing pre-school influences on attainment and social/behavioural outcomes measured in Year 1 and Year 2. The Year 1 analyses adopted standardised reading and mathematics assessments, while the Year 2 collected national assessment data. The results examined the evidence of continuing impact of pre-school process characteristics such as quality, duration, effectiveness and type.

The Linked Study in Northern Ireland 1998-2003

The Effective Pre-school Provision in Northern Ireland (EPPNI) is linked to EPPE and is under the directorship of Professor Edward Melhuish, Professor Kathy Sylva, Professor Pam Sammons and Professor Iram Siraj-Blatchford. The study explored the characteristics of different kinds of early years provision and examines children's development in pre-school, and influences on their later adjustment and progress at primary school up to age 7 years. It has identified the aspects of pre-school provision that have a positive impact on children's attainment, progress, and development, and so provides guidance on good practice. The research involved 70 pre-school centres randomly selected throughout Northern Ireland. The study investigated all main types of pre-school provision attended by 3 to 4 year olds in Northern Ireland: playgroups, day nurseries, nursery classes, nursery schools and reception groups and classes. The data from England and Northern Ireland offer opportunities for useful comparisons. The Northern Ireland Study is described more fully in Appendix A.

Summary

Both qualitative and quantitative methods, including multilevel modelling, have been used to explore the effects of individual pre-school centres on children's attainment and social/behavioural development at entry to school, and any continuing effects on such outcomes at the end of Key Stage 1 (age 7). In addition to centre effects, the study investigates the contribution to children's development of individual and family characteristics such as gender, ethnicity, language, parental education/employment and learning activities in the home. A parallel study was carried out in Northern Ireland (Melhuish et al., 2002).

This "educational effectiveness" design of the EPPE study demonstrated the complex effects of amount and type of pre-school provision (including attendance) experienced by children after taking into account their personal, social and family characteristics. Assessments of both cognitive and social/behavioural outcomes were made. The use of multilevel models for the analysis enabled the impact of both type of provision and individual centres on children's pre-school outcomes (at age 5 and later at age 7) to be investigated. Moreover, the detailed relationships between pre-school characteristics and children's development were explored. The results of these analyses and the findings from the qualitative case studies of selected centres have informed both policy and practice. A series of 12 Technical Papers are available (see Appendix D) and these report the findings of the EPPE research in more depth.

The continuation study 'Effective Pre-school and Primary Education 3-11', which commenced in 2003 is described in Appendix C.

Section Four: What Were the Children and Families Like at the Beginning of the Study?

In order to understand the possible effects of pre-school experience upon children's development, it is essential to take account of pre-existing differences between children at the start of the pre-school period. Hence information on the characteristics of the parents, families, and children was collected by parental interview at the start of the study. This information included data on parents labour market participation, socio-economic characteristics, qualifications, marital status and age as well as the family's composition, ethnicity and language, the child's health, development and behaviour, the child's activities in the home, the use of pre-school provision and childcare history.

The sample's socio-economic characteristics were compared to those of a recent national sample of parents of similar age children and the EPPE sample was found to be somewhat over-represented at the lower end of the socio-economic spectrum. This was anticipated because the project sampled from Local Authorities that were chosen to maintain a reasonable representation of social disadvantage.

While the EPPE sample was not designed to be wholly representative of the population of the UK, it is useful to know the relationship between the sample and the wider population. Towards the beginning of the research, a nationally representative sample of parents with a pre-school child was surveyed for the DfES (Prior et al, 1999). Using this survey as the basis for statistics on a national sample, it is possible to compare the EPPE sample with a national sample of parents of 3-4 year old children. Table 4.1 shows this comparison for educational qualifications of the mother. Similar comparisons for other socio-economic variables show a similar pattern.

The national sample by Prior (ibid) is drawn from all parents of 3-4 year old children, regardless of whether their child attends a pre-school centre. The EPPE sample is specifically drawn from users of six types of pre-school centre; nursery classes, playgroups, private day nurseries, local authority day nurseries, nursery schools and integrated centres as well as a 'home' group with no pre-school centre experience.

Comparing the EPPE sample with the UK population

Table 4.1 Educational qualifications of mother: EPPE versus national sample.

Qualification	EPPE Sample%	National Sample %
Degree or higher	16.9	12.9
HND, 18+ vocational	13.4	12.1
A level	8.4	12.7
O level	37.0	44.1
Less than O level	23.4	16.2
Other miscellaneous	0.9	1.9

The EPPE sample is over-represented (as compared with a national sample) at the bottom end of the socio-economic spectrum with some over-representation at the top end of the spectrum. This was done for two reasons: (a) to provide sufficiently large numbers of disadvantaged/ethnic minority children for robust findings related to them, and (b) to lead to a representative sample at age 7 after (anticipated) selective attrition in more disadvantaged groups.

How do groups within the sample compare?

The characteristics of the different types of pre-school group were closely related to parental socio-economic and educational status. The relative advantage of the different groups in the study can be illustrated by considering mothers' educational qualifications, which shows a similar pattern across groups as other socio-economic indicators. The classification of mother's educational qualifications by pre-school types within the EPPE sample is shown in table 4.2

Table 4.2 Educational qualifications of mother by pre-school type (% within each pre-school type).

Education Qualifications	Pre-school groups						
	Nursery class	Playgroup	Private Day nursery	LA day nursery	Nursery school	Integrated centre	'Home' group
Degree or higher	12.9	10.9	36.9	18.3	14.6	16.5	3.9
HND, 18+ Vocational	11.8	14.1	9.9	16.6	16.8	18.2	6.6
A level	6.4	8.2	13.8	6.8	8.9	11.4	3.5
GCSE	43.5	46.3	31.2	27.6	40.1	27.8	27.1
Less than GCSE	23.6	19.7	6.5	29.8	19.4	26.1	58.1

Clearly the relative advantage of the private day nursery group is apparent from the high percentage of mothers with a degree or higher qualification. Conversely the relative disadvantage of the 'home' group is also very clear with most mothers in this group having less than a GCSE qualification. The differences between the other four groups are not so great. Similar patterns are reflected in other educational and socio-economic variables.

Consideration was given to whether type of pre-school centre differences reflect socio-economic status or whether the differences between the users of different types of pre-school centre go beyond differences in socio-economic status.

Parental characteristics of level of employment, marital status, parental age and qualifications all varied with socio-economic classification and the variation by type of pre-school centre reflected this variation. In addition to variation linked to socio-economic status, maternal levels of paid employment were also linked to type of pre-school centre and amount of previous childcare used. Both maternal employment and previous childcare use were highest for the private day nurseries and Local Authority day nurseries.

When the child's health, development and behaviour were considered, to a large extent, a similar pattern emerged of type of pre-school differences following the pattern of socio-economic differences. Recent health and potentially disruptive life events for children appeared to be related neither to social class nor type of pre-school centre.

Children's activities in the home were considered in terms of educational activities, TV and video watching, and rules concerning TV and bedtime. Home learning activities were only weakly associated with mother's educational level and family SES. Rules regarding TV and bedtime, however, did not show a consistent relationship with social background.

Parents use of and involvement with pre-school centres, demonstrated relationships with socio-economic differences. For example, parents from higher socio-economic groups were more likely to visit centres and more likely to attend meetings with staff and to be involved in policy discussions. Parents from higher socio-economic groups were also more likely to express concern with the atmosphere and educational activities in their choice of pre-school centre. However, there were a number of differences that were related to type of pre-school centre rather than deriving from parental socio-economic differences. These included:

- the age of starting which was lower for both private day nurseries and local authority day nurseries
- the number of sessions attended which showed a different pattern for each type of pre-school centre
- a relationship between maternal level of paid employment was found for those using private day nurseries and local authority day nurseries but not for nursery classes or playgroups
- also visits by parents were more likely in playgroups than other types of pre-school centre. For playgroups, visits by parents included spending time with children and fundraising activities more often than for the other types of pre-school centre.

The childcare histories of the children revealed enormous diversity across the whole sample and for children within each type of pre-school centre. Overall, children using private day nurseries and Local Authority day nurseries had more than twice as much non-parental care as those in the nursery classes and playgroups, often related to higher maternal employment. Children who started pre-school earlier and attended for more sessions and hours per week largely accounted for this difference. There was also a strong association between level of maternal paid employment and previous childcare use. Those mothers who were employed for longer hours had a history of using greater amounts of childcare. The socio-economic differences in childcare histories largely reflect the differential use of types of pre-school centre and differential levels of maternal paid employment by the different socio-economic groups

What background variables are related to child development at the start of the study?

Children's personal, social and family characteristics can influence their progress and development. As a consequence it is essential to establish the extent to which the background characteristics of children attending different centres and types of pre-school provision vary. Only in this way is it possible to identify any possible pre-school effects on children's later educational outcomes. When the children entered the EPPE study they were assessed on cognitive and social/behavioural development. These data, together with data from the parental interview, were used to investigate social/behavioural and cognitive development at 3-4 years in relation to a range of parental, family, child, home and childcare factors. The analysis provides information about associations between variables and should not be automatically interpreted in terms of causality. It is possible that unmeasured factors are producing the effects found. The explanation of cognitive development provided by the analyses presented here is strong (i.e., it explains a large amount of variance in children's scores) whereas the explanation of social/behavioural development leaves much of the variation between children unexplained. This may be explained in part by the fact that the social-behavioural measures were completed by more than 200 practitioners using a coarse rating scale; the cognitive and linguistic measures were administered 1:1 by a small team of highly trained researchers conforming to standardised testing procedures. It seems likely that variation in the sophistication and reliability of measurement available for the two aspects of development led to the cognitive analyses being stronger. The findings can be summarised as follows:

Parents:

- Socio-economic status showed effects upon both cognitive attainment and also cooperation/conformity and confidence. For these variables the children of professional parents were rated more highly than other children.
- Mother's age had a small effect upon the amount of anti-social behaviour. Children with very young mothers tended to be rated higher for anti-social behaviour than other children.
- For cognitive development, a two-parent family, higher socio-economic status and mother's qualifications were all significantly related to higher outcomes.

Family:

- If English was not the child's first language, this was associated with lower co-operation/conformity, and lower cognitive development scores.
- Family size was found to be significant. 'Singleton' children were rated higher on anti-social behaviour than children with siblings. Children with one or two siblings scored higher on co-operation/conformity. Children with three or more siblings scored lower on peer sociability and confidence. For social/behavioural development, having one or two siblings but not more, was most advantageous.
- Children with three or more siblings scored lower on cognitive development. It could be argued that in larger families, parents may give less attention to individual children. This decreased individual attention from parents may be the reason for the effects on cognitive development. Single children (singletons) showed no difference to those with 2 or 3 siblings in terms of cognitive development.

Child:

- Gender had several significant effects. Girls showed more co-operation/conformity, peer sociability and confidence. Girls also had higher cognitive development scores. These results suggest that pre-school gender differences are precursors of later gender differences often found in school.
- Aspects of health had some slight effects in that, children with more perinatal health problems (first two months) had lower cooperation/conformity. Also children with low birth weights had lower cognitive development scores. Where children had previous developmental problems (e.g. speech problems, late to walk), they were more likely to have lower cognitive development scores. They also had lower cooperation/conformity, peer sociability and confidence. These may reflect a general developmental delay in children with health related problems.
- Where children had previous behaviour problems reported by the parent, they had lower cooperation/conformity, peer sociability and confidence, and increased anti-social behaviour reported by their pre-school carers. This indicates that early behaviour problems observed at home continue into the pre-school setting.
- The effects on cognitive development of belonging to a particular ethnic group are primarily mediated by language. Several ethnic groups showed lower cognitive scores than the White UK group. These were White European, Black African, Pakistani, Bangladeshi, 'Other' and Mixed Heritage. However, an analysis of non-verbal scores showed no effects for whether English was a first language and all ethnic group effects except one disappeared. Those children of Bangladeshi heritage had lower non-verbal scores than children of White UK heritage, but the size of this effect was considerably smaller than when verbal scores were included.
- It is possible that language or communication difficulties may mediate ethnic effects on the social/behavioural measures in that these depend upon ratings of children made by pre-school staff. There were some ethnic group differences associated with anti-social and worried/upset behaviour. Black Caribbean, Black African and Mixed Heritage children were reported as showing more anti-social behaviour than White UK children. Black Caribbean children were rated as showing more worried/upset behaviours and White European children as showing less than White UK children. However these ethnic group effects on social/behavioural development occurred in weak regression models and should be interpreted with caution.

Home:

- Those children who had more experience of playing with friends outside of the home showed higher peer sociability and confidence.
- The variable, whether the child had a regular bedtime, could be regarded as a marker for the degree of structure in the child's home life. This variable was associated with increased co-operation/conformity and higher cognitive development scores.
- Higher home learning environment scores were associated with increased co-operation/conformity, peer sociability and confidence, lower anti-social and worried/upset behaviour and higher cognitive development scores. The effect on cognitive development was particularly pronounced. After age, **it was the variable with the strongest effect on cognitive development**. Its effect was stronger than both social class and parental education, which have often been found to be amongst the strongest predictors of children's cognitive development in previous studies.
- The importance of the home learning environment indicates that what parents do is more important than who parents are.

Childcare History:

- Being cared for by a relative e.g. usually a grandmother before entering the study showed modest effects but was associated with higher co-operation/conformity and less anti-social behaviour compared to children not cared for by a relative.
- Being cared for in a group of children outside the home (e.g. nurseries) before entering the study at age 3 was slightly associated with increased anti-social behaviour and had a important significant association with higher cognitive development scores.
- Children who started at their pre-school centre before 3 years of age showed better cognitive scores. This effect was apparent for children starting as young as 2 years of age. However, when children started below 2 years of age there was no additional effect of the time before 2 years of age.
- Where children had intensive group care before 2 years of age there was a small but significant increase in the likelihood of showing anti-social behaviour. This effect primarily applies to children who attended private day nurseries and local authority day nurseries.

Section Five: The Pre-School Settings: Context and Quality.

The EPPE research was designed to enable the linking of three sets of data: (1) information about children's attainment and development (at different points in time), (2) information about parents and the home, and (3) information about pre-school experience (type of centre and its characteristics). This section focuses on the 141 settings and the local contexts in which they operated.

Table 5.1 Pre-school types

The table below shows the recruitment from different types of pre-school provision.

Type	Number	Number of children recruited
Nursery classes	25	590
Playgroups	34	610
Private day nurseries	31	520
Nursery schools	20	520
Local Authority day care	24	430
Integrated centres	7	190
Home		310

The low number of integrated centres reflects their rarity at the time the study started. Information about the pre-school centres was collected through two methods. Interviews were conducted with all centre managers and in addition we interviewed 12 Local Authority coordinators in order to provide a context to the pattern of provision being studied in EPPE, in terms of the impact of government initiatives. Also systematic observations, supplemented by interviews were used to provide profiles of the experience and activities provided by the pre-school centres to the children in their care.

Observational Profiles of Centres

There have been studies in many countries on the relationship between the quality of pre-school provision and children's developmental outcomes (see Melhuish, 2004a,b). Loeb, Fuller, Kagan and Carrol (2004) studied the relationship between the quality of caregivers' interactions (as measured on the Arnett Scale) with children and developmental outcomes in the children they served. In a sample of disadvantaged children, they found that children had greater reading readiness and fewer social problems when the Arnett scores for staff sensitivity were higher. Similarly the Cost Quality and Outcomes Team (Peisner-Feinberg et al, 1999) found quality effects: higher quality measured on the Early Childhood Environment Rating Scale (ECERS-R, Harms et al 1998) was associated with better language attainment at the end of Year 1, after controlling for background factors. Another relevant research study was carried out by Phillips et al. (2000) on variation in quality across different states in the U.S. They found that differences in state legislation were associated with differences in quality. This important study shows how closely quality is linked to legislation (Porter, T. et al., 2002).

The EPPE project created a 'centre profile' for each centre through systematic observation and questions to staff. The Early Childhood Environment Rating Scale: Revised (ECERS-R) was used in drawing up each centre's profile along with an extension to it: ECERS-Extension (Sylva et al., 2003) based upon the curriculum guidelines for young children in common use at the time (QCA/DfEE Desirable Learning Outcomes 1996). The ECERS-R rating scale consisted of seven sub-scales covering aspects of the setting from furnishings to individuality of care and the quality of social interactions. The ECERS-E describes the curriculum within the pre-school, including areas such as mathematics and literacy. Each sub-scale is comprised of a range of items describing 'quality' of the specific type of provision. Each item was rated 1 (inadequate) to 7 (excellent). For more information on the quality rating scales see the Technical Paper 6 and 6a by Sylva et al. (1999).

This section describes the characteristics of the 141 centres attended by 3 and 4 year-old children in the EPPE sample. Averaged scores across the 141 centres in the sample approached 'good' on the ECERS-R but the curricular profile developed for England (ECERS-E) showed that the learning opportunities in maths and science were often limited and even inadequate. However, overall scores on the ECERS suggest that the quality of much provision in England is similar to that in other industrialised countries.

Centres within the educational maintained/state sector (nursery schools, nursery classes and integrated centres) generally had higher scores than those in the voluntary or private sectors. State sector educational provision was in the 'good'-to-'excellent' range followed by local authority social services day-care. Private day nurseries were consistently found to have scores in the 'minimal/adequate' range while playgroups had lower scores. These differences in quality are similar to those found by the UK's Office for Standards in Education (OfSTED) reports on variation in the quality of pre-school provision (OfSTED, 1999) and to a recent study using ECERS on 44 pre-school centres in London by Lera, Owen and Moss (1996).

This large sample of pre-school centres from different regions in England shows great variation in the curriculum and care on offer, the pedagogical strategies seen in interactions between children and staff, and in the resources available for children's play and learning. Comparisons between types suggest that an adult child ratio of 1:8 as found in the private and voluntary sector do not guarantee high standards by themselves and that ratios of 1:13 in the LEA sector are not associated with low quality. However, the issue of ratio is inevitably confounded with type of pre-school and other variation associated with type, e.g. qualifications of staff.

Although centres offering full day-care generally had lower ratings than those on a sessional basis, the LEA nursery schools which had changed from 'education only' to 'integrated' centres (offering full day care and parental support) usually scored highest of all. Furthermore, adding 'education' to more traditional local authority day care settings through the addition of just one teacher or a peripatetic teacher was not associated with higher quality. EPPE found that settings integrating care and education had high scores only when there was a good balance between 'care' and 'education' in terms of staff qualifications. This implies that the successful integration of care and education is related to the proportion of staff with 'educational' qualifications.

Details of the Early Childhood Environmental Rating Scales

One of the most widely used observational measures for describing the characteristics of early childhood education and care is the Early Childhood Environment Rating Scale (ECERS-R; Harms, Clifford & Cryer, 1998). The revised ECERS-R has 43 items that are divided into 7 sub-scales. These sub-scales are space and furnishing, personal care routines, language and reasoning, activities, social interactions, organisation and routines, and adults working together. Each item is rated on a 7-point scale (1 = inadequate, 3 = minimal/adequate, 5 = good, 7 = excellent). Completion of the ECERS usually involves approximately one day of observation, as well as talking to the staff about aspects of the routine that were not visible during observation (for example, weekly swimming or seasonal outings). The word 'environment' in the rating scale is taken in its broadest sense to include social interactions, pedagogical strategies and relationships between children as well as adults and children. Matters of pedagogy are very much to the fore in ECERS-R. For example the sub-scale Organisation and Routine has an item 'Schedule' that gives high ratings to a balance between adult-initiated and child-initiated activities. In order to score a 5 the centre must have 'a balance between structure and flexibility' but a 7 requires 'variations to be made in the schedule to meet individual needs, for example a child working intensively on a project should be allowed to continue past the scheduled time'. Further attention to pedagogy can be found in the item Free Play where to earn a 5 centres must have 'free play occurring for a substantial portion of the day/session both indoors and outdoors'. Although entitled 'Environmental Rating Scale' the ECERS-R describes processes of the educational and care environment even more than the physical space and materials on offer.

Early Childhood Environmental Rating Scales – Curricular Extension

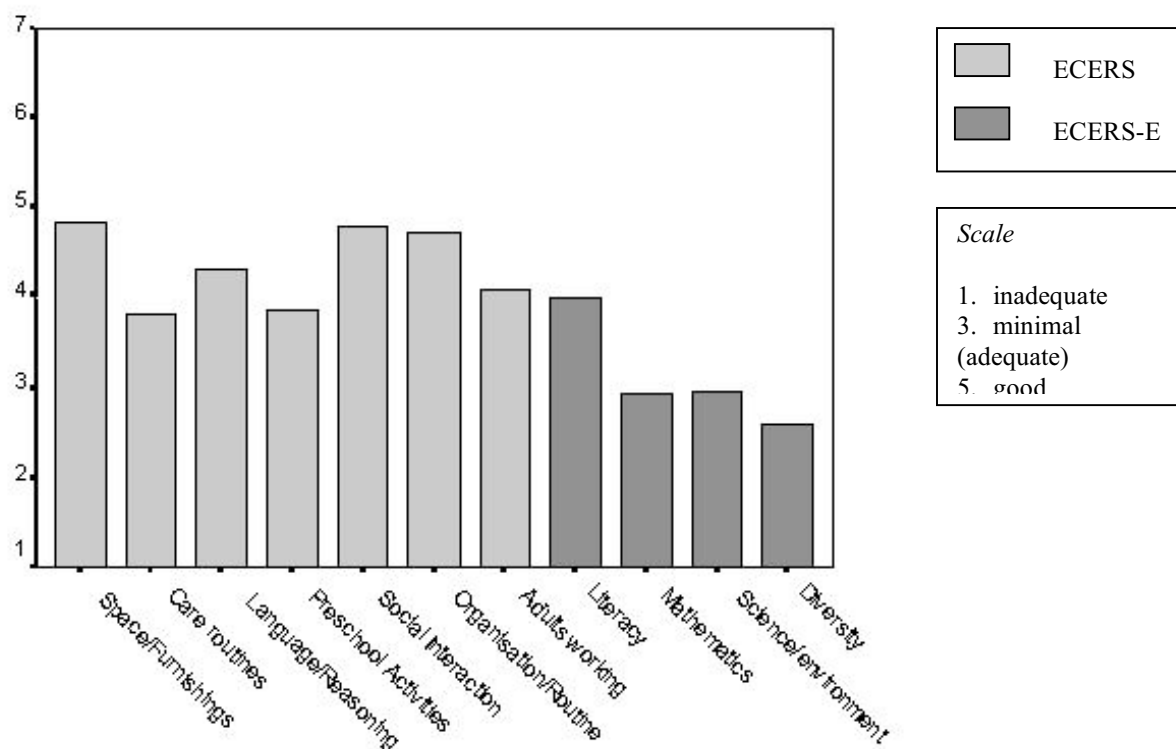
As the ECERS-R was developed in the United States of America and intended for use in both care and educational settings, the EPPE team thought it necessary to devise a second early childhood environment rating scale which was focused on provision in England as well as good practice in catering for diversity, hence the ECERS-R was supplemented by a new rating scale (ECERS-E, Sylva, Siraj-Blatchford, & Taggart, 2003), devised by the EPPE team based on the Desirable Learning Outcomes (QCA/DfEE 1996) for 3 and 4 year-olds and pedagogical practices associated with it (Siraj-Blatchford and Wong, 1999). The ECERS-E was devised after wide consultation with experts and piloted extensively, and consists of 4 sub-scales: literacy, mathematics, science and environment, and diversity. Both the ECERS-R and ECERS-E are based on a conceptual framework that takes account of pedagogical processes and curriculum.

The Regional Research Officer responsible for each region carried out both ECERS ratings. The research officers had, in every instance, experience of assessing children for at least 6 months in the centre before carrying out the ECERS observation and ratings. Moreover, each observer put aside a full day to complete the ECERS. This was necessary because the two rating scales contained very detailed information about curricular provision, pedagogy, planning, resources and relationships.

The overall profile of quality

The histogram below shows how the scores for the total ECERS-R and ECERS-E scales were distributed across all centres. It clearly shows that the scores on ECERS-E are lower overall than the scores for ECERS-R. Only the ECERS-E subscale literacy is on the same level as the ECERS-R subscales. This reflects the overall greater attention given to those aspects of the environment measures by ECERS-R and the comparative neglect overall given to the curriculum issues covered by ECERS-E.

Figure 5.1 ECERS-R and ECERS-E sub-scale scores across all centres

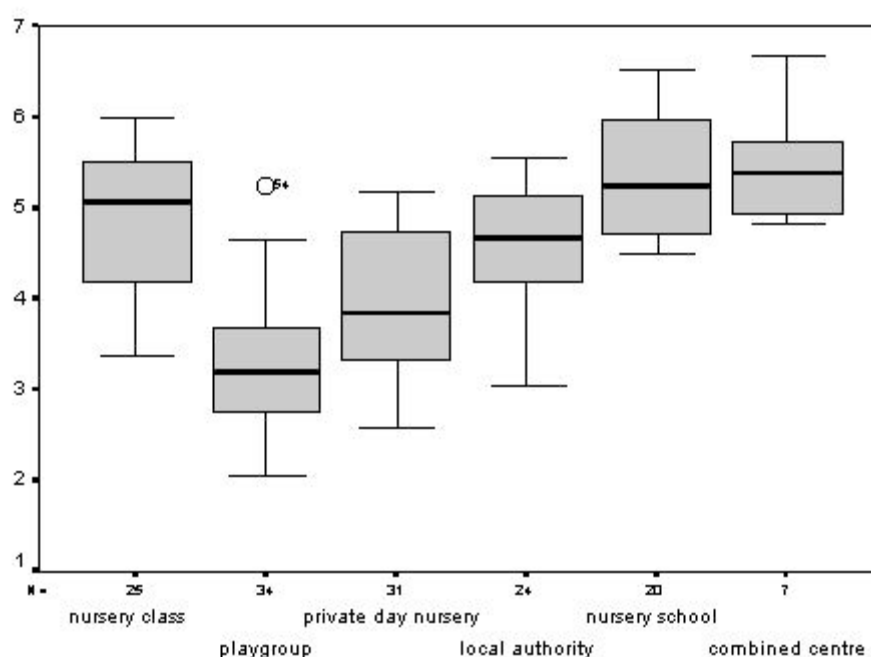


Comparison of pre-school environments by type of provision

Turning to the differences in the environment according to type of provision. Figure 5.2 shows that the three types of provision managed by the LEA had significantly higher scores for total ECERS-R when compared to other types of provision. The trends in the ECERS-R total scores are fairly consistent throughout the sub-scale scores. Of the six pre-school types, playgroups had

the lowest mean sub-scale score for all 7 sub-scales; private day nurseries had the second lowest mean sub-scale scores for all sub-scales except language and reasoning in which they were rated slightly higher than local authority day nurseries. Nursery classes, nursery schools and combined centres were rated consistently high on all the sub-scales. The results show that, for ECERS-R, the Local Education Authority (LEA) provision generally scored highest followed by local authority day care, then private day nurseries, and finally playgroups. In the box and whisker plots below the horizontal line inside the box represents the median score on each sub-scale and the length of the box shows the range in which 75% of the centres fall. The lines reaching up and down (the 'whiskers') show the location of higher and lower scores in that particular distribution.

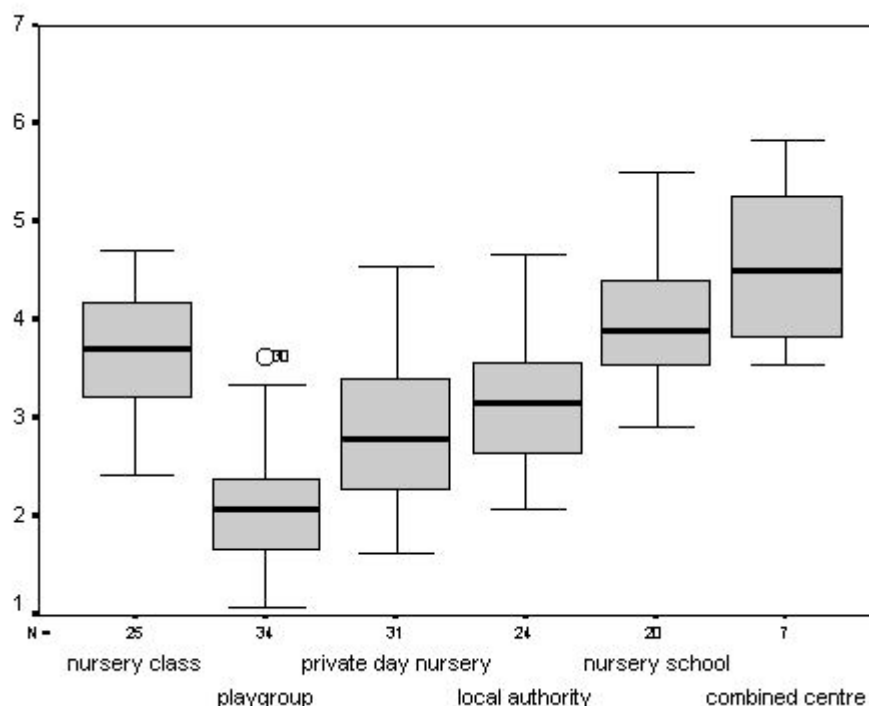
Figure 5.2 . Box plot of mean ECERS-R score by pre-school type



The focus on curriculum in ECERS-E

The results for total ECERS-E scores were almost identical to those found for the ECERS-R: LEA nursery classes, nursery schools and integrated centres (that combining care and education) scored most highly, significantly higher than playgroups and private day nurseries. Local authority day nurseries scored significantly higher than playgroups, *but not* private day nurseries; local authority day nurseries also scored significantly lower than *both* nursery schools and integrated (combined centres). Additionally, private day nurseries scored significantly higher than playgroups, and integrated (combined) centre scored significantly higher than nursery classes.

Figure 5.3 Box plot of mean ECERS-E score by pre-school type



For sub-scale scores, there were significant differences according to type of provision nursery schools and integrated or combined centres were consistently rated more highly than playgroups and private day nurseries.

Variation within type of provision

Playgroups generally had fewer resources and lower environmental ratings, but there were exceptions. Coldspring Playgroup (not the real name) appears as a circle above the upper vertical extension line. Coldspring had a very strong ECERS-R profile, usually scoring above the combined average for all centres. Coldspring is a statistical 'outlier' because it scored substantially higher than other centres in the same group. It has 'good' to 'excellent' provision for furnishings, language and reasoning, science and the environment. This playgroup had no place for staff to store their belongings and no separate room for staff or parents. Despite this the staff met daily for planning and participated regularly in Pre-school Learning Alliance (PLA) training courses. So, it was possible for playgroups to achieve high ECERS-R ratings, especially on items that did not require expensive materials.

Quality Characteristics

The Caregiver Interaction Scale

Additional measures of pre-school quality are provided by the Caregiver Interaction Scale (CIS) (Arnett, 1989). This scale of adult-child interaction was completed after a sustained period of observation with the 26 items forming 4 sub-scales: 'Positive relationships', 'Permissiveness', 'Punitiveness' and 'Detachment'. The 'Positive relationships' identifies favourable aspects of adult-child interaction whereas the other 3 sub-scales represent unfavourable aspects.

Table 5.2 reveals that the behaviour of staff in pre-school centres varies significantly in terms of 'Positive relationships', 'Permissive' and 'Detachment'. Integrated centres, followed by nursery classes and nursery schools score more highly in terms of the Caregiver Interaction Scale measure of 'Positive relationships'. Playgroups score least well on this scale, and show higher mean scores on the 'Detachment' and 'Permissiveness' scale (negative aspects of adult-child interactions) followed by LA day nurseries.

Table 5.2 Mean Caregiver Interaction Scale factors by pre-school type

	Nursery classes	Playgroups	Private day nurseries	LA day care	Nursery schools	Integrated centres
Positive	3.50	2.94	3.20	3.25	3.45	3.67
Permissive	1.30	1.62	1.49	1.59	1.44	1.31
Detachment	1.26	1.66	1.53	1.47	1.24	1.08

Note that 'Punitiveness' did not differ significantly by pre-school type so is not included in the table

In addition to the observed quality measured by the ECERS scales, all centre managers were interviewed about their settings. The semi-structured interviews covered aspects such as **general information** i.e. age of centre, opening times, major objectives etc., **centres and parents** i.e. opportunities for parent/staff contact, written materials provided to parents, parent education etc., **the staff** i.e. conditions and benefits, qualifications, turnover etc., **the children** i.e. numbers, provision for special educational needs etc. **perceptions of quality in child care and education**, and **organisational practices** i.e. planning and record-keeping etc.

The interview highlighted the extent to which there was no 'level playing field' in early years provision, with the maintained ('State' or LEA) sector generally being better resourced than the voluntary sector. The following findings are important in the debate about quality.

Staffing

The longest hours worked by centre managers was reported to be in integrated centres that may reflect the extended hours of opening. The longest hours worked by staff however were reported in private day nurseries. Overall, full-time staff had access to better staff development opportunities than part-time staff. This has implications for types of pre-schools employing more part-time than full-time staff such as the playgroups and private day nurseries. The private day nurseries had the youngest age profile of staff and nursery classes the oldest profile. The most ethnically diverse staff were found in inner-city local authority day nurseries and integrated centres.

All sectors benefited from the help of unpaid workers. Providers were able to meet or better the statutory requirements for adult/child ratios without the help of unpaid workers, except for some playgroups where unpaid workers are essential to maintaining statutory ratios. Both nursery classes and nursery schools appeared to offer ratios that were notably lower than the statutory requirements for their sector.

Qualifications and Training

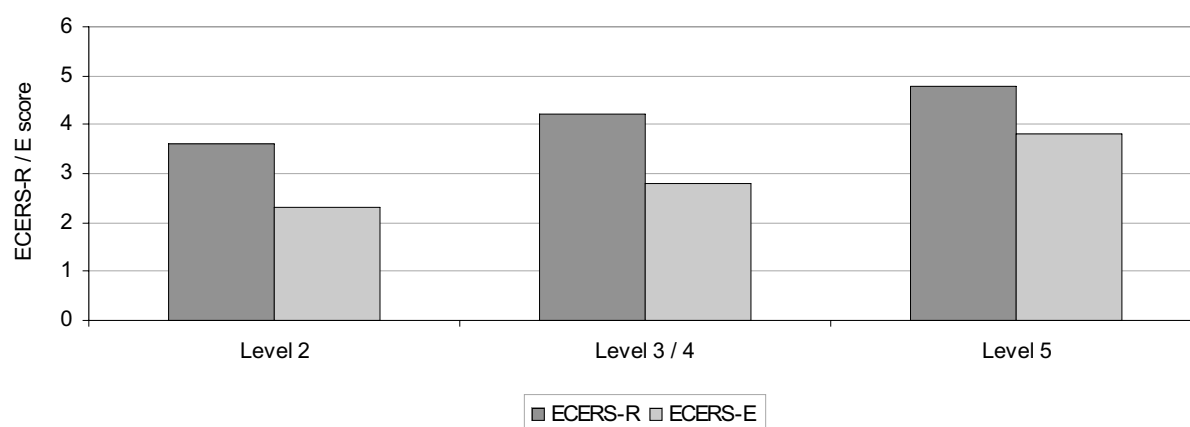
Training opportunities for staff working in playgroups were poorer than for staff working in any other types of pre-school provision. Playgroup staff had fewer opportunities to be appraised, fewer secure training resources, less access to training materials and fewer opportunities to have their training paid for by their centres.

The most highly qualified staff (for childcare qualifications) were in the LEA settings, where the highest salaries were also to be found. The centre managers with the highest childcare qualifications e.g. Batchelor of Education (B.Ed) or Post Graduate Certificate of Education (PGCE) appeared to be predominately in the 'education' rather than 'care' provision i.e. nursery schools and nursery classes. Integrated centres also had high levels of staff with higher childcare qualifications. Playgroups had the least qualified centre managers with over 50 per cent with National Vocational Qualification (NVQ) Level 2 or below. The most commonly held childcare qualification amongst pre-school staff was the National Nursing Examination Board qualification (NNEB) with the second most common category being 'no qualifications'. Nursery classes and nursery schools had very similar proportions of qualified staff and could be

summarised as most highly qualified, followed by integrated centres, then private day nurseries and local authority day nurseries together, and finally playgroups, who have the lowest proportion of qualified staff.

There was a relationship between the centre manager's qualification level and the quality of the pre-school environment. The Figure below shows ECERS scores set against qualifications level with Level 2 being NVQ Level 2 or equivalent and Level 5 being qualified teacher status.

Figure 5.4– ECERS-R and ECERS-E means by manager qualification



Quality and Programmes

Centre managers at interview reported widespread use of daily timetables and collegiate planning but the maintained ('State' or LEA) sector was more likely to refer to aspects of the curriculum when planning activities. There was good use made of the curriculum guidelines at the time, the most common being the Qualifications and Curriculum Authority's (/DfEE, 1996) Desirable Learning Outcomes, but playgroups made less use of this document in their planning than other types of provision.

Staff working in the maintained rather than the voluntary or private sector were more likely to have been trained to assess and monitor children's development. They conducted assessments more regularly and used a wider repertoire of assessment strategies.

Centres and parents

The maintained sector, especially the LEA settings, reported more meetings for parents, sharing of assessment information and helping parents in their roles as 'educators' of their own children.

Summary of quality profiles

Although the EPPE results present a picture of satisfactory pre-school environments, centres varied considerably in their ECERS profiles according to type of provision. The traditional nursery schools and integrated (combined) centres usually had the highest scores, often close to 'excellent', followed by nursery classes. Unfortunately many young children are attending centres where the provision is 'minimal' rather than 'good'. The playgroups and private day nurseries typically had the lowest scores, with local authority day nurseries somewhere in between. This study shows clearly that well-resourced pre-school centres with a history of 'education' (including substantial numbers of trained teachers, LEA in-service training, OfSTED 'school' inspections rather than 'care' inspections) were providing the highest quality of care and education. The centres from the 'care' tradition, despite their more favourable staff-child ratios, were offering a different level of care and education. It is relevant here to mention that care-oriented provision usually offers the lowest salaries to staff, employs workers with the lowest level of qualifications, and has limited access to training and higher staff turnover. We found that provision above the 'minimal' level was concentrated in well-resourced centres.

Section Six: The Developmental Progress of Children over the Pre-School Period

Background

The Effective Provision of Pre-school Education (EPPE) project explores the impact of pre-school provision on young children's cognitive progress and their social/behavioural development. This section reports on the main findings of the first phase of the longitudinal research covering the pre-school period from age 3 years plus to the start of primary school.

The research seeks to establish whether different types of pre-school settings differ in their impact and effectiveness. It also seeks to identify any variations between individual pre-school centres in their impact upon children's cognitive progress and social/behavioural development.

This section describes the results of analyses of young children's cognitive and social/behavioural development during their time in pre-school. Developmental gains were measured from entry to the EPPE study until the start of primary school. Cognitive attainment assessed at entry to primary school was measured in terms of five attributes: four derived from the British Ability Scales II (Eliot et al., 1996), language attainment, two non-verbal measures, early number concepts and a fifth derived from work on early literacy skills (Bryant & Bradley, 1985) i.e. pre-reading attainment (for details of assessments see Technical Paper 1). Young children's social/behavioural outcomes were assessed by a questionnaire completed by the class teacher in the first term of primary school. Four aspects of social/behavioural development are dealt with here, namely 'Independence & Concentration', 'Co-operation & Conformity', 'Peer Sociability' and 'Anti-social / Worried behaviour'. A range of statistical methods has been used to analyse data for around 2,800 children, representing around 95 per cent of the total child sample at entry to the study. Multilevel modelling has been used to identify and explore pre-school centre effects. An additional sample of 'home' children (without pre-school centre experience) was recruited at primary school entry bringing the total to over 3171 in some analyses.

Methodology

EPPE uses multilevel modelling to measure the influence of different background factors on young children's social/behavioural development at the start of primary school. Contextualised analyses are used to identify the unique (net) contribution of particular characteristics to variation in children's outcomes while other influences are controlled. Thus, for example, the impact of family socio-economic status (SES), is established while taking into account the influence of mother's qualification levels, low income (indicated by eligibility for free school meals), ethnicity, birth weight, home learning environment etc. It is of policy interest to establish the nature and strength of such background influences, individually and in total, because they are relevant to issues of equity and social inclusion.

Multilevel modelling has been used to identify pre-school centre effects and the 'value added' by different centres.¹ Value added multilevel models investigate children's developmental gains over their time in pre-school, by controlling for a child's age at assessment and prior development at entry to pre-school, as well as a wide range background influences. These analyses are used to establish whether there is evidence of pre-school influences on young children's developmental gains. In particular, to measure the extent to which children's developmental gains are associated with the pre-school centre attended. The centre level variance provides an indication of the size of any effect related to pre-school attended. More effective centres (positive outliers in value added terms) can be identified where children made significantly greater developmental gains than predicted on the basis of prior social/behavioural and intake characteristics. Centres

¹ Social/behavioural developmental gains were measured from entry to the EPPE study (age 3 years plus) until the start of primary school (usually at entry to reception classes at rising 5 years, though in some instances children are enrolled directly into year 1 classes and did not join a reception class).

where children made less developmental gains than predicted can be viewed as *less effective* (negative outliers in value added terms)³.

The multilevel value added analyses are also extended to establish the extent to which factors such as type of pre-school attended, number of sessions, quality characteristics ratios and staff qualifications show any statistical relationship with the effects of pre-school. It is thus possible to establish whether variations in quality and extent of time in pre-school have an impact on children's developmental gains and, in particular, whether higher quality and more pre-school experience have a positive impact.

Findings concerning a sample of 'home children', who have had no pre-school centre experience before starting primary school, are reported for comparison with the pre-school sample. The contextualised multilevel analyses explore whether home children are at a disadvantage in terms of development when they start primary school and the extent to which any developmental gap can be attributed to the absence of pre-school experience, rather than to differences in their background characteristics. These analyses provide important additional evidence concerning the overall impact of pre-school provision.

Main Findings and Implications for Policy

a) Cognitive development

The impact of a child's background

The early findings relating to children at the start of the study described in Section 4 illustrate that there are important differences in young children's cognitive and social/behavioural attainments related to specific child, parent and home environment characteristics at entry to the study (age 3 years plus). The continued effect of 'disadvantage' on cognitive outcomes was also found at entry to primary school (See table 6.1).

Table 6.1 Percentage of children identified as 'at risk' using multiple disadvantage indicators at entry to primary school

Number of indicators	Pre-school sample children			'Home' children		
	General cognitive ability	Pre Reading 'risk'	Early number concepts 'risk'	General cognitive ability	Pre Reading 'risk'	Early number concepts 'risk'
0	6.6	7.2	9.4	33.3#	22.2#	22.2#
1-2	13.1	16.8	14.8	35.5	37.5	33.3
3-4	34.5	28.5	34.3	51.0	38.7	45.3
5+	54.7	44.0	55.8	70.8	46.7	69.0
n	2582	2567	2560	185	185	184

Less than 10 pupils. N.B. 'General cognitive ability' refers to 'strong cognitive risk'

For certain outcomes, especially pre-reading and early number concepts, children from some ethnic minority groups, (including Black Caribbean and Black African), and children for whom English is an additional language (EAL) made greater progress during pre-school than white UK children or those for whom English is a first language. These results remain significant even when account is taken of the influence of other important factors, like mother's education level and socio-economic status (SES). Overall, such groups had significantly lower cognitive scores at entry to the study in language measures (though not in non-verbal scales). This suggests that the experience of pre-school provision may provide the opportunity for some groups to begin to 'catch up' in terms of particular areas of cognitive attainment (e.g. pre-reading skills).

The analyses have explored the extent of variation in children's attainments in school entry assessments for different groups of children. Child, parent and home environment characteristics of children together account for a lower proportion of the variance in attainment at

³ Outlier centres are identified by reference to the confidence limits associated with each residual estimate of centre effects ($p < 0.05$).

school entry for pre-reading and early number concepts measures than was the case for total cognitive ability score at entry to the pre-school study.² This may reflect the positive impact of pre-school experience and its ability to help reduce the inequality in cognitive development already evident at entry to pre-school. Nonetheless, such background factors remain powerfully associated with variations in young children's language attainment. One implication of this finding may be the need for more intensive work on language enrichment for young children who show poor language development at the start of pre-school. The analyses of attainment demonstrate a significant positive impact of pre-school, in comparison to no pre-school, for all children on all outcomes including language. This impact remains when background influences are controlled. Thus we can conclude that pre-school has an important role to play in combating disadvantage and giving children a better start at school.

Additional analyses were conducted for the sub-group of children identified as 'at risk' of special education needs (SEN) [see Section 10 of this report for more details], defined as those showing very low cognitive scores at entry to the study. It was found that children who are multiply disadvantaged (in terms of a range of child, family and home learning environment characteristics) show much better attainment than similarly disadvantaged children in the home sample at the start of primary school (age rising 5 years). Again this finding points to the positive impact of pre-school experience on cognitive development for particularly vulnerable groups of young children.

Baseline assessment instruments at the start of school have important consequences. The analyses reported here show that the choice of school entry measures can have equity implications. Differences related to children's gender, EAL and ethnic background are more likely to be identified in measures of language and pre-reading skills than in non-verbal attainments. It is important that accurate measures of children's attainments at school entry are obtained covering a range of attainments so that different areas of strength/weakness can be assessed and children receive additional support, or, by contrast, sufficient challenge. A focus on mainly language based measures for school reception assessment may disadvantage some children of particular ethnic/language backgrounds, whereas non-verbal assessments that are less language based may provide additional information about such young children's skills. Nonetheless, it remains important not to ignore or minimise the existence of language or pre-reading differences because of their potential relationship with later attainment and progress in school. It is crucial that school entry assessments are used formatively to assist teachers in planning a programme to meet individual needs.

When children's cognitive progress (change in attainment) over the pre-school period was analysed the impact of child, parent and home environment characteristics was found to be much smaller than when attainment at any one time point is explored (see Technical Paper 8a). Background characteristics showed a strong relationship with prior cognitive attainment (measured at age 3 years plus), and prior attainment is used as the baseline for measuring progress. Nonetheless, a number of characteristics continue to show a statistically significant influence on progress over the pre-school period, particularly for language and pre-reading. For example, girls make greater gains in pre-reading, early number concepts and non-verbal reasoning than boys over the pre-school period. Children from larger families (3+ siblings) made less progress than singletons (i.e. only children) in pre-reading and language. Children whose mothers had educational qualifications made more progress in all outcomes. EAL children showed greater progress in pre-reading but not in language (reflecting their lower cognitive attainment at entry to pre-school especially in language). Children from higher SES families made greater progress compared to children from lower SES families in all outcomes except spatial awareness / non verbal reasoning. The home learning environment also showed significant positive impacts on cognitive progress in pre-reading, early number concepts and language.

² Measured by the British Ability Scales II, which cover both language and non-verbal skills.

These results emphasise the need to control for differences in prior attainment and other relevant characteristics of young children in studies of pre-school institutions. This ensures that valid comparisons are possible for individual centres and for type of provision.

Home learning environment

The results clearly indicate the importance of different aspects of parental activities that contribute to the quality of the children's home learning environment. While other family factors such as mother's education and family SES are also important, the 'Home Learning Environment' exerts a significant and independent influence on attainment at both age 3 years plus and later at the start of primary school (rising 5 years) and on progress over the pre-school period. Aspects of self-reported parental involvement in activities (such as reading to their child, teaching songs and nursery rhymes, playing with letters and numbers, visiting the library, painting and drawing, emphasising the alphabet, etc) remain significant positive influences which account for differences in attainment and also influence young children's cognitive progress over the pre-school period. The study also shows that the home learning environment index (measuring the extent of different activities involving the child at home) is only moderately correlated ($r=0.3$) with family SES or mother's education.

These results suggest that policies for parents in disadvantaged communities that encourage active parenting strategies can help to promote young children's cognitive progress as well as positive social/behavioural outcomes. Many pre-school settings already encourage parental participation, and some have developed programmes that feature parent education. The EPPE results indicate that programmes which directly promote activities for parents and children to engage in together are likely to be most beneficial for young children.

Variations in centre effectiveness

The value added multilevel analyses of children's progress show that the individual pre-school centre attended by a child also has an impact on cognitive progress.³ In some centres children make significantly greater gains than in others. Centre effects are larger for pre-reading followed by early number concepts, possibly reflecting different emphases between individual settings in curriculum provision and the priority accorded to different types of activities. A number of centres were identified – some more effective in terms of child outcomes and some less effective. Just over one in 5 centres (22.0%) were found to be statistical *outliers* (performing *significantly above* or *significantly below* expectation for one or more cognitive area).

Typically centres varied somewhat in their effects on different cognitive outcomes. No centres performed significantly above or below expectation for all cognitive outcomes. Pre-school centre effects are only moderately correlated in language, early number concepts, pre-reading and non-verbal measures. Thus pre-school settings show important internal variation in effectiveness for different child outcomes. Nonetheless, the most usual profiles across the five outcomes studied show that a number of centres can be distinguished with broadly positive effects, whereas others showed generally poorer effects for most areas of cognitive progress.

Child mobility (moving between pre-school centres) was fairly common during the pre-school period. Over a fifth of children (23%) left their target centre before starting primary school and moved to other provision. The amount of mobility varied by type of provision, being very uncommon for those in nursery classes or nursery schools, but the majority of playgroup children (52%) had moved from their centre, often to a different form of provision, such as a nursery class. A change of centre was associated with poorer progress in pre-reading. The much higher mobility for playgroup children has implications for the analysis of the effects of this type of provision. This high mobility means that it is difficult to measure the impact of playgroups on children's progress (either at the level of individual centres or as a type of provision) accurately.

³ Significant centre-level variance in children's cognitive progress remains, even when account is taken of prior attainment and other intake differences (in terms of child, parent and home environment characteristics).

Playgroup children also tended to experience a lower average number of sessions at the target pre-school before starting primary school. This was also related to poorer progress.

The impact of pre-school – quantity and quality

After taking account of child, parent and home environment factors, children who started pre-school at a younger age (i.e. below 3 years of age) had significantly higher age-adjusted cognitive attainment at the start of the project than those who started at an older age. However, the minority who started below 2 years of age did not show more positive outcomes than those who had joined their pre-school centre aged between 2 and 3 years. This advantage was still evident when children entered primary school. This suggests that, in general, children who start pre-school at a younger age (between 2 and 3 years) experience a cognitive boost, which remains evident up to the start of primary school.

The duration of pre-school⁴ showed a significant positive link with young children's cognitive progress during pre-school for all five cognitive measures. A longer period of months of pre-school experience was associated with greater gains, even when other significant factors are controlled.⁵ By contrast, the number of sessions for which a child was registered per week was not found to relate to amount of cognitive gain during pre-school, when the impact of other factors was controlled. There was no evidence that full-time provision (10 sessions per week) resulted in better outcomes than part-time provision (i.e. 5 sessions). Taken together, the findings suggest that an extended period of pre-school experience on a part time basis is likely to be more advantageous than a shorter time period of full-time provision.⁶

The study explored variation in the quality of individual centres using the Early Childhood Environment Rating Scale (ECERS-E and ECERS-R scales) as described in Section 5. Higher quality as assessed by the ECERS-E scale was significantly positively related to children's cognitive progress in several areas: pre-reading, early number concepts and non-verbal reasoning. The *literacy* sub-scale of ECERS-E was also found to be positively related to progress in pre-reading and early number concepts, while the *diversity* sub-scale (which includes items on differentiation, observation, individual record keeping and ability grouping) was also significantly related to progress in pre-reading, early number concepts and non-verbal reasoning.

The analyses of the ECERS-R sub-scales also suggest that other aspects of quality (the *social interaction*, *adults working together* and *language reasoning* sub-scales) were associated with better progress in several cognitive outcomes. Additionally, other quality measures of adult-child interactions (the Caregiver Interaction Scale) showed effects upon development. The sub-scale *positive relationships* was related to greater pre-reading progress. By contrast, the three sub-scales that assess negative aspects of adult-child relationships and interaction (*detachment*, *permissive* and *punitive*) were associated with poorer progress in pre-reading and early number concepts. These effects were independent of SES and indicate that children from all SES groups benefit from higher quality provision.

⁴ The duration of pre-school was measured by the number of months from entry assessment (age 3 plus) to the date of starting primary school. A separate measure of total number of sessions attended in the target pre-school centre during this period was also collected from registers. Analyses showed similar results but the duration measure showed a stronger relationship with progress.

⁵ The baseline (entry to the study at age 3+) attainment measures were standardised on the basis of children's age at assessment, in addition age at follow up assessment in primary school was also controlled. The duration measure excludes time in pre-school prior to age at which children were recruited to the project (i.e. earlier starting age). Attendance patterns at pre-school were also found to be statistically significant.

⁶ Quantity of sessions attended was statistically significant. The total number of sessions a child was recorded as having attended their target pre-school centre was related to greater progress for language and verging on significance for pre-reading and spatial awareness / reasoning (pattern construction). Those who attended a higher total number of sessions during the study period made greater cognitive gains. Duration, however, showed a stronger link than attendance, when both measures were tested in the statistical models.

Quality effects were similar for both socio-economically and educationally advantaged and disadvantaged groups alike. However, a positive interaction for gender and quality suggests that boys particularly show a greater benefit in progress for early number concepts if they attended high quality provision. Given that, as a group, girls made greater cognitive gains and had higher attainments at entry to pre-school in most areas, the positive impact of pre-school quality for boys' progress in early number concepts is of special interest. It suggests that raising the quality of pre-school provision may help promote boys' attainment levels and possibly reduce the gender gap. This is important since on average the home learning environment scores of boys were somewhat lower than those of girls, suggesting possible gender differences in parenting practices.

Type of provision

Type of provision was not significantly related to attainment at entry to pre-school, when account was taken of differences in intake in terms of child, parent and home environment characteristics, but differences in cognitive progress related to type of provision emerged during the pre-school period.

The multilevel analyses controlled for differences in duration of pre-school, as well as child mobility (change of centre), since these were significant influences on cognitive progress for several outcomes. In addition, as well as individual child, parent and home environment measures, the analyses took account of compositional influences. A compositional influence is associated with the cumulative effect of the social backgrounds of all the children in each pre-school centre. Some centres may draw children only from a socially deprived catchment area. The compositional effect in these centres would be different from a catchment area that maintains a better social mix of children. Children in centres that served a higher proportion of children with highly qualified mothers (had a degree/higher degree or professional qualification) tended to make more progress in some outcomes, particularly pre-reading. Private day nurseries tended to serve more children from educationally advantaged backgrounds. If compositional effects are not included in the model, this form of provision showed significant positive effects for pre-reading progress. The inclusion of controls for child mobility, compositional effects and pre-school duration mean that the extent of differences between types of provision identified by the model is reduced (because such factors are themselves related to type of provision).

Outlier centres, both positive and negative, were found in each type of provision. There was significant variation in effectiveness on cognitive progress within each type of provision; thus we can conclude that differences between individual centres are likely to be more important than differences between type. Nonetheless, certain patterns emerged suggesting that some forms of provision were generally more effective. Integrated provision (i.e. combined centres) showed a significant positive impact for several measures. Nursery schools also showed some positive effects compared with other types of provision similar to those found for integrated provision. By contrast, children who attended local authority day nurseries tended to make relatively poorer progress, especially for pre-reading. There were interactions for low SES children with type of provision. Children in the low SES group showed better outcomes if they attended an integrated provision (i.e. combined centres) or nursery schools. Both these forms of provision also showed higher scores in observed quality.

While private day nurseries did not show up as significantly more effective in the analyses of impact of type of provision (except in comparisons with local authority day nurseries for pre-reading and language), a number of positive outlier centres for pre-reading were found to be private day nurseries. The results suggest that centres classified as private day nurseries in particular show much variation in effects and quality, some having a specific educational philosophy or tradition (e.g. Montessori). Each centre was categorised by the percent of children's mothers with university education. This percent was related to the amount of cognitive progress made by children in the centre. A 'compositional effect' such as this suggests that concentrations of disadvantaged children (in terms of mothers' educational levels) is related to lower developmental progress in children. This suggests that the clustering of disadvantaged children within specific centres is not conducive to their cognitive progress. Policies aimed at

encouraging a social mix of children may be more appropriate, although this may be difficult to achieve in practice, given many parents' preferences for centres close to home, and the extent that social and ethnic groups cluster in some neighbourhoods.

There was significant variation both between individual centres and by type of provision in the observed quality of provision (see Section 5). When account is taken of variation in quality of centre environments, the impact of type of provision is reduced. This indicates that the impact of type of provision is likely to be, at least in part, attributed to variations in environmental quality and adult-child interactions. In interpreting the findings on type of provision, it is important to acknowledge the very different resourcing levels typical of different types of provision, which have implications for staffing, training and facilities. The maintained sector differs quite markedly in this respect from voluntary provision, particularly playgroups which, in the past, have had little access to resources in England and often few staff with higher levels of relevant qualifications.

Ratios and staff qualification

Adult child ratios can be measured in several ways. Statutory minimum levels vary by type of provision. However many settings operate with more generous ratios than those statutorily required. Observed ratios (with and without volunteers) were used to provide indicators of staffing levels normally experienced by children aged 3-5 years in individual centres. Statutory, reported (by centre managers) and observed ratios were all tested for links with children's cognitive progress. More generous adult/child ratios showed a significant link with one aspect of children's cognitive progress, early numbers concepts. Quality, qualifications and type of provision are themselves associated. Ratios tended to be poorer (i.e. higher ratios with more children per adult) in some forms of provision that had more highly qualified staff and higher observed ratings for quality (measured by ECERS-E), although the correlation is fairly low ($r=0.21$). The exception is integrated centres that have higher quality scores but low ratios.

Centre managers' qualifications and the proportion of staff hours at different qualification levels also show significant variation between centres and by type of provision. Centre managers' qualifications are significantly associated with the observed quality profiles of centres. Centres where managers reported they had Level 5 qualifications (e.g. trained teachers⁷) exhibited higher quality. Findings from the associated Researching Effective Pedagogy in the Early Years study (REPEY see Siraj-Blatchford et al, 2002) also indicate that the observed behaviour of other staff is positively influenced by the presence of a member of staff with Level 5 qualifications.

The multilevel analyses of children's progress found a significant positive relationship between the percentage of Level 5 staff hours and young children's progress in pre-reading. This suggests a link between more highly qualified (i.e. qualified teacher) staff and better child outcomes in pre-reading, although this link may operate indirectly through an impact on centre quality. Given the complex inter-relationships between ratios, staff qualifications, quality and type of provision, plus the extent of variation between individual centres of the same type, these influences on children's outcomes may be confounded (although the significant relationship between Level 5 staff hours and young children's progress in pre-reading indicates that staff qualifications are important in this complex of influences). It may be more relevant for policy makers and practitioners to consider the impacts of *packages* of provision, rather than to try to separate the impact of particular features in isolation.

Children who had no pre-school centre experience

Data were collected for a group of 'home' children with no or only minimal pre-school centre experience. Comparisons of the home sample with children who had attended a pre-school centre showed that both the characteristics and attainments of home children vary significantly from those who had been in pre-school. It is not possible to conclude with certainty that the much lower attainments of the 'home' group are directly due to lack of pre-school experience.⁸

⁷ For further details of classifications, see EPPE Technical Paper 5.

⁸ A controlled experiment (which would not be feasible on either ethical or practical grounds) would be needed to draw firm conclusion.

Nonetheless, the statistical analyses strongly suggest that pre-schooling provides a significant cognitive boost.

Contextualised multilevel analyses of attainments at entry to primary school that explored the impact of child, parent and home environment factors illustrate that, even when these are controlled, home children's cognitive attainments are poorer than those of children who attended any of the six types of provision studied. The results also support the link between a longer duration of pre-schooling and higher cognitive attainments, in comparison with the 'home' group (who had not attended a pre-school centre). Although causal connections cannot be drawn, these findings, combined with those on the advantages of an early start date, suggest that pre-schooling has an important positive impact on young children's cognitive attainment. Thus, children who do not attend a pre-school may be at a disadvantage when they start primary school. Indeed analyses conducted on the EPPE data sets intended to explore 'at risk' status in relation to special educational needs indicate that 'home' children are over-represented in the cognitive 'at risk' category, compared with other EPPE children, even when the level of multiple disadvantage is held constant.

The EPPE research indicates that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children, in particular, a better start to primary school. The findings indicate pre-school has a significant and positive impact on progress over and above important influences such as family SES, mother's qualification level, ethnic and language background, income etc. The quality of the pre-school centre experience as well as the quantity are both influential. The results show that individual pre-school centres vary in their effectiveness in promoting cognitive progress over the pre-school period, and indicate that better outcomes are associated with some forms of provision. Likewise, the research points to the separate and significant influence of the home learning environment. These aspects (quality and quantity of pre-school and home learning environment) can be seen as more susceptible to change through policy and practitioner initiatives than other child or family characteristics, such as SES.

b) Social/behavioural development

The impact of a child's background

The early findings on the children at the start of the study (see Section 4) show important differences in young children's cognitive and social/behavioural attainments related to specific child, parent and home environment characteristics. It should be noted that in general, children's cognitive attainments are more susceptible to child, family and home environment influences than social/behaviour for this pre-school age group. This may reflect problems of measurement or real effects.

The analyses of social/behavioural outcomes emphasise the need to control for differences in the characteristics of young children who attend different pre-school settings, in both prior social/behavioural development and other relevant characteristics, in studies of pre-school institutions. Such control for intake differences is important to ensure that valid comparisons are possible for individual centres and for type of provision. It is also essential for studies seeking to compare children who do or do not attend a pre-school centre, because of differences in a range of characteristics (see Technical Paper 8b).

Home learning environment

The research indicates the importance of a range of factors, such as mother's educational level, socio-economic status (SES) etc, and the home learning environment, (i.e. activities that offer learning opportunities to the child), when investigating young children's social/behavioural outcomes. The analyses confirm that parental involvement in activities (such as reading to their child, teaching songs and nursery rhymes, playing with letters & numbers, visiting the library, painting & drawing, emphasising the alphabet, etc) are significant in accounting for differences in social/behavioural development at the start of primary school. The effect sizes relating to the

home learning environment (and in particular the home learning environment index⁹) are generally higher than for family measures such as mothers' qualification level. The home learning environment measures also influence young children's social/behavioural developmental gains over the pre-school period. It is interesting to note that the pre-school home learning environments differ for boys and girls. As a group significantly more girls' parents reported activities such as reading, teaching songs and nursery rhymes etc. It is not possible to establish whether these self-reported differences in parenting reflect different expectations of boys and girls, and or gender differences in the behaviours and interests of pre-school children. The home learning environment effect, however, remains significant even when child gender is included in the models. The results suggest that some of the differences in cognitive and social/behavioural outcomes at primary school entry evident between boys and girls may in part be attributed to differences in the quality of home learning environment.

Thus, policies targeted at working with parents in disadvantaged communities (such as *Sure Start*) are supported by the EPPE findings. Many pre-school settings across England already encourage parental participation, and some have developed programmes that feature parent education. The EPPE results suggest programmes that directly promote activities for parents and children to engage in together are likely to be most beneficial for young children. Health visitors may also be well placed to provide guidance for parents on ways to enrich young children's home learning environments and some primary schools run activities for parents. Such provision could also seek to promote the benefits of joint activities, which promote pre-school children's developmental learning at home.

Variations in centre effectiveness

Value added multilevel analyses show the individual pre-school centre attended by a child also has an impact on children's social/behavioural developmental gains.¹⁰ A number of statistically significant outlier centres were identified (i.e. centres whose children made more progress than the scores of their children at entry to the study would predict). These are centres where children showed significantly better (positive outliers) or, by contrast, significantly poorer social/behavioural developmental gains than predicted (negative outliers), given their prior social/behaviour and background. There were 52 (36.9%) centres identified as performing broadly as expected across all areas of social/behavioural development, when intake differences are controlled. Just over one in 10 centres (12.8%) were found to be statistical outliers (performing significantly above or below expectation for one or more social/behavioural area). This is likely to be a conservative estimate of the extent of real differences in effectiveness between individual centres, since, with small numbers of children per centre an effect has to be large to reach statistical significance.

Typically centres vary in their effects on different social/behavioural outcomes. No centre performed significantly above or significantly below expectation for all social/behavioural outcomes. However, pre-school centre effects are generally more highly correlated in social/behavioural outcomes than cognitive outcomes. This suggests that pre-school settings show more internal variation in effectiveness in promoting children's cognitive outcomes than is the case for their social/behavioural outcomes. Nonetheless, the most usual profiles across the four outcomes studied show that a number of centres could be distinguished with broadly positive effects, whereas others showed generally poorer effects on social/behavioural developmental gains.

More than a fifth of children (23%) had left their target centre before starting primary school and moved to other provision. There was no evidence that mobile children, who moved pre-school centre during the study, showed poorer social/behavioural outcomes when they started school.

⁹ The home learning environment index provides a summary based on the individual measures reported above such as parents reading to their child. It is interesting to note that the home learning environment index is only moderately correlated ($r=0.3$) with family SES or mother's qualification levels.

¹⁰ Significant centre level variance in children's social/behavioural developmental gains remains even when account is taken of prior social/behavioural development and other intake differences (in terms of child, family and home learning environment characteristics).

Mobile children were very uncommon in nursery classes or nursery schools, but the majority of playgroup children (52%) had moved centre, often to a different form of provision. The higher mobility of playgroup children has implications for the analysis of the effects of this type of provision, and the effects of individual playgroup centres. The high degree of mobility means that it is very difficult to measure the impact of playgroups on children's social/behavioural developmental gains (either at the level of individual centres or as a type of provision) accurately.

The impact of pre-school – type, quantity and quality

Quality of pre-school provision is regarded as a vital feature of early years education and care. The EPPE study explored variation in the quality of individual centres using the Early Childhood Environment Rating Scale (total ECERS-E and ECERS-R scales). Higher quality scores as assessed by the ECERS-R scale were positively related to better child outcomes for one of the social/behavioural measures ('Co-operation & Conformity'). The results of analyses of the ECERS-R subscales also suggest that specific subscales of quality measured by this instrument (social interaction, and language and reasoning) are associated with better social/behavioural developmental outcomes at primary school entry. In addition, another observational instrument, which provides measures of adult child interaction (Caregiver Interaction Scale, Arnett, 1989), is related to all three of the social/behavioural outcomes except 'Anti-social / Worried' behaviour. In particular, where staff-child interactions were rated as more 'Positive', better child social/behavioural outcomes are found.

Types of provision effects were identified for several social/behavioural outcomes, in line with findings for cognitive outcomes. These results suggest that, as a group, children who attended local authority day nurseries and private day nurseries show poorer behavioural outcomes than those who attended other forms of provision (note that proportionately more of the children in LA day nurseries and private day nurseries started at their pre-school target centre before 2 years of age). Moreover children who attended integrated provision or nursery classes tended to make greater gains in social/behavioural development during the pre-school period. Nonetheless, there was significant variation in effectiveness on social/behavioural gains within each type of provision; thus differences between individual pre-school centres and differences between types of provision are both important.

There is evidence that some types of provision are associated with better social/behavioural development and that higher staff qualifications (proportion of staff hours at qualified teacher status) have a positive influence on young children's social/behavioural outcomes. It has been demonstrated that there is a significant link between pre-school centre quality ratings and centre manager qualification levels and variations between type of provision and quality. Thus improving staff training and qualification levels may be strategies that can help raise the quality of provision.

When looking at social behaviour outcomes at start of school, it is found that children who spent longer in pre-school (measured from start date at target pre-school centre to date started at primary school) were rated by class teachers as showing more 'Anti-social / Worried' behaviour at primary school entry. In other words, a longer time (in years and months) spent in pre-school, is associated with slightly more 'Anti-social / Worried' behaviour, although it should be noted that only a small proportion of children in total, show difficulties for this behavioural outcome. This effect is primarily related to local authority day nurseries and private day nurseries where a substantial proportion start under 2 years of age and some under one year. However, when a measure of pre-school centre quality was added to the model (i.e. ECERS-R), the impact of duration was reduced (although still remained significant). This suggests that higher quality in pre-school centres tends to reduce, but not eliminate, the negative effect of a longer time spent in pre-school centres on 'Anti-social / Worried' behaviour.

Duration of pre-school (number of months) was not statistically significant in accounting for social/behavioural developmental gains over the pre-school period in any of the four outcomes.

Ratios & staff qualifications

Adult-child ratios can be measured in several ways. Observed ratios (with and without volunteers) were used to provide indicators of staffing levels normally experienced by children aged 3-5 years in individual centres. Statutory, reported (by centre managers) and observed ratios were all tested for links with children's social/behavioural gains. There were no significant relationships between ratios and young children's social/behavioural developmental gains over the pre-school period.

As noted earlier, centre managers' qualification levels and the proportion of staff hours at different qualification levels also show significant variation between individual centres and by type of provision. Centre managers' qualifications are significantly associated with the observed quality profiles of centres (see Section 5). Centres where managers reported they had Level 5 qualifications (trained teachers) exhibited higher quality. Findings from the associated Researching Effective Pedagogy in the Early Years study (see Siraj-Blatchford et al, 2002) also indicate that the observed behaviour of other staff is positively influenced by the presence of a member of staff with Level 5 qualifications.

The value added multilevel analyses found a significant positive relationship between the percentage of Level 5 staff hours and young children's social/behavioural developmental gains in 'Co-operation & Conformity'. In addition, children who attended centres where proportionately more staff time were at Level 5 showed reductions in 'Anti-social / Worried' behaviour. Given the complex inter-relationships between ratios, staff qualifications, quality and type of provision, plus the extent of variation between individual centres of the same type, these influences on children's social/behavioural outcomes may be confounded. It may be more relevant to consider the impacts of *packages* of provision, rather than to try to separate the impact of particular features in isolation.

Children who do not experience pre-school

Comparison of the 'home' sample with the main EPPE sample of children who experienced pre-school showed that both the characteristics and the social/behavioural development of 'home' children vary significantly. It is not possible to conclude with certainty that differences in social behaviour found for the 'home' group are directly a consequence of their lack of pre-school experience, due to the 'home' children's very different social backgrounds. Analyses of social/behavioural assessments exploring the impact of child, parent and home environment factors illustrate that, even when these important influences are controlled, 'home' children's social behaviour is rated as significantly poorer in terms of three areas of development - 'Independence & Concentration', 'Co-operation & Conformity' and 'Peer Sociability' - than those of children who attended any of the six types of pre-school provision studied. This suggests that pre-schooling has a positive impact on these aspects of social/behavioural development, in particular 'Peer Sociability'. Hence, children without pre-school centre experience may be at a disadvantage in terms of 'Peer Sociability', 'Independence & Concentration' and 'Co-operation & Conformity' when they start primary school, as these behaviours are likely to be important for successful adjustment to primary school. In addition, 'Independence & Concentration' is modestly associated with cognitive attainment at entry to school and hence would be expected to promote classroom learning. Home children do not show any significant differences in terms of 'Anti-social / Worried' behaviour in comparison to the pre-school sample.

In combination with the findings for cognitive progress reported earlier, the results summarised here indicate that pre-school centre experience can help to combat social exclusion and promote inclusion by offering disadvantaged young children, in particular, a better start at school, through promoting positive social/behavioural as well as cognitive development. Section 9 reports on progress to the end of Key Stage 1. This helps to establish the positive impact of pre-school on young children's cognitive (which remains significant to the end of Key Stage 1) and social/behavioural development (which remains significant to the end of Year 1) as children progress through their first years at primary school. At the end of Year 2, the impact of pre-school experience on social development had decreased. This decrease for duration and quality on social/behavioural development became non-significant at the end of Year 2. However, when we look at the impact of the pre-schools level of effectiveness (children showing more/less

progress than expected given their initial profile and background characteristics) then there are still significant effects on children's social/behavioural development at the end of Year 2.

The EPPE team was asked by Her Majesty's Treasury (HMT) to explore the effects of pre-school provision and family income (as measured by salary or lack of it). These analyses are reported in Appendix B.

Section Seven: Case Studies of Practice

Analyses of the quantitative data collected on every child in the study revealed that in some pre-school centres children made progress as expected or better progress than expected given their individual and home characteristics. In order to choose settings for the case study research we compiled a profile of each setting based on their child outcome data. We were therefore able to see the variation of child outcomes between centres and the range of outcomes within centres on the cognitive and social development outcomes.

All of the settings selected for case study demonstrate a range of practices, all of them demonstrate some above average outcome/s. Put another way, settings were chosen from a range identified as good (even if their children only made slightly more developmental progress than expected given a plotted trajectory based on their individual child and home characteristics) to excellent (where children made significant developmental progress above their projected developmental progress). We therefore consistently refer to settings throughout the section as good (slightly above average) or excellent (well above average) based on their child outcome data. Good and excellent are sometimes used in relation to whole centres or when we are reporting on differences between particular outcomes e.g. the 3 settings which had significantly added to their children's development in number concepts are contrasted with those where children are making progress as expected.

Data from 12 effective pre-school centres, reflecting good child outcomes, (cognitive and/or social/behavioural from our quantitative analysis) has been analysed to reveal a unique 'story' for each centre. The associated, DfES funded Researching Effective Pedagogy in the Early Years (REPEY) study (Siraj-Blatchford et al, 2002) allowed us to add two reception classes to our 12 EPPE cases, and we draw on these data in this section too (14 cases in total). The aim of the intensive case study analyses has been to attempt to tease out the specific pedagogical and other practices that are associated with achieving 'excellent' outcomes compared to those centres with 'good' or more 'average' outcomes.

For further, full details on the methodology and findings please refer to EPPE Technical Paper 10 (Siraj-Blatchford et al, 2003). This report provides comprehensive descriptions of one of each type of early years group setting representing the Foundation Stage (local authority day nurseries, private day nurseries, playgroups, nursery classes, nursery schools, integrated provision¹¹ (Early Excellence Centre) and reception classes). None of the cases reported fully is meant to be typical or representative of its type of provision.

The EPPE definition of 'effectiveness' is based on child outcomes, which was understood as a necessary but insufficient component of quality on its own. High quality provision is determined by the quality of child care and pedagogical practices that is offered as well. It was possible that care and pedagogy might be compromised at times to achieve effectiveness and we therefore had to look very closely at all of the practices that were a normal part of centre routine. Our report illustrates how the actual practices in the settings vary significantly.

In conducting the case studies, trained researchers, who were already familiar with the centres, spent two whole weeks in each centre collecting qualitative data. Case study data came from multiple sources to allow for assessment by source and the method of data collection. Information from policy documents was triangulated with manager and parent interviews, and, extensive naturalistic observations of staff (over 400 hours). In addition systematic focal child observations of children (254 target child observations) engaged in various curricular activities were conducted.

¹¹ The integrated setting was also an Early Excellence Centre; this type of centre is part of the Government's initiative to provide every region with a one-stop-shop childcare and education service that is responsive to the needs of children, families and local early years staff.

Findings

Every effort was made to collect comparable data across the case studies and to provide a framework for analysis allowing for comparison across centres. Case studies were compared in terms of their key quality characteristics, for example the pedagogy employed, the curriculum on offer, the ethos and the management and organisational strategies.

The term pedagogy in this section refers to the instructional techniques and strategies that enable learning to take place. It refers to the interactive process between teacher/practitioner and learner. It may also include how aspects of the learning environment (e.g. materials provided, organisational techniques, actions of the family and community etc.) are harnessed to promote learning in children.

Management and staff

Our data reveal that all the pre-school settings in which we conducted case studies had strong leadership and long serving staff. Most of the managers and staff had been in the settings over 3 years. We know from Technical Paper 5 (Taggart et al., 1999) that there is a high turnover of staff in the private sector, however, the private day nurseries in our case study sample had stability of staffing with retention between 3-9 years. In the other settings, staff, especially senior management, had been in post even longer and 10 to 20 years was not uncommon.

All the managers took a strong lead, especially in curriculum and planning. In most of the settings the strong leadership was characterised by a strong philosophy that was shared by everyone working in the centre.

The managers of the excellent centres had a strong educational focus, valued the importance of adult-child interaction, and supported their staff to develop better ways of engaging children.

In excellent centres, staff were encouraged to attend staff development sessions, although there was a great deal of variation in training offered and what staff were able to access. Recent developments enabling local authorities to offer training that includes personnel from all pre-school sectors would appear to be a positive way forward. However, the research indicates that training needs to be more sensitive to the needs of staff from different backgrounds. In our discussions with local authority personnel and staff in the case study centres we learned that there are wide variations in training backgrounds. Where there are trained teachers we found a stronger educational emphasis, with the teachers playing a lead role in curriculum planning and offering positive pedagogical role modelling to less well-qualified staff.

Ethos and climate of the settings

Perhaps most significantly, the case studies have shown us how diverse early years settings are. They show that there is no 'level playing field' in terms of the training of staff, staff salaries and conditions of service, adult-child ratios, resources or accommodation.

The case studies reveal great variation in the conditions and the service provided to children and families. For instance opening times and sessions varied greatly from children attending half-day sessions a few times a week to extended day-care and education being provided full time for 48-50 weeks of the year. There was similar variation apparent in the salaries paid to staff. The salary range for the playgroup was under £3,000 to £7,000 per annum, while the maintained sector was £15,000 to £32,000 and the private sector £11,000 to £24,000.

Most nursery classes and playgroups are small with two or three members of staff. Most private day nurseries and nursery schools are medium sized with 3-8 or more staff and some nursery schools with up to 12 staff. The more complex fully integrated (combined) centres (and early excellence centres) and local authority day care centres have large numbers of staff due to larger numbers of children on roll, extended provision, their outreach work to parents, role as trainers and dissemination work. For instance in Centre 426, which caters for 200 children and has Early Excellence Centre (EEC) status, the staff total is 55.

Furthermore, the number of children varies from 20 or so in playgroup and nursery classes to 100–200 in nursery schools, local authority day nurseries and fully integrated centres. The staff numbers reflect the numbers of children and the extent of the services on offer to families and other early years practitioners e.g. training support.

It is clear that EPPE has been able to locate moderate to excellent settings from among all types of providers. However, there were many fewer settings to choose from in the top range for playgroups and local authority day nurseries. Given the variation in staff pay, training and development this is unsurprising. There is no level playing field. In spite of this we found our case study centres were able to portray some or a good deal of quality characteristics in terms of their ethos:-

a) All case study settings generally presented a warm, caring, safe, secure and supportive approach to their children. All the settings engaged children in a range of different groupings, individual and group play, group focused table top activities, interest areas and snacks and story times.

b) All case study settings had a welcoming appearance. The displays on the whole reflected the children's work. Children were generally treated with respect. The centres were warm and inviting places. Staff appeared calm and engaged well with the children. All these centres had fairly good resources and, although not always ideal, space. However, the outdoor play environments varied greatly.

Analysis of the quantitative findings with the qualitative case studies data

The case study analysis has gone a long way in providing explanations for the patterns and associations between particular practices (as measured by the Early Childhood Environment Rating Scales R and E, see Sylva et al., 1999b 1999c; Technical Paper 6 and 6a) and developmental outcomes (see Technical Papers 8a and 8b). In our preliminary discussion, four patterns of association were identified in terms of the ECERS quality ratings and the child developmental outcomes scores for settings. Special attention and close analysis of the data from systematic observations suggested that we should investigate each of the following practices further:

- Adult-Child verbal Interactions.
- Differentiation and formative assessment.
- Discipline and adult support in talking through conflicts.
- Parental partnership with settings and the home education environment.

Adult-child interactions

We found that the 'excellent' settings encouraged relatively more 'sustained shared thinking'. By this we mean an episode in which, two or more individuals "work together" in an intellectual way to solve a problem, clarify a concept, evaluate activities, extend a narrative etc. Both parties must contribute to the thinking and it must develop and extend thinking. However, we found that this does not happen very frequently. In 'excellent' settings there were significantly more 'sustained shared thinking' interactions occurring between staff and children than in the 'good' settings. When this did occur, it extended children's thinking. Our investigations of adult-child interaction leads us to believe that periods of 'sustained shared thinking' are a necessary pre-requisite for excellent early years practice, especially where this is also encouraged in the home through parent support.

In 'excellent' case study settings, the importance of staff members extending child-initiated interactions was also clearly identified. In fact, almost half of all of the child-initiated episodes which contained intellectual challenge, included interventions from a staff member to extend the child's thinking. The evidence also suggests that adult 'modelling' is often combined with more sustained periods of shared thinking, and that open-ended questioning is also associated with

better cognitive achievement. However, open-ended questions made up only 5.1% of the questioning used in even these 'excellent' settings.

In the 'excellent' settings, the balance of who initiated the activities, staff or child, was very equal, revealing that the pedagogy of the excellent settings encourages children to initiate activities as often as the staff. Also, staff in excellent settings, regularly extend child initiated activities, but did not dominate them. The children in reception classes experienced a different balance of initiation, with a much greater emphasis upon staff initiated episodes. In all of the case study settings we found that the children spent most of their time in small groups. Our observations, however, show that 'sustained shared thinking' was most likely to occur when children were interacting 1:1 with an adult or with a single peer partner. Freely chosen play activities often provided the best opportunities for adults to extend children's thinking. Adults need therefore, to create opportunities to extend child-initiated play as well as teacher-initiated group work, as both have been found to be important vehicles for promoting learning.

We found that level 5 qualified staff (almost all trained teachers in our study) provided children with more experience of academic activities (especially language and mathematics) and they encouraged children to engage in activities with higher cognitive challenge. While we found that the most highly qualified staff also provided the most direct teaching (instruction through demonstration, explanation, questioning, modelling etc.) we found that they were the most effective in their interactions with the children, using the most 'sustained shared thinking'. Furthermore, we found that less well qualified staff were significantly better pedagogues when they worked alongside qualified teachers.

Differentiation and formative assessment

The analysis of teacher observations suggests a positive association between curriculum differentiation, formative assessment, and the process of selecting activities to provide the optimum cognitive challenge, and 'sustained shared thinking'. The practice of adults 'modelling' (or demonstrating) positive attitudes, behaviours, and appropriate use of language, has also been identified as a valuable pedagogic strategy to be employed in early childhood. The best of our case study settings kept good records and engaged with parents about their child's progress on a weekly or monthly basis. However, we found little evidence of detailed formative feedback to children *during* their engagement with tasks.

Discipline and adult support in talking through conflicts

The excellent settings adopted discipline/behaviour policies that involve staff in supporting children in rationalising and talking through their conflicts. In other words a more problem solving approach was adopted. Three settings with very positive social and behavioural outcomes had this practical approach supported by a strong behaviour management policy with which all the staff were conversant. In settings that were less effective in this respect, our observations showed that there was often no follow up on children's misbehaviour or conflicts and, on many occasions, children were 'distracted' or simply told to stop.

Parental partnership

The case studies indicate that where a special relationship in terms of shared *educational* aims had been developed with parents, and pedagogic efforts were made by parents at home to support children, sound learning took place even in the absence of consistently good pedagogic practice in the pre-school setting. The excellent settings shared child-related information between parents and staff, and parents were often involved in decision making about their child's learning programme. This level of communication was particularly the case in private day nurseries. While settings providing for the needs of children from the higher socio-economic groups benefited especially from this, the potential benefit of adopting a combined approach (good pedagogic practice within the setting and support for the home learning environment) in settings serving more disadvantaged areas is also clear. In more disadvantaged areas, staff in settings had to be pro-active in influencing and supporting the home education environment in order to support children's learning. The evidence suggests that the 'excellent' settings in disadvantaged areas recognise the importance of, and were pro-active in encouraging strong

parental involvement in the educational process, by taking the time to share their curriculum, pedagogical strategies and educational aims with parents. They offered advice on how parents could complement this within the home learning environment and how this impacted on young children's development.

Pedagogy

Whilst this section describes the pedagogy in a limited number of Foundation Stage settings, more detailed information on reception class practices, childminders and the Foundation Stage curriculum is reported in the Researching Effective Pedagogy in the Early Years (REPEY) Project report (see Siraj-Blatchford et al., 2002).

Knowledge of the curriculum and child development

The analysis has shown that practitioners' knowledge and understanding of the particular curriculum area that is being addressed are vital. A good grasp of the appropriate 'pedagogical content knowledge' is a vital component of pedagogy and is just as important in the early years as at any stage of education. The research found that, even in these 'good' and 'excellent' settings, there were examples of inadequate knowledge and understanding of curriculum areas, especially in the teaching of phonological skills. Our study shows that early years staff may need support in developing their 'pedagogical content knowledge' in the domains of the *Early Learning Goals* stated in the Curriculum Guidance for the Foundation Stage (QCA/DfES 2000). Educators who demonstrate good 'pedagogical content knowledge' display a firm understanding of curriculum content. Moreover we found, crucially, that the most 'effective' educators also demonstrated a knowledge and understanding of what part of that content was most relevant to the needs of the children. They were also able to draw upon knowledge of the pedagogical strategies found to be most effective in teaching any particular content.

In summary effective pedagogy in the early years involves both the kind of interaction traditionally associated with the term "teaching", and also the provision of instructive learning play environments and routines.

The 'excellent' settings provided both teacher-initiated group work and freely chosen, yet potentially instructive play activities. Children's cognitive outcomes appear to be directly related to the quantity and quality of the teacher/adult planned and initiated focused group work for supporting children's learning. The research findings support the general approach taken in *Curriculum guidance for the foundation stage (QCA/DfEE 2000)*. The settings that viewed cognitive and social development as complementary seemed to achieve the best outcomes. Trained teachers were most effective in their interactions with children, using the most 'sustained shared thinking' interactions.

Section Eight: The Effects of Pre-School on Children's Attainment and Progress up to the end of Year One.

This section summarises the findings on cognitive attainment, progress and social/behavioural development from entry to reception classes (age rising 5 years) through to the end of Year 1 (age 6+ years) in primary school. EPPE uses an educational effectiveness design to explore the impact of different child, family, and home learning environment factors on a range of child outcomes. The research explores whether pre-school influences found to be important in accounting for variations in children's progress and development up to the time they start primary school continue to show relationships with outcomes in the early years of primary school. The analyses explore whether 'home' children (those who had very little or no pre-school centre experience) continue to lag behind other children, and whether duration of time, quality and effectiveness of pre-school attended still show significant positive effects on attainment and social behaviour over the early primary school years.

When the children were at the end of Year 1 (6 years old) we administered two assessments of cognitive attainment, reading and mathematics (measured by the NFER-Nelson Primary Reading Level 1 and the Maths 6 tests). Also social/behavioural development was assessed by teachers using an extended version of the Goodman (1997) Strengths and Difficulties Questionnaire. Four measures of social behaviour are reported: Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour.

EPPE uses statistical techniques (multilevel modelling) to measure the influence of different background factors on young children's attainments at different time points. Similar analyses were conducted earlier when children entered primary school. A comparison of the results at the two time points allows us to establish whether background influences change (reduce or increase) over the first years of school. Contextualised analyses are used to identify the unique (net) contribution of particular characteristics to variation in children's outcomes. Thus, for example, the impact of family SES was established while taking into account the influence of mother's qualification levels, low income, ethnicity, birth weight, home learning environment etc. It is of policy interest to establish the nature and strength of such background influences, individually and in total, because they are relevant to issues of equity and social inclusion.

Value added multilevel models have already investigated children's progress over their time in pre-school I (see Section 6). These analyses were used to create value added indicators of each pre-school centre's effectiveness in promoting progress in a given outcome (e.g. reading, maths and aspects of social behaviour) during the pre-school phase of the study. Centres where children had made significantly greater progress than predicted on the basis of prior attainment and intake characteristics can be viewed as *more effective* (positive outliers in value added terms). Centres where children made less progress than predicted can be viewed as *less effective* (negative outliers in value added terms).

Previous analyses over the pre-school period showed that variations in quality and extent of time in pre-school had an impact on children's cognitive and social/behavioural gains. They indicated that higher quality and longer pre-school experience have a positive impact. This section builds on these earlier findings to explore whether the positive impacts of pre-school are still evident in child outcomes measured at the end of Year 1 of primary school.

Findings concerning a sample of 'home' children, who had no pre-school centre experience before starting primary school, are reported for comparison with the pre-school sample. Analyses explore whether 'home' children are still at a disadvantage for cognitive development (reflecting differences evident when they started primary school) and the extent to which any attainment gap can be attributed to the absence of pre-school experience, rather than differences in background characteristics. In addition other analyses focus on the children who attended pre-school to explore any continuing pre-school impact. Equivalent analyses of four

social/behavioural measures (Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour) are also reported.

The impact of a child's background

The impact of child background factors is broadly in line with that found during the pre-school period and at entry to primary school. Multiple disadvantage continues to show significant negative associations with all outcomes in Year 1. However, the background influences are relatively weaker in accounting for variations in reading and mathematics attainments at the end of Year 1 than was the case for cognitive development at earlier time points. Both pre-school and school influences may reduce the power of background influences on attainment in subjects such as reading and mathematics, in comparison with assessments of General Cognitive Ability (GCA). By contrast the impact of background on social behaviour shows stronger influences on Positive Social behaviour and Anti-social behaviour at the end of Year 1 than during the pre-school period.

Home learning environment

Aspects of the home learning environment (as measured at age 3+) continue to show significant positive effects on attainment and social behaviour, net of the influence of child and family background influences such as family SES and mothers' qualification levels.

The continued impact of pre-school - Duration, quality and effectiveness

The duration of pre-school continued to show a significant positive link with children's attainments in reading and maths at age 6 years plus. A longer period of pre-school (measured in months) was associated with greater gains, even when other significant factors are controlled. Taken together with the findings reported on the pre-school period, the results suggest that an extended period of pre-school experience has significant benefits in preparing young children for a better start to school and that such children continue to show better progress during Key Stage 1.

Quality of pre-school provision is regarded as a vital feature of early years education and care. The EPPE study explored variation in the quality of individual centres using the Early Childhood Environment Rating Scale (total ECERS-E and ECERS-R scales). Higher quality as assessed by the ECERS-E scale was significantly positively related to children's cognitive progress over the pre-school period in several areas. Likewise higher quality measured by ECERS-E and R scales showed significant links with better social/behavioural outcomes.

Children who had attended higher quality pre-school provision tended to show better outcomes at the end of Year 1, although this appears to be related to duration of pre-school experience. For high quality to show a continued impact it is important that it is combined with a longer duration for cognitive outcomes. A short or medium time in high quality provision does not confer such a great advantage, whereas a longer duration (3 years plus associated with an earlier pre-school start) has a greater impact on cognitive attainment still evident at age 6 years plus. The advantages of a longer duration and high quality pre-school show a stronger impact for mathematics than reading at age 6 years plus. For social behaviour, children who had attended high quality provision showed significantly better outcomes in terms of Self-regulation, Positive social behaviour and reductions in Anxious behaviour. For Anti-social behaviour children who had attended low quality provision showed significantly poorer outcomes than those who had attended high quality provision. The negative effects of long duration previously reported can be ameliorated by high quality provision.

Children with no pre-school experience

Comparison of the 'home' group (who had no centre experience) with children who had attended a pre-school centre showed that both the characteristics and attainments of 'home' children vary significantly from those who had been in pre-school. Despite statistical control, caution should be exercised when concluding that the much lower attainments of the 'home' group are directly due to lack of pre-school experience. Nonetheless, analyses of attainment and social behaviour

at primary school strongly suggest that pre-schooling provided a significant cognitive boost at entry to reception and had benefits on most areas of social behaviour, particularly Peer sociability.

Analyses of attainments at the end of Year 1 explored the impact of child, parent and home environment factors. Even with influences controlled, 'home' children's cognitive attainments are poorer than those of children who had attended a pre-school centre. The results also point to a link between a longer duration of pre-schooling and higher cognitive attainments, in comparison with the 'home' group. These findings, combined with those on the advantages of an early start date, continue to indicate that pre-schooling has a strong positive impact on young children's cognitive attainment. The implication is that children without pre-school experience remain at a disadvantage during their first year of primary school. Further analyses exploring 'at risk' status in relation to special educational needs indicate that home children remain over-represented in the cognitive 'at risk' category in Year 1, compared with other EPPE children, even when multiple disadvantage is held constant. In addition, proportionately many more 'home' children were identified by their teachers as showing some form of SEN during Key Stage 1 (see EYTSEN Technical Paper 2, 2004 for details).

Social/behavioural outcomes also continue to indicate that the positive pre-school impact is sustained through to the end of Year 1. However, while quality of pre-school shows a positive impact in reducing Anti-social behaviour after the age of 3+ (over the pre-school period) there was a weak but significant association between very long duration of pre-school (associated with an earlier start age under 2 years) and increases in scores on the Anti-social measure in Year 1. However, only a very small number (under 5%) show any increased scores. At age 6 Self-regulation, Positive social behaviour and reductions in Anxious behaviour are particularly associated with higher quality of the pre-school attended and more effective pre-school centre experience.

Overall the Year 1 analyses indicate that the early boost given by pre-school has not washed out by age 6 years plus, nor have 'home' children caught up. The absence of pre-school has a continued negative influence on cognitive and several social/behavioural outcomes, although children who had very long duration in pre-school show relatively less good scores on the Anti-social measure in Year 1 (These are children with extensive group care under two years of age). This risk should be placed in the context of very positive scores for most children on this aspect of behaviour and reduced Anxiety and improved Self-regulation evident.

The longitudinal follow up of EPPE children confirms that pre-school continues to show a positive impact on most developmental outcomes over the early years of primary school. This supports earlier conclusions that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children a better start to primary school. The duration of pre-school is especially influential for cognitive attainment in reading and maths, but both effectiveness and quality still show an impact on child outcomes. For example, the change in effect size for duration, over the early years of primary school for 2 outcomes is illustrated below.

Table 8.1: Effect of duration at entry to school and end of Year 1

Duration	Effect of duration at entry to school and end of Year 1			
	Reading		Maths	
	Entry to school	End of Year 1	Entry to school	End of Year 1
Up to 1 year	0.12	0.26	0.34	0.32
1 – 2 years	0.28	0.17	0.45	0.36
2-3 years	0.39	0.26	0.56	0.46
> 3	0.49	0.35	0.55	0.52

Other results again point to the continuing influence of the pre-school and home learning environment, although impact is somewhat weaker than at earlier time points, which may be due to the accumulating and powerful influence of the primary school.

Section Nine: Did Pre-School Experience lead to Lasting Gains in Cognitive and Social/behavioural Development to the end of KS 1?

Over the pre-school period variations in duration and quality of pre-school experience had an impact on children's cognitive and social/behavioural progress. Higher quality and longer pre-school experience were predictors of better child outcomes measured at entry to primary school. There were continuing positive effects on children's cognitive and social/behavioural development at the end of Year 1. To what extent do the effects continue until the end of Key Stage 1 (age 7 years)? This is an important milestone because past research has shown that attainment at age 7 years remains a good predictor of long-term educational outcomes as measured by public examination results at age 16 years (see Sammons et al., 1995).

This section focuses on two measures of cognitive attainment assessed at the end of Year 2, reading and mathematics (using decimalised levels measures based on national assessment reading and mathematics results, combining levels and test scores within levels). Social/behavioural development was assessed by teachers using an extended version of the Goodman (1997) Strengths and Difficulties Questionnaire. A range of statistical methods was used to analyse data for 2793 children for whom attainment and/or social/behavioural outcome data was collected in Year 2, representing 91.6 per cent of the total child sample assessed at entry to primary school (n=3048 children with equivalent entry to primary school cognitive and/or social behaviour measures)¹². Four measures of social behaviour are reported: Self-regulation, Positive social behaviour, Anti-social behaviour and Anxious behaviour.

Findings for a sample of 'home' children, who had no pre-school centre experience before starting primary school, are also reported for comparison with the pre-school sample. The contextualised multilevel analyses explore whether 'home' children are still at a disadvantage in terms of cognitive attainments at the end of Year 2 (reflecting differences evident when they started primary school) and the extent to which any attainment gap can be attributed to the absence of pre-school experience, rather than differences in background characteristics. These analyses strengthen the evidence concerning the impact of pre-school provision or lack of it. In addition, results from analyses which focus just on the sample of children who attended pre-school are reported to further explore any continuing pre-school impact related to quantity, effectiveness and quality of pre-school centre provision on reading and mathematics outcomes.

At the end of Key Stage 1 (Year 2) cognitive findings were generally in line with those found in Year 1. Once again, the results confirm the impact of specific background influences on young children's cognitive attainments and progress. For social/behavioural development the impact of the effectiveness of the pre-school is still evident at the end of Key Stage 1. They also provide additional evidence concerning the impact of pre-school and show that pre-school effects are not 'washed out' by the end of Year 2 in primary school. However, it is possible that the somewhat weaker pre-school effects found at age 7 are a result of the accumulating (and powerful) effects of the primary school. It is also possible that weaker cognitive effects at age 7 are due to the use of national assessments as the main cognitive outcome measure. These assessments vary from year to year and they do not possess as strong psychometric characteristics as the standardised tests of reading and maths used at age 6.

The impact of a child's background

The results indicate that child and family factors continue to show a significant relationship with attainment in both reading and mathematics, but were weaker predictors of social behaviour than of academic outcomes in Year 2. Age remains significant, but its effect is reduced for cognitive outcomes in comparison with relationships in the pre-school period. The impact of English as an Additional Language (EAL) is also reduced. Girls show significantly better reading results but gender is not significant for mathematics attainment. Mother's education remains influential, with

¹² It should be noted that numbers of children sometimes vary due to incomplete data on a few control variables.

children whose mothers have a degree or higher degree showing higher attainment. Likewise family SES is also significant, with those from semi and unskilled manual backgrounds, or whose parents had never worked showing relatively lower attainment, and those from professional non-manual group relatively higher results in national assessments. Low income, as indicated by free school meals, also has a moderate impact, with children from poor families having lower attainments.

Taken together, background characteristics are weaker predictors of reading and mathematics attainment at age 7 years than of General Cognitive Ability (GCA) at age 3 years, or of attainment in pre-reading, early number or language at entry to primary school. In particular, the impact of EAL status has reduced, probably reflecting improvements in fluency in English as children move through pre-school and primary school. Both pre-school and school influences may be acting together to help reduce the power of background influences on attainment in subjects such as reading and mathematics, in comparison with earlier assessments of cognitive ability. By contrast, the impact of background on social behaviour (which was much weaker during the pre-school period than was found for cognitive outcomes) shows somewhat stronger influences on Positive social behaviour and Anti-social behaviour as children move through Key Stage 1. In general older children and girls show better social behaviour at the end of Key Stage 1, especially for Self-regulation.

Home learning environment

The home learning environment (HLE), as reported by parents in the pre-school period, was found to exert a strong impact on cognitive development and a weaker positive impact on aspects of social behaviour at school entry and at age 6, even when parental qualification levels and family SES and low income are controlled. Aspects of the home learning environment (related to activities as reported in parent interview) experienced by children during the pre-school period continue to show significant positive effects on attainment and social behaviour at age 7 years plus, net of the influence of child and family background influences such as family SES and mothers' qualification levels. Boys and girls have significant differences in HLE, with boys tending to have lower scores. Such differences in this feature of parenting may account for some of the gender differences in cognitive attainment and social behaviour evident from age 3 years onwards. The results on HLE confirm that such pre-school experiences remain significant predictors of later educational outcomes at the end of Key Stage 1.

The continued impact of pre-school – Duration, quality and effectiveness

Analyses explored cognitive attainment at the end of Year 2 and whether this relates to duration (in terms of number of months), quality and effectiveness of pre-school experience. Taken together, in all comparisons the attainment of the 'home' group is significantly poorer than that of children who had attended a pre-school centre. It is not possible to fully separate the influence of quality, duration and effectiveness of pre-school attended in comparisons of the pre-school and 'home' sample, since, in practice, pre-school is experienced as a 'package' combining these different features. However, the findings support the conclusion that these three features generally remain predictors of better cognitive attainment during Key Stage 1. Also, measures of the effectiveness of the pre-school attended continue to show a significant positive impact on young children's subsequent attainments at the end of Key Stage 1.

In terms of progress after entry to primary school, there is no indication that pre-school children made greater gains than the 'home' children. The absolute attainment scores of the pre-school children remains significantly higher than the attainment of the 'home' children at the end of Key Stage 1, although there has been a modest narrowing of the gap from the 'home' children's lower starting point.

The results suggest that, overall, attending a pre-school rather than none has a positive impact. In addition, experiencing a longer duration, higher quality and more effective pre-school centre has significant benefits in preparing young children for a better start to school. The Year 2 analyses suggest that such children continue to show better reading and mathematics attainment in national assessments at the end of Key Stage 1. The lessening of effect sizes has been

mentioned earlier in light of two explanations: the rise of the 'primary school effect', or the use of national assessments as outcome measures at age 7 rather than standardised tests at age 6 and at school entry. The changes in effects over the school period vary by outcome and are illustrated below.

Table 9.1: Effect of duration at end of Year 1 and end of Year 2

Duration	Effect of duration at end of Year 1 and end of Year 2			
	Reading		Maths	
	End of Year 1	End of Year 2	End of Year 1	End of Year 2
Up to 1 year	0.26	0.29	0.32	0.21
1 – 2 years	0.17	0.27	0.36	0.18
2-3 years	0.26	0.29	0.46	0.22
> 3	0.35	0.36	0.52	0.29

The impact of duration of pre-school upon reading is maintained in approximately equal magnitude right through to the end of Key Stage 1. However, the impact of duration of pre-school upon maths is reduced by about 40-50 per cent at the end of Year 2 as compared with the end of Year 1. This indicates that primary school maths is starting to reduce the impact of pre-school. This could be related to the curriculum emphasis on maths evident with the introduction of the National Numeracy Strategy.

For social/behavioural outcomes in Year 2 there is less evidence of the positive impact of duration and quality of pre-school. Individual pre-schools differed in the benefits for children's development that they provided. Where pre-schools provided greater developmental benefit, they were regarded as more 'effective'. Hence the effectiveness (children showing more/less progress than expected given their initial profile and background characteristics) of a pre-school is a measure of the total benefit associated with the characteristics of that pre-school. The effectiveness of the pre-school centre attended in promoting better social/behavioural and cognitive outcomes continues to show a positive impact for the pre-school sample up to the end of Year 2.

Children who do not experience pre-school

Data were collected for a group of 'home' children with none or only minimal pre-school centre experience. Comparison of the 'home' sample with children who had attended a pre-school centre showed that both the characteristics and attainments of 'home' children vary significantly from those who had been in pre-school. It is not possible to conclude with certainty that the much lower attainments of the 'home' group are directly due to lack of pre-school experience.¹³ Nonetheless, earlier statistical analyses of attainment and social behaviour at primary school entry strongly suggest that pre-schooling provided a significant cognitive boost at entry to reception and had benefits on most areas of social behaviour, particularly Peer sociability.

Analyses of attainments at the end of Year 1 and Year 2 explored the impact of child, parent and home environment factors. Even when these important influences are controlled, 'home' children's cognitive attainments are poorer than those of children who had attended a pre-school centre. These findings add weight to earlier conclusions that pre-schooling has a beneficial impact on young children's cognitive attainment. 'Home' children remain at a disadvantage during Key Stage 1 and evidence of a significant attainment gap remains in Year 2.

By contrast, the difference between the 'home' and pre-school group had reduced and were no longer significant for the four measures of social behaviour studied. This is in contrast to findings for the 'home' group at entry to primary school and in Year 1. It appears therefore that the beneficial impact of pre-school on cognitive attainment is more long lasting than that on social behaviour. Social/behavioural outcomes may be more influenced than cognitive outcomes by the primary school peer group. Still this finding is at odds with the Perry Pre-school study, which

¹³ A controlled experiment (which would not be feasible on either ethical or practical grounds) would be needed to draw firm conclusions.

indicated that the social outcomes of pre-school were more salient than the cognitive ones by adolescence. Data from the EPPE continuation study, will follow children into adolescence, to shed light on this.

Overall, the Year 2 analyses suggest that the early cognitive boost given by pre-school on subsequent reading and mathematics attainment has not washed out by the end of Key Stage 1, nor have 'home' children caught up. Thus, lack of pre-school experience can be seen to disadvantage cognitive attainment well into the primary school. Although lack of pre-school is a disadvantage at school entry (in terms of absolute attainment), the gap between pre-school and 'home' children does not widen.

The longitudinal follow up of EPPE children confirms that pre-school continues to show a generally positive impact on developmental outcomes. It supports earlier conclusions that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children, in particular, a better start to primary school. Pre-school experience can be viewed as a 'package' with attributes of quality, effectiveness and duration. Analyses suggest that these aspects continue to influence child outcomes at the end of Key Stage 1 although the effects tend to be weaker than those evident at entry to primary school (age rising 5 years) particularly for social behaviour.

The research again points to continuing significant and positive influence of parents' activities as measured by the pre-school home learning environment, and of child and family characteristics. In addition, the Year 2 analyses, in line with those in Year 1, indicate that there are significant primary school differences. These will be explored in the EPPE 3-11 continuation study, which is following the same group of pupils up to the end of Key Stage 2 (2003 – 2008).

Section Ten: Children ‘At Risk’ of Special Educational Needs.

Two years into the project, the DfES commissioned the EPPE team to conduct an investigation into children who might be ‘at risk’ of special educational needs (SEN). It was recognised that *definitions* and *criteria* for SEN are contested concepts, particularly for very young children. While very few children in pre-school have been formally assessed as having SEN, many may exhibit behaviours that give cause for concern amongst the adults who care for them. It should be noted that children whose disability or medical condition require specialist assistance are likely to attend a specialised centre and were therefore unlikely to be enrolled in the six types of provision included in the research and be part of the EPPE sample.

The Early Years Transition and Special Educational Needs (EYTSEN) project was therefore a sub-study within EPPE. EYTSEN focussed on children from age 3 to age 6 years (from pre-school to the end of Year 1 in primary school). The study used a range of information to identify children ‘at risk’ of developing SEN in terms of either cognitive or social/behavioural development and investigated the links with a variety of child, parent and family characteristics. It also described variations in the policies and provision offered by different pre-school settings and primary schools designed to support children with special educational needs. The study was innovative in using different sources of data including individual assessments of different aspects of children’s cognitive attainment, pre-school workers’ and teachers’ assessments of their social behaviour, parent interview and questionnaire data, and information about pre-school centres. The inclusion of ‘home’ children who had not attended a pre-school setting (or had minimal experience of pre-school) enables the study to explore whether children without pre-school are at greater ‘risk’ of SEN. The findings of this sub-study are reported in detail in a series of three EYTSEN Technical Papers (see Appendix D) as well as in a DfES Research Report (RRX15-03) and Research Brief (RBX15-03) both available at www.dfes.gov.uk/research.

Children may be perceived differently by parents, pre-school workers and teachers (Hay et al., 1999; Heiser et al., 2000). At some stages particular children may be identified as giving cause for concern but not at others. Likewise different adults’ concepts of SEN can vary. Young children develop differently, so changes in status in terms of ‘showing’ some form of ‘need’ may be expected to take place between the ages of 3 and 6 years (for further discussion of the issues surrounding the identification of special educational needs of young children see Scott and Carran, 1989; Roffey, 1999). As SEN is such a contentious issue the research chose to adopt a means of identification highlighting those children ‘at risk’ of developing SEN given their characteristics during pre-school. This ‘at risk’ status is a more appropriate for very young children than diagnosed SEN, which rarely occurs for children during pre-school.

Aims

The aims of the EYTSEN study were to:

- 1 Examine the impact of pre-school settings on the progress and development of children who may be seen as vulnerable or ‘at risk’ of developing SEN over the pre-school period and in transition to school until the end of Year 1.
- 2 Identify the characteristics of those children who are identified as ‘at risk’ for different measures of cognitive or social/behavioural development.
- 3 Analyse the distribution of the ‘at risk’ groups of children across different types of pre-school provider.
- 4 Analyse patterns of progress and changes in cognitive and social/behavioural development of the various ‘at risk’ groups across the pre-school period and into KS1, including the extent to which ‘at risk’ groups are identified as having SEN at primary school.
- 5 Identify pre-school centres’ policies and practice in relation to the early identification of SEN as reported by centre managers.

6 Examine the relationship between pre-school centre quality characteristics and the subsequent progress and development of different 'at risk' groups.

7 Investigate parents' perceptions of whether their child has special educational needs and their views and experiences of provision to support their child's needs.

The Sample

The EPPE design over-sampled areas with ethnic diversity and low socio-economic status (SES) families. This was to ensure that sufficient numbers of children from a variety of backgrounds were studied. One consequence of this sampling strategy is that the rates of SEN represented in EYTSen may have slightly overestimated the rates in the 'general' population of children at age 3 plus years. However, the data for 6 year olds on the proportions with SEN in EYTSen is broadly in line with national statistics for primary age pupils. This suggests that any overestimation of SEN within EYTSen is likely to be small. The sample for the EYTSen study was essentially the total EPPE sample with specific sub-groups, defined below, regarded as being 'at risk' for developing SEN.

Methodology

The EYTSen study used a range of sources of data to explore the notion 'of risk' for SEN:

- child assessments were used to determine 'risk' for SEN in terms of cognitive and social/behavioural development
- parental questionnaires administered when the children were in primary school were used to collect additional details from parents particularly in relation to SEN.
- 'child profiles' were completed by primary school teachers who also reported a child's SEN status and development.

Thus, a range of sources of information were available to explore a child's SEN status.

In addition to the above interviews with parents and pre-school centre managers provided details about the home background and the provision available during pre-school. Observations were conducted by trained researchers to explore aspects of a pre-school centre 'quality' and the environment experienced by children.

The EYTSen study analysed these different sources of information and the links between them to inform policy and practice related to the characteristics of young children 'at risk' of SEN and pre-school centre practices associated with changes in 'risk status'.

The longitudinal nature of the data allowed the EYTSen research to investigate possible SEN for the same group of children over three time points (at entry to pre-school, at entry to primary school and at the end of Year 1).

Concepts of Special Educational Needs (SEN) and risk for SEN

Special Educational Needs has been defined by the DfES as follows:

"Children have special educational needs if they have a learning difficulty which calls for special educational provision to be made for them. Children have a learning difficulty if they:

- a) have more significant delay in learning than children of the same age*
- b) have a disability that prevents or hinders them from making use of educational facilities generally provided for children of the same age in schools within the area of the local education authority*
- c) are under compulsory school age and fall within the definitions a) or b) above, or would do so if special educational provision was not made for them.*

Children must not be regarded as having a learning difficulty solely because the language or form of language of their home is different from the language in which they will be taught." (DfES 2001, SEN Code of Practice 2001, p. 6)

The Code of Practice, (which is a set of guidelines issued by the UK's DfES to help assist those working with children to identify and support children who they suspect as having SEN) while laying emphasis on cognitive attainment, also considers the child's social and behavioural development. A child may receive a statement of SEN if their behaviour is such that it affects

their attainment potential. The Code of Practice (2001) stresses the benefits of early identification of needs.

The EYTSEN project examined special educational needs within a framework of potential 'risk' during the pre-school period, rather than attempting to identify a fixed cognitive or social/behavioural problem. Both cognitive and social/behavioural measures of young children's development were considered relevant. The project explored the relationships between the two domains and acknowledges the need to look at multiple outcomes within the education and care system and their association with different child, parent and family characteristics, particularly the impact of multiple disadvantage and the home learning environment.

Developing a simple but robust definition of children who may be considered 'at risk' of some form of SEN was an important component of the EYTSEN study. The EYTSEN study used cognitive and social/behavioural assessments to identify those children in the EPPE sample who were 'at risk' of SEN at three different time points. It should be noted that for social/behavioural development two factors were considered in detail: Peer sociability and Anti-social/worried/upset behaviour. For cognitive 'risk' children whose scores fell 1 standard deviation below the mean for a national sample were classified as 'at risk' and those that were 1 standard deviation below the mean for the EPPE sample were considered at 'strong risk'. For social/behavioural risk children who were worse than the mean by 1 standard deviation or more for the EPPE sample on either peer sociability or anti-social/worried/upset were considered 'at risk'.

Distribution of 'at risk' children across different types of pre-school providers

At the beginning of the study (3+ years) private day nurseries were less likely to serve children at cognitive 'risk', reflecting differences in the communities they served. The majority of children in integrated centres were identified as 'at risk' (58%). Fairly substantial proportions of children from local authority day nurseries (42%) and playgroups (41%) were also identified as 'at risk' in relation to national norms for cognitive attainment at age 3 years plus. For the more stringent '*strong cognitive risk*' measure, 40% of the children in integrated centres were classified as 'at risk' at entry to pre-school.

For social/behavioural measures more children in integrated centres were classified as 'at risk' for Peer sociability (26%), followed by nursery classes (20%) and playgroups (just under 20%). Fewer children in private day nurseries (11%) or local authority day nurseries (14%) were classified as 'at risk' for Peer sociability at entry to the study. For the Anti-social/worried/upset measure significantly more children in local authority day nurseries were classified as 'at risk' at entry to the study (29%) followed by integrated centres (22%). This is likely to be related to the incidence of disadvantage amongst such groups and also their earlier start at pre-school. A weak but significant link between an early start at pre-school and increased Anti social/worried/upset behaviour was noted, although an earlier start was also associated with significantly better cognitive attainment.

SEN status at school

Once children had entered school, information from class teachers on children's SEN status was obtained. Fewer than 30% of children were identified as having had or currently having SEN at school (27%), with far more of the 'home' group being recognised as showing SEN (42.3%) than children who had attended a pre-school centre (25.5%). This is further evidence that children who miss out on pre-school are more likely to experience learning difficulties and are particularly vulnerable for SEN at school.

Most children identified with SEN received extra help (e.g. small group or individual support) within their primary school. However, a small number (under 1 in a 100) attended a special class outside school. Proportionately more 'home' children attended a special class or were taught by a special teacher for some of the time.

For cognitive development there was a significant overlap between those identified as being 'at risk' and those formally identified as having SEN at primary school. Over two thirds (67%) of

children classified as ‘at risk’ for reading (at aged 4+) and had been identified as showing a SEN at aged 6+, and over 72% had been recognised or given special help at some point in primary school. The relationship for mathematics was only slightly weaker (63% of those ‘at risk’ for mathematics at age 4+, were identified as showing a SEN currently, and nearly 70% had been recognised or received special help at some point in primary school). Children identified by teachers showed particularly low scores in reading and mathematics at the end of Year 1. This suggests that schools tend to identify children with more extreme difficulties (very low scores). Also there appeared to be some children with poor cognitive attainments whose needs were not apparently identified at school and who did not receive any extra support during Key Stage 1.

For social/behavioural development the overlap between the research definition and identification at school was less marked. A little over a half of children identified as ‘at risk’ for one of the three social factors studied in Year 1 were reported to be recognised as having SEN (52% for those ‘at risk’ for Emotional symptoms, 55% for those ‘at risk’ for Conduct problems and 55% for those ‘at risk’ for Peer problems).

Characteristics of children identified in different ‘at risk’ categories

Children who were identified as having SEN were more likely to be: boys (61% compared with 52% of all children), have EAL (12.8% compared with 7.5% of all children) and had mothers who had no qualifications (28% compared with under 18% for all children). Children reported to have SEN at primary school also had significantly higher scores on the multiple disadvantage index (over 41% scored on 3 or more factors compared with under 25% of all children). They also tended to have lower scores for the home learning environment.

Detailed information, about a wide range of child, parent and home environment characteristics of children at entry to pre-school (age 3+ years), was collected from parent interviews. The project sought to explore the relationships between these measures and children’s ‘at risk’ classification at different time points. Research has consistently indicated that there are strong associations between certain factors (such as low SES, low income, mother’s educational level) and poor cognitive attainment at school (for example, see Essen & Wedge, 1982; Mortimore & Blackstone, 1982; Mortimore et al, 1988; Parsons & Bynner, 1998). The concept of the ‘cycle of disadvantage’ has been used to describe such associations and patterns of continuing disparities across generations and between different social groups.

Few large-scale research studies have explored these associations in relation to concepts of ‘at risk’ status and definitions of SEN at different ages, and changes over time. This project developed an index of multiple disadvantage, and sought to establish whether this shows good prediction of ‘at risk’ status. The following shows factors considered within the index:

Table 10.1; Factors in the multiple ‘at risk’ index

Child Characteristics	Disadvantage Indicator
First language	English not first language
Large family	3 or more siblings
Pre-mature/Low Birth Weight	Premature or below 2500 grams
Parent Characteristic	
Mother’s highest qualification	No qualifications
Social class of father’s occupation	Semi-skilled, unskilled, never worked, absent father
Father’s employment status	Not employed
Young mother	Age 13-17 at birth of EPPE child
Lone parent	Single parent
Mother’s employment status	Unemployed
Home environment Characteristics	
Home environment scale	Bottom quartile

Many factors are inter-related (e.g. the mother’s qualification levels and employment status, father’s SES, family size, premature birth, marital status, one parent family etc.). Therefore, it was important not to attribute causality to individual factors. For example, more children whose

mothers were not working were identified as being 'at risk', but the link may reflect the higher qualifications and smaller family size associated with mothers in employment.

Children who did not have English as their first language (EAL children), showed a higher incidence of identification of cognitive 'at risk' status at entry to pre-school. This was most noted for the '*strong* cognitive risk' measure, which includes a verbal component, but was less marked for non-verbal measures. At later ages the association of EAL with children's cognitive 'at risk' status for Pre-reading and Early number concepts was much weaker for the main pre-school sample. This suggests that EAL children who attend pre-school tend to catch up as they get older (probably as fluency in English improves). Given that EAL children were over-represented in the 'home' group, this finding has implications for practice because such children may have fewer opportunities to interact with a wider circle of adults and peers and thus find it more difficult to adjust to primary school. Increasing the uptake of pre-school places amongst EAL groups may improve the educational outcomes of such children in primary school.

Information about parents' home activities with their pre-school child was collected at interview. A variety of measures showed a significant positive link with cognitive attainment and to a lesser extent, with social/behavioural measures (for example, frequency parents reported reading to child, teaching songs and nursery rhymes, painting and drawing, playing with letters and numbers, visiting the library, teaching alphabet, teaching numbers). A Home Learning Environment (HLE) index was created which showed a strong relationship with cognitive attainment at entry to pre-school, and at primary school entry. The Home Learning Environment also showed a link with greater cognitive progress over the pre-school period, and with social/behavioural development.

The Home Learning Environment was only moderately associated with mother's educational level or family SES ($r=0.3$), indicating that this measure is relatively independent of other indicators of disadvantage. The HLE index was strongly associated with 'at risk' status in all assessments, at pre-school entry and at start of primary school. Those who scored poorly on the HLE scale (i.e. those who reported low levels of home learning activities) were over-represented among those identified as 'at *strong* cognitive risk' at entry to primary school. The results suggest that policies that improve parent education and encourage active parental involvement in their child's learning at home could play a positive role in combating the impact of disadvantage and reduce the risk of SEN for children in vulnerable groups. The 'home' sample tended to have significantly lower scores on the HLE index, and as such, 'home' children may be especially vulnerable to SEN due to missing out on pre-school experience and having fewer learning opportunities at home. Again this has important implications for policy, increasing the availability and quality of pre-school provision and the uptake by vulnerable groups is likely to improve development and thus reduce the incidence of SEN. In addition, for children whose families do not use pre-school, initiatives such as *Sure Start* local programmes may help improve the home learning environment and thus benefit children most 'at risk' of developing SEN and facilitate a better start to school.

Overall, child and parental factors were more strongly associated with children's cognitive outcomes than with social/behavioural development. Multiple disadvantage is strongly associated with low cognitive scores amongst young children, at age 3 years plus. Children scoring highly in terms of multiple disadvantage were much more likely to be identified in the '*strong* cognitive risk' category than others.

The impact of pre-school on 'at risk' status

Four questions relevant to the impact of pre-school on young children were explored:

1. *Do children who have not attended a pre-school centre differ in 'risk' for SEN, taking account of child, family and home environment characteristics?*

The statistical analysis comparing the pre-school and the 'home' sample indicate that the 'home' children (those with little or no experience at a pre-school setting) were significantly more likely to be identified by the research as 'at risk' for all measures of cognitive development at entry to primary school and more were also 'at risk' of poor social/behavioural development in terms of Peer Sociability. 'Home' children were also more likely to be multiply disadvantaged than those who had attended pre-school. These differences remained evident at the end of Year 1. Overall, around 44% of 'home' children were 'at risk' in relation to national norms for reading, and 37% for mathematics.

2. *Does risk reduce as a result of pre-school experience?*

One-third of the pre-school sample can be considered 'at risk' of SEN at the start of the study. By the start of primary school the proportion of children had reduced to one in five (21%). This suggests a positive impact of pre-school on young children's cognitive development, which remained evident until at least the end of Year 1.

3. *Does an early start in pre-school influence 'risk' for SEN, taking other factors into account?*

Those children who made an earlier start (between 2 and 3 years) at pre-school had higher cognitive attainments than other children at age 3+, even when controlling for the impact of child, family and home environment influences. This cognitive advantage remains evident at entry to primary school. On average children identified as 'at risk' in the cognitive assessments at entry to pre-school were likely to have started pre-school at a later age. However, a very early start (i.e. below 2 years) at pre-school was weakly associated with increased 'risk' for Anti-social/worried/upset behaviour.

4. *Does the amount of time (number of months) children attend a pre-school centre relate to risk of SEN over the pre-school period?*

Children's progress indicated that longer attendance at pre-school (months of pre-school) has a significant positive impact on cognitive attainment and thus may reduce the 'risk' of SEN.

Movement in and out of 'risk' by pre-school type

Children who attended integrated centres and nursery school were more likely to move out of 'at risk' status in terms of the 'strong cognitive risk' definition. Children from integrated centres were also much more likely to move out of 'at risk' status for Pre-reading, by the time they started primary school. Children from nursery schools were also more likely to move out of 'at risk' status for Early Number Concepts. By contrast, proportionately more children who attended nursery classes moved into 'at risk' status for general cognitive ability, Pre-reading and Early Number Concepts. Children who attended local authority day nurseries showed a greater likelihood of moving into 'at risk' status for Early Number concepts. Overall more children in all forms of provision tended to move out of, than into 'at risk' status for Anti-social/worried/upset. For Peer sociability relatively more children in integrated centres, playgroups, and nursery classes moved out of, than into 'at risk' status.

These results suggest that certain forms of pre-school provision may be of particular benefit to children aged 3 plus who are 'at risk' or more vulnerable in terms of low cognitive attainment and poor social behaviour. Integrated centres and nursery schools show the most positive outcomes for movement out of 'risk' for several measures, especially for cognitive outcomes. Integrated centres, nursery classes and playgroups show most positive movement for the social/behavioural outcome Peer sociability.

Pre-school centre quality and progress and development

Measures of pre-school centre quality

An important question for the EYTSen research is whether higher quality pre-school provision helps to promote the cognitive and social/behavioural development of young children. Different types of pre-school centre vary in terms of their quality characteristics. Pre-school quality was measured using the ECERS scales and the Caregiver Interaction Scale (see Section 5).

Integrated centres and nursery schools had the highest average scores on pre-school environmental quality, and also the lowest staff turnover. Value added analyses of children's cognitive progress have shown that higher quality scores on the ECERS-E scale are associated with greater cognitive progress over the pre-school period for all children. Children from low socio-economic status backgrounds and boys were found to benefit particularly from higher quality provision as measured by this instrument. Quality measures from the main ECERS-R scale also showed a significant link with social/behavioural development. In addition, ratings on the sensitivity of adult-child interactions showed a significant link with young children's cognitive progress and social/behavioural development.

Children who moved out of 'strong cognitive risk' status generally attended higher quality provision than those who moved into 'at risk' status. It appears that higher pre-school quality promotes cognitive development for children, including those of low attainment. High quality provision may be seen as an effective intervention that can improve cognitive development and thus provide vulnerable children with a better start at primary school. This is an important finding and suggests that policy makers and practitioners should focus on developing ways to improve the quality of pre-school centres, particularly those which serve higher numbers of disadvantaged children who are at greater 'risk' of SEN.

Parents' perceptions and experiences of special educational needs

When the children were in primary school the project sent out a questionnaire to all parents. The questionnaire contained a section asking specifically about parents' perceptions of their child's special educational needs. We found that parents of the 'home' children were the least likely to report incidence of special educational needs in their children. However, when the 'home' children were considered for their 'at risk' status by teachers, there were proportionately far more children 'at risk' of SEN in this group than in the group of children who had attended a pre-school centre. This discrepancy indicates a need for targeted parental education.

Type of SEN

Medical/physical conditions- Although most medical conditions do not fall within the strict definition of SEN, it is interesting to note that the most common type of medical/physical condition reported across the sample as a whole was asthma followed by eczema (with many children having both), followed by children with language difficulties.

Psychological development: More children were reported by parents as having difficulties with reading than with numeracy. Parents on the whole reported less incidence of social/behavioural difficulties in their children than medical/physical conditions or learning difficulties. Children with behavioural problems were more likely to have difficulties over a number of SEN domains than children with learning or physical difficulties.

Who were the children reported by parents to have a special educational need?

Gender: Boys were more likely to be reported by parents as having a learning disability, be hyperactive, unhappy going to school and have eating problems.

Marital status - There were more 'SEN' children reported by parents who were divorced and fewer by married parents.

Socio-economic status - There were more 'SEN' children reported by parents from the father 'never worked' group and fewer from the 'professional father' group.

Life events - There were significant relationships between a child being exposed to a potentially upsetting 'life event' and parents reporting concern for SEN. The 'life events' with a significant association with SEN reporting by parents were not settling at school, being hospitalised, 'suffered from family conflict', separation/divorce, moving home and sibling rivalry. This may

reflect the association between life events and disadvantage and the greater disadvantage of the 'at risk' group. It should be noted that some children had experienced a number of 'life events' i.e. may have had family conflict and moved home. Having experienced a number of life events when very young, may be cumulative and may make a child more 'at risk' of developing SEN.

Support for children whose parents reported they had special educational needs

The most commonly reported type of help given during the pre-school and school period for children with any kind of need (medical, physical, learning and behavioural) was speech therapy, which was provided off-site. Other help provided consisted of one-to-one tuition and general additional educational support¹⁴ with some emotional and behavioural support.

Children were more likely to receive the help of a learning support assistant¹⁵ if they had a learning difficulty as opposed to a medical or physical condition. Children with behavioural difficulties were most likely to receive on-site support during their time at pre-school by a combination of emotional and behavioural support, extra educational support and feedback and advice. The majority of parents were generally satisfied (65%) with the help their children received. Around 18% were quite or very dissatisfied. More parents of children who had attended a pre-school centre were satisfied with the help they were given than the 'home' group' parents.

Summary and policy implications

The EYTSN study developed a simple but robust definition to identify children who may be seen as 'at risk' of SEN for cognitive and social/behavioural measures. For cognitive outcomes, children with multiple disadvantage (in terms of child, family and home environment characteristics) were much more likely to be identified as 'at risk'. Background characteristics showed weaker links with social/behavioural development. The quality of the home learning environment (related to parents' reported activities with their pre-school child) showed a strong relationship with 'at risk' status. A more stimulating home learning environment benefits both cognitive and social/behavioural development. The home learning environment was only moderately related to parents' education and SES.

A third of the sample showed low cognitive attainment at entry to pre-school and were classified as 'at risk' of SEN in relation to national norms. By entry to primary school this figure had dropped to a fifth, suggesting that pre-school has a positive impact on young children's cognitive development (in both language and non-verbal skills). This positive impact on cognitive attainment remains evident at the end of Year 1 in both better reading and mathematical skills.

Those children in the sample who had had no pre-school experience were more likely to be 'at risk' of SEN in terms of their cognitive development, even taking into account this group's higher levels of multiple disadvantage. The findings thus suggest that pre-school may be an effective intervention for the reduction of SEN, especially for the most disadvantaged and vulnerable groups of young children.

Integrated/combined centres, local authority day nurseries and playgroups are most likely to have children 'at risk' of SEN on their roll. This may reflect the higher numbers of disadvantaged groups in the areas served by these centres. Understanding of SEN varies and poor cognitive development often is not recognised as a need in pre-schools.

Certain forms of provision were of particular benefit to children who are 'at risk' of SEN for different reasons. For those 'at risk' of SEN in terms of poor cognitive development, integrated centres and nursery schools, were seen to be particularly beneficial, and for those 'at risk' of SEN in terms of poor social behaviour, integrated centres, nursery classes and playgroups were particularly beneficial. Generally those centres with better quality provision produced the most

¹⁴ General extra educational support usually meant curriculum differentiation or one-to-one tuition.

¹⁵ Learning support assistants were most likely to be found in the types of pre-school settings that are able to make available additional resourcing to employ a dedicated learning support (or teaching) assistant. In general, this type of provision would be more likely to be seen in nursery schools, nursery classes attached to primary schools and fully integrated centres rather than in private day nurseries, Local authority day nurseries or playgroups.

benefit. Also longer duration of pre-school was beneficial with every extra month over two years of age being associated with better cognitive development.

High quality pre-school centres may be seen as an effective intervention that can help improve cognitive development and thus provide more vulnerable children with a better start at primary school, particularly if children spend more months in the pre-school centre.

Due to variations in the use of 'systems' for identifying children with SEN across different types of pre-school, some children 'at risk' of SEN may go unidentified and may, therefore, miss the opportunity for early interventions in these forms of provision. However the majority of parents were satisfied with the support their children were given for SEN, but where they were dissatisfied, they wanted more learning support on an individual basis.

The findings suggest a number of implications for policy as follows:

- Programmes that increase the take-up of pre-school places by parents who would not usually send their children to pre-school (usually found in geographical clusters or within specific minority ethnic groups) are likely to provide these vulnerable groups of children with a better start to school and therefore reduce their risk of developing SEN.
- Pre-school and school workers/teachers should be aware that boys may be at increased 'risk' of developing SEN for cognitive development and aspects of social development. The development of programmes which seek to focus on the specific needs of boys, as learners, linked with appropriate staff development may have long-term benefits and help reduce the gender gap in SEN.
- Policies and practices that foster active parental engagement with children and involvement in play activities that promote children's language, spatial skills and creativity, in particular, are likely to benefit children's subsequent cognitive and social development and attainment at school.
- Given the strong links between 'at risk' status on cognitive measures and multiple disadvantage, ways of effectively targeting additional resources to pre-school settings and primary schools that serve high proportions of young children from multiply disadvantaged families should be explored.

Section Eleven: Summarising the findings: What are the messages for policy and practice?

Or, From Cinderella to Policy Princess

In less than seven years EPPE had recruited its sample of 3,000 families, constructed developmental trajectories for children between the years of 3+ and 7, and described the Early Years practices associated with children making a flying start to Reception class. This large scale longitudinal study required the contribution of six local authorities, 5 full time Regional Officers responsible for keeping track of and assessing hundreds of children in their region, and many part-time data analysts and research assistants, led by a full time research co-ordinator. The research was guided by a Steering Committee, selected by the DfES (which included a range of expertise encompassing research, policy and practice) and an equally helpful Consultative Committee who ensured that the research questions were related to current policy initiatives. When it became clear that integrated centres were ‘on the agenda’ the DfES increased the scope of the study so that their impact on children’s development could also be established. After so much effort, what has the research really shown?

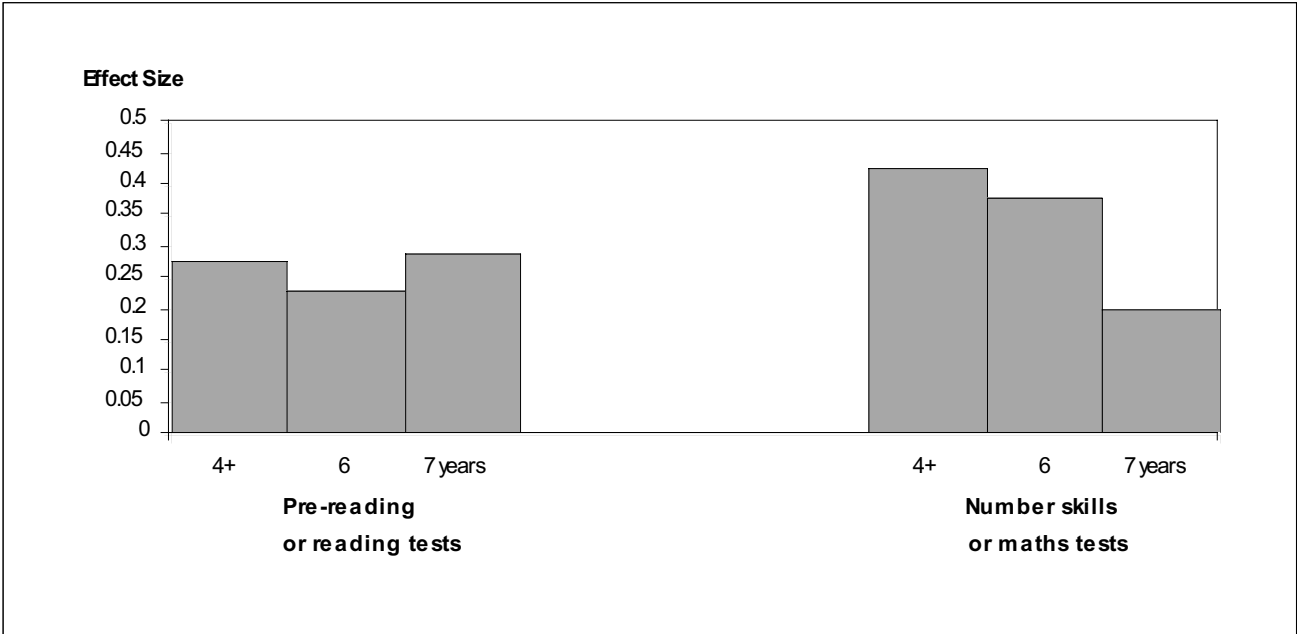
Major findings at entry to school

1. Impact of attending any form of pre-school setting

Pre-school experience, compared to none, enhances children’s development.

Irrespective of level of multiple disadvantage, ‘home’ children (those who had little or no pre-school experience) show poorer cognitive and social/behavioural outcomes at entry to school and at the end of Year 1 than those who attended pre-school. They are more likely to be identified by teachers as having some form of SEN. By the end of Key stage 1 the attainment gap is still evident for reading and mathematics, but is no longer significant for social behaviour.

Figure 11.1: Bar Chart of the Effect of home v pre-school attendance on cognitive attainment (contextualised models)



The results in Figure 11.1 above are expressed in terms of effect sizes, these give a measure of the strength of the relationship between attending a pre-school and not attending a pre-school on attainment at different time points across Key Stage 1, after control for the impact of significant child, family and home learning environment factors. It can be seen that the pre-school influence is strongest for early number concepts when children start primary school (at age 4 years plus,

mean age 4 years 9 months) but reduces for mathematics attainment over Years 1 and 2. For pre-reading the effects are more modest, but the impact shows less decline across Key Stage 1.¹⁶ For social behavioural outcomes such as Peer sociability and Self regulation, the effect sizes are strong at entry to primary school but no longer significant by the end of Year 2. It appears that the pre-school impact is more long lasting for attainment in reading and mathematics than in social behaviour.

2. Diversity of provision

There are significant differences between individual pre-school settings in their impact on children. Some settings are more effective than others in promoting positive child outcomes.

Examples of more and of less effective centres can be found in all types of provision. Overall however, there were indications that children tend to make better intellectual progress in fully integrated centres and nursery schools, but poorer progress in Local Authority day nurseries.

3. Duration and age of entry

The duration of attendance is important with every month of pre-school experience after age 2 years linked to better intellectual development and improved independence, concentration and sociability.

4. Quality of provision

The observed quality of pre-school centres is related to better intellectual/cognitive and social/behavioural development in children.

Good quality can be found across all types of early years settings. However quality was higher overall in integrated settings, nursery schools and nursery classes.

Settings that have staff with higher qualifications, especially with a good proportion of trained teachers on the staff, show higher quality and their children make more progress and better social/behavioural gains.

5. Pre-school practices on the ground

Where settings view educational and social development as complementary and equal in importance, children make better all round progress.

Effective pedagogy includes structured interactions between staff and children, traditionally associated with the term “teaching”, the provision of instructive learning environments and ‘sustained shared thinking’ to extend children’s learning.

Full time attendance led to no better gains for children than part-time provision.

Children who had extensive group care under the age of two, were associated with slightly higher levels of anti-social behaviour at 3 and 5 years of age.

6. Vulnerable children

Disadvantaged children and boys in particular can benefit significantly from good quality pre-school experiences.

Where disadvantaged children attended centres that included children from mixed social backgrounds they showed further benefit than if they attended centres containing predominantly disadvantaged children.

¹⁶ The method of calculating effect sizes is described in more details in Technical Papers 8a & 8b. In papers 9 and 11 further information is given in relation to duration of attendance. It should be noted that the average time in pre-school was around 22 months (sd 11 months) and the majority attended part time rather than full time. For comparison children had attended primary school full time for between 2-3 years by the end of Key Stage 1.

Children 'at risk' of learning or behavioural difficulties are helped by pre-school; integrated settings and nursery schools are particularly beneficial.

7. The importance of home learning and support for parents.

The quality of the learning environment at home (where parents are actively engaged in activities with children) promoted intellectual and social development in all children. Although parent's social class and levels of education were related to child outcomes the quality of the home learning environment was more important and only moderately associated with social class or mothers qualification levels. What parents do is more important than who they are. For this reason pre-school and school settings that do not include parent support and education are missing an important element in raising achievement and enhancing social and behavioural development.

Major findings at end of Key Stage 1

1. Lasting effects

The beneficial effects of pre-school remained evident throughout Key Stage 1, although some outcomes were not as strong as they had been at school entry. The most likely explanation for the diminishing 'pre-school effect' is the powerful influence of the primary school on children's development. By the end of Year 2 most children had been in their primary school for three years longer than the majority of children had been in pre-school. An alternate explanation for the finding that pre-school effects were stronger at age 6 than at age 7, is the use of national assessments as the main academic outcome at the end of Key Stage 1. These vary from year to year and may not have the psychometric strength of the standardised reading and maths assessments we used at age 6.

The main effects of pre-school are present at school entry; these strong effects can be seen in the difference between school-entry profiles of the 'home' children and the pre-school group. The influence of pre-school is also demonstrated in the 'dose effect' by which the more pre-school experience a child has, the more progress they make in the period 3-5 years. However, once children enter school at reception, the pre-school children do not make more gains than the 'home' children. This suggests that the impact of pre-school operates through a stronger start to school and NOT through increased capacity to learn more in subsequent years,

2. Duration and quality

The number of months a child attended pre-school continued to have an effect on their progress through Key Stage 1. This effect was stronger for academic skills than for social/behavioural development. Pre-school quality was significantly related to children's scores on standardised tests of reading and mathematics at aged 6. At aged 7 the relationship between quality and academic attainment was somewhat weaker and the effect of quality on all forms of social/behavioural development, including anti-social behaviour, was no longer significant. However, the impact of a pre-school centres effectiveness was still significant at the end of Key Stage 1 on social/behavioural outcomes.

3. Vulnerable children

Many children continued to be 'at risk' of special educational needs at the end of Key Stage 1 (2.3% of the EPPE sample had full statements), with more of the 'home' children falling into this group even after taking into account background factors. Multiple disadvantage continued to have an effect.

4. Effective settings

The individual pre-school a child attended shaped their developmental profiles at school entry and also at age 7. These unique pre-school centre effects continued to influence children's cognitive and social/behavioural development throughout Key Stage 1. Of course this does not mean that primary school has no impact on children's lives – only that the individual pre-schools they attended continued to have an influence. Indeed, the Key Stage 1 findings are already pointing to important variations in primary school effects and these are a main focus of the continuation EPPE 3-11 study up to end of Key Stage 2.

Relationship of EPPE findings to other research

In many ways the EPPE findings are not new; for example the adverse impact of social disadvantage on children's development has been established wherever it has been studied. Other areas in which the EPPE findings are supported elsewhere include:

1. Short-term, positive effects of pre-school education have been shown conclusively in the U.S., Sweden, Norway, Germany, Canada, Northern Ireland and New Zealand (Melhuish, 2004a).
2. The effects of greater staff training and qualifications have been shown in the U.S. (Peisner-Feinberg, 1997; 2001) and in Northern Ireland (Melhuish et al., 2000a and b).
3. The contribution of quality to children's developmental progress has been shown in many studies, often using the ECERS observational scale (Melhuish 2004a and b).
4. Early day care was found in EPPE to relate to increased cognitive outcomes better Independence, Peer sociability at age rising 5, but also increased anti-social behaviour. These findings are similar to those in the U.S. (NICHD, 2002) Norway (Borge & Melhuish, 1995) and Northern Ireland (Melhuish et al., 2000; 2002).
5. The findings on disadvantage are mirrored elsewhere (see Melhuish, 2004a) and are the basis of policy initiatives all over the world (Young, 1996).
6. EPPE is one of few studies (the only in the UK) to demonstrate the role of pre-school education as an effective means of early intervention in SEN (Sammons, 2002c).
7. EPPE is the first study to show convincingly that individual pre-school centres have lasting effects on children's development. This thread runs through the theoretical work of educationalists such as Jerome Bruner (1996) but previously had not been empirically demonstrated in a large representative sample.

The impact of EPPE on policy and practice

From the outset EPPE was designed to inform policy and everyday practice. When integrated provision came into the policy realm, EPPE added this pre-school type to its sample. When government turned its attention to combating social exclusion, EPPE concentrated in its analysis on the effects of different kinds of pre-school on vulnerable children. When new forms of qualification were devised, EPPE analysed the contribution of staff training on children's learning. An expert steering committee contributed to the 'policy steer'; it included policy makers at national and local level as well as practitioners, academics and researchers.

The case studies have always been a vital part in the design; they show in detail and 'on the ground' how staff teams can function effectively, how children's play can be extended and lifted to new heights of intellectual challenge, and how parents and staff can work together so that the 'learning environments' of home and pre-school are harmonized and stretched.

The impact has been seen at four levels:

- National policy—through evidence at Parliamentary Select Committees, Ministerial Briefings and contributions to the Spending Review at departmental and Treasury and evidence to teams preparing government reports and policy documents.
- Local authority policy – through disseminations to local officers and Elected Members of local authorities seeking to reconfigure their early years services. Also locally through workshops and training usually organised by the Early Years Development and Care Partnerships.
- Practitioners and Parents – through lectures, seminars and workshops focused on practical pedagogies. We have also been reported widely in practitioner publications e.g. Nursery World, Primary Practice, etc. One of the unanticipated impacts of EPPE has been the way it has raised awareness of rigorous methods in carrying out 'policy-sensitive research'. We have anecdotal evidence showing that people at every level of expertise are now asking 'How do you know it works?'
- Academic/Research community – The Team have published twelve technical papers, explicitly showing the workings out of the analyses and descriptions of the research instruments. We have submitted papers to prestigious research journals and have contributed to the debate about effective early years schooling through attendance at a range of academic conferences in a number of countries. The EPPE team developed a new instrument for assessing the quality of curricular provision, the ECERS-E. This is being widely used in the U.S. now because they too are interested in curriculum and pedagogy in the Early Years. In addition to developing the ECERS-E, the team developed the interview schedule for assessing the 'home learning environment'. This scale is being used in other research studies in the U.K. The project is affiliated to the ESRC Teaching and Learning Programme.

The EPPE project has become well known for its contribution to 'evidence based policy' in early years education and care. Its findings are robust because they are based on sound and innovative research methods. The implications for policy of the EPPE project have been spelled out clearly and are being discussed – and acted upon – at national and local level. EPPE set out to contribute to the debate about the education and care of young children; the EPPE design targeted issues that could 'make a difference' to the lives of young children and their families. The research is now extended in the continuation study, EPPE 3-11 also funded by the DfES, to find out if the effects of early education that were so evident at ages 5 and 7 continue through to the age 11. Moreover, the team will investigate the way in which educational experiences in Key Stage 2 interact with the earlier pre-school experiences in the shaping of cognitive and social/behavioural outcomes for children.

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Appendix A

Effective Pre-school Provision in Northern Ireland (EPPNI)

The Effective Pre-school Provision in Northern Ireland (EPPNI) project is a parallel project to the Effective Provision of Pre-school Education (EPPE) project in England. EPPNI is a major longitudinal study of a sample of children (Northern Ireland) followed from age of 3 to age 8 years. The focus of the study is the effects of pre-school education for 3 and 4 year olds. EPPNI studied a range of different types of pre-school settings and 850 children from differing social backgrounds. The research team collected information on children's parents, home environments and the 80 pre-school settings they attended. Northern Ireland has a different pattern of pre-school provision from England. There are neither Local Authority day nurseries nor integrated centres and hence EPPNI did not include consideration of such settings. However, 3-year-old children in rural areas may be in primary schools either in a specific pre-school aged group, termed a reception class or in a group within a class containing school aged children, a reception group. These alternative forms of provision were included in the EPPNI study, and the pre-school settings studied included playgroups, private day nurseries, nursery schools, nursery classes, reception classes and reception groups. A sample of 'home' children (who had no pre-school experience) was recruited to the study at entry to school for comparison with the pre-school group.

EPPNI set out to investigate:

- ❖ What is the impact of pre-school on young children's intellectual and social development?
- ❖ What aspects of pre-school experience were related to change in children's development, including type quantity and quality?
- ❖ What is the impact of the home, childcare history (before aged 3) and area level of deprivation on children's intellectual and social development?

EPPNI has sought to ensure that fair comparisons are made between settings and types of provision. Hence, the differences in the characteristics of the children attending different settings and types of provision need to be taken into account. Such differences include background factors such as birth weight, gender, parental qualification/occupations and the home learning environment. Where pre-school effects are reported they are net of child and family factors. This 'value added' approach ensures appropriate comparisons across pre-school settings.

Methods

EPPNI researchers assessed children individually at three/four years old when they joined the study, subsequently at the start of primary school, and thereafter annually until the end of Key Stage 1 (age 8 in Northern Ireland). Assessments provided a profile of each child's intellectual and social/behavioural development using standardised assessments and reports from a staff member familiar with the child. Also interviews were conducted with parents when their child entered the study (with follow-up questionnaires when the children were in school).

EPPNI considered whether higher quality pre-school provision makes a difference to the intellectual and social/behavioural development of young children, and if so, what is essential in ensuring quality? To this end observations using standardised rating scales, and interviews were used to assess the quality and other characteristics of each setting. In addition there were 3 case studies. The case studies included detailed documentation of naturalistic observations of staff pedagogy, and systematic structured target child observations of children's learning.

Findings

Effects of pre-school

From analyses of children's development during pre-school compared with 'home' children, EPPNI found that pre-school attendance improves all children's cognitive development and aspects of social behaviour, such as independence and concentration, co-operation, conformity and relationships with other children (peer sociability). Moreover, individual settings vary in their effectiveness with some settings fostering better child outcomes than others.

Children with no pre-school experience (the 'home' group) had poorer cognitive attainment, sociability and confidence when they started school. These differences show even when we take account of differences between the pre-school and home groups in child, family and home environment characteristics.

A number of factors associated with attendance at pre-school were also explored. EPPNI shows that how long a child attended pre-school (duration measured in months from entry to the study to the start of primary school) was related to positive intellectual gains. An early start at pre-school (under 3 years) was linked with better intellectual attainment at age 3 years. These benefits continue when children start primary school. However, there was no evidence that full day attendance led to better development than half-day attendance.

Disadvantaged children are more likely to have adverse social profiles at age 3 and at school entry.

There is evidence of significant gender differences in young children's intellectual and social/behavioural development. At entry to pre-school, girls generally show better social development than boys, especially in co-operation/conformity and independence and concentration.

EPPNI has shown that pre-school has an important impact on children's development. Whilst not eliminating disadvantage, it can help to ameliorate the effects of social disadvantage and can provide children with a better start to school. Investing in good quality pre-school provision is therefore likely to be an effective means of achieving targets concerning social exclusion and breaking cycles of disadvantage.

Good quality pre-school education can be found in all kinds of settings irrespective of type of provider. Several features of the quality rating scale were related to increased intellectual progress and attainment at entry to school. Also there was a positive relationship between the qualification levels of the staff and ratings of centre quality.

Impact of the home and childcare history

Interviews with parents provided detailed information about childcare histories, characteristics of children, their families and home environments. This enabled the study to investigate some of the influences affecting young children that have a significant relationship with their intellectual and social/behavioural development

Demographic influences

The parent, family and home characteristics of children are inter-related and precise attributions are difficult. However, EPPNI findings show a strong relationship between a child's intellectual skills and family characteristics. These findings are consistent with findings from the NICHD study in America and the EPPE study in England, where family characteristics have a greater impact on outcomes for children than pre-school factors. However, the effect of attending pre-school (versus not) on developmental progress is greater than the effect of measure of social disadvantage (qualification level of family, SES etc). In addition, for children attending pre-school, the effect of attending pre-school is about half that of social background factors (bearing in mind individual settings vary in their impact).

Patterns of childcare before entering the study

Parental interviews discussed the 'history' of their children before they entered the study. Data were collected on the number of hours and type of childcare before aged three but not on the quality of that childcare. This revealed that high levels of 'group care' before the age of three (and particularly before the age of two) were associated with higher levels of anti-social behaviour.

The home learning environment

The opportunities children have for engaging in developmentally enhancing learning activities at home makes a real difference to their development. The home learning environment (HLE) included activities related to improving children's learning and development e.g. reading to child, teaching songs and nursery rhymes, painting and drawing, playing with letters and numbers, visiting the library, teaching alphabet, teaching numbers, visits and regular opportunities for play with friends at home. Where more of these activities occurred in the home children had better intellectual and social/behavioural development. The HLE can be viewed as a 'protective' factor. This has important implications for programmes such as Sure Start that target areas of high social exclusion.

Similar findings from EPPNI and EPPE

Impact of attending a pre-school centre

Pre-school experience, compared to none, enhances children's development.

The duration of attendance is important with an earlier start from age two onwards, being related to better intellectual development.

Full time attendance led to no better gains for children than part-time provision.

Disadvantaged children in particular can benefit significantly from good quality pre-school experiences.

The quality of pre-school centres is related to better intellectual and social development in children. EPPNI and EPPE findings on quality are consistent with other large-scale longitudinal research including the NICHD (National Institute of Child Health and Development) and CQO (Childcare Quality and Outcomes) studies in the US.

Demographic influences

In both England and Northern Ireland strong effects were found for parental education and social class upon children's development. Children from large families (3+ siblings) showed poorer intellectual development.

The importance of home learning

The home learning environment (activities providing opportunities for learning) was strongly related to intellectual and social development in all children. There is a modest association between social class and parental education and the home learning environment. However, the home learning environment was more important than either of these factors. What parents do is more important than who they are.

Childcare history

Both EPPNI and EPPE find that high levels of group day care in the first two years are associated with slightly higher levels of anti-social behaviour later. Also in both countries high levels of relative care are associated with less anti-social behaviour and more co-operative behaviour.

Findings that are different in Northern Ireland and England

Quality of pre-school

There is less variation between types of centre in Northern Ireland than in England on the quality assessment instrument (ECERS-R). Pre-school centres in Northern Ireland score slightly higher overall than comparable centres in England. This is due to the playgroups and the private day nurseries, but particularly the playgroups, scoring more highly on ECERS-R than in England. It is clear that on every sub-scale playgroups in Northern Ireland score higher than playgroups in England. The interviews in pre-school centres revealed that the level of staff training was substantially greater in the Northern Ireland playgroups than those in England. This probably reflects the extensive training activity of the Northern Ireland Pre-school Playgroup Association (NIPPA), and suggests that quality differences in pre-school may be more related to staff training than type of pre-school.

Area Deprivation

The EPPNI study was able to investigate the additional effects of level of deprivation of the area in which the child was living. Those children living in areas of high deprivation were negatively affected in their development in addition to the consequences of their demographic and home characteristics.

Summary

EPPNI demonstrates the positive effects of high quality pre-school provision on children's intellectual and social behavioural development. The EPPNI research indicates that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children, in particular, a better start to primary school. The findings indicate pre-school has a positive impact on children's progress over and above important family influences. The quality of the pre-school experience as well as the quantity (more terms but not necessarily more hours per day) are both influential. The results show that individual pre-school centres vary in their effectiveness in promoting intellectual progress over the pre-school period, and indicate that better outcomes are associated with some forms of provision. Likewise, the research points to the separate and significant influence of the home learning environment. These aspects (quality and quantity of pre-school and home learning environment) can be seen as more susceptible to change through policy and practitioner initiatives than other child or family characteristics, such as SES. For more information on the EPPNI Project contact Louise Quinn Research Co-ordinator, Stranmillis University College, Belfast, BT9 5DY. Tel: 02890 384 353.

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Appendix B - Analyses of family salary data, pre-school duration, quality and impact on child attainment and progress at entry to primary school¹⁷

Prepared for HM Treasury November 2003

Introduction

This paper provides an analysis of the impact of family income on young children's cognitive attainment. It also makes comparisons with the impact of quality and duration of pre-school. Using average cost data for different types of pre-school provider, and effect sizes for different types of provision. The paper also presents some evidence concerning cost benefit for pre-school provision. The analyses focus in the main on two child outcomes collected at entry to primary school (age rising five years). Pre-reading and language attainment were chosen because they show stronger relationships with child and family background in earlier multilevel analyses (EPPE Technical Papers 8a & 8b). Evidence of the positive impact of pre-school on Early Number concepts and social behaviour, especially Peer sociability has been provided in the main EPPE pre-school results.

Sources of data

The EPPE parental questionnaire survey provides indicators of parental salary in the form of average yearly salary (before tax). This information was collected in the form of seven income bands (see Tables B1 and B2 below). This limitation means that it is not possible to explore the relationships between child attainment and more finely differentiated salary levels. In addition, a total parent salary measure was created, by combining the mother's and father's salary bands. To do this the mid point of each band was used except for the top band (£65000 plus) where the conservative estimate of £66000 was chosen. The results are shown in Table B3. The use of bands means that the salary data provide an approximate indication of *relative* family salary levels, but cannot be treated as providing accurate information about *actual* gross salary. The total salary measure approximates to a continuous variable. To allow further exploration another parent salary measure was created, which divided the continuous measure into seven broad joint income categories (see Table B4). This creation of categories allows the inclusion of an 'unknown' category for children for whom no parent salary data were collected and increases sample size in selected analyses. The use of parent salary categories also allows direct comparisons with the influence of different amounts of pre-school in multilevel analyses.

In addition to parent salary a measure was created concerning parent work status. This covers no parent working, mother only, father only, and both parents working see Table B5.

Table B1 Mother's average yearly salary before tax

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1 £0-4999	301	9.5	13.2	13.2
2 £5000-9999	362	11.4	15.9	29.0
3 £10000-19999	381	12.0	16.7	45.7
4 £20000-29999	194	6.1	8.5	54.2
5 30000-39999	74	2.3	3.2	57.5
6 £40000-64999	43	1.4	1.9	59.4
7 £65000+	22	.7	1.0	60.3
9 not applicable / or absent mother/voluntary	906	28.6	39.7	100.0
Total	2283	72.0	100.0	
Missing -100 missing parent questionnaire	719	22.7		
99 missing answer	169	5.3		
Total	888	28.0		
Total	3171	100.0		

¹⁷ Derived from EPPE Parent Questionnaire conducted autumn 2001/spring 2002. The response rate to the parent survey was over 77%.

Table B2 Father's average yearly salary before tax

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1 £0-4999	25	.8	1.2	1.2
2 £5000-9999	81	2.6	3.7	4.9
3 £10000-19999	456	14.4	21.1	26.0
4 £20000-29999	450	14.2	20.8	46.8
5 30000-39999	193	6.1	8.9	55.7
6 £40000-64999	158	5.0	7.3	63.0
7 £65000+	119	3.8	5.5	68.5
9 not applicable / or absent father	681	21.5	31.5	100.0
Total	2163	68.2	100.0	
Missing -100 missing parent questionnaire	725	22.9		
99 missing answer	283	8.9		
Total	1008	31.8		
Total	3171	100.0		

Mother's and father's salary data were combined to form a measure of family income.

Table B3 Total family salary

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	569	17.9	23.9	23.9
2500	91	2.9	3.8	27.7
5000	3	.1	.1	27.9
7500	121	3.8	5.1	33.0
10000	18	.6	.8	33.7
15000	252	7.9	10.6	44.3
17500	86	2.7	3.6	47.9
22500	102	3.2	4.3	52.2
25000	151	4.8	6.3	58.6
27500	72	2.3	3.0	61.6
30000	103	3.2	4.3	65.9
32500	110	3.5	4.6	70.5
35000	58	1.8	2.4	73.0
37500	27	.9	1.1	74.1
40000	114	3.6	4.8	78.9
42500	39	1.2	1.6	80.5
50000	96	3.0	4.0	84.6
52500	45	1.4	1.9	86.5
55000	18	.6	.8	87.2
60000	77	2.4	3.2	90.5
66000	54	1.7	2.3	92.7
67500	31	1.0	1.3	94.0
68500	8	.3	.3	94.4
70000	16	.5	.7	95.0
77500	27	.9	1.1	96.2
81000	17	.5	.7	96.9
87500	13	.4	.5	97.4
91000	12	.4	.5	97.9

101000	12	.4	.5	98.4
105000	9	.3	.4	98.8
118500	18	.6	.8	99.6
132000	10	.3	.4	100.0
Total	2379	75.0	100.0	
Missing -100 no salary data (no questionnaire or non response of question)	792	25.0		
Total	3171	100.0		

The family income data were categorised into seven bands for further analysis in the multilevel model. It should be noted that due to the addition of salary band data for both parents, certain income values are not found. The salary bands reflect the discontinuous nature of the distribution. Rather than reflecting exact family income levels they are best seen as providing indicators of approximate income levels from low through to high, which can be compared to the no reported salary group (that are likely to represent families on benefit).

Table B4 Total family salary (categorical variable)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0 no salary	569	17.9	17.9	17.9
1 2500-15000 salary	485	15.3	15.3	33.2
2 17500-27500 salary	411	13.0	13.0	46.2
3 30000-35000 salary	271	8.5	8.5	54.7
4 37500-66000 salary	470	14.8	14.8	69.6
5 67500-132000 salary	173	5.5	5.5	75.0
6 no salary data (no questionnaire or non response of question)	792	25.0	25.0	100.0
Total	3171	100.0	100.0	

Data about parents' working status was also collected. This showed that a little under one in five children were in families with no earned income (17.9%). In addition, no data were available for a quarter of the sample (no response to the questionnaire survey or to the specific item in the questionnaire). The models tested whether parental employment status showed a significant impact on attainment at entry to primary school. Table 5 gives details of parents' employment status.

Table B5 Parents' employment status

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0 no one working in the house	569	17.9	17.9	17.9
1 mum working / dad not working or no info	328	10.3	10.3	28.3
2 dad working / mum not working or no info	433	13.7	13.7	41.9
3 mum and dad working	1049	33.1	33.1	75.0
4 no data for mum nor dad	792	25.0	25.0	100.0
Total	3171	100.0	100.0	

The parent salary measures were tested in multilevel models used to explore the impact of pre-school on attainment and which included a 'home' sample that had no pre-school experience (for further details see Tables E.1, E.3 Charts 4.1, E.2, E.4 in EPPE Technical Paper 8a). A range of child parent and family measures are controlled in order to assess the **net impact** of parent salary and pre-school while controlling for other significant predictors.

IMPACT OF FAMILY INCOME AND PARENTS' EMPLOYMENT STATUS

Correlations show the relationship between the parent income measure (continuous) and attainment in Pre-reading and Language (0.37 for both). These associations are somewhat stronger than those between parental work status (0.24-0.30) and attainment. It should be noted that these associations do not control for the impact of other measures, such as parental qualifications and SES.

Table B6: Associations between salary, work status and child attainment

	Pre-reading (standardised)	Language (standardised)
Total Parent Salary (continuous)	0.37**	0.37**
Parental Work Status	0.24**	0.30**

** Correlation is significant at the 0.01 levels

The multilevel estimates allow the calculation of effect sizes for salary categories, while controlling for the influence of other relevant factors such as birth weight, parent highest SES, mothers qualification levels, aspects of the home learning environment etc. For the purposes of this paper we report the results of the variables of specific interest in relation to the effect sizes for the duration of pre-school (see Table B6). The method of calculating these is detailed in Appendix B of EPPE Technical Paper 8a.

The results in Table B7 show that parental salary is more closely related to young children's pre-reading than their language development. Furthermore, it can be seen that there are only significant differences in attainment between the no salary group and those on higher joint incomes (the band £37500-£66000 and the band £67500 plus). The effect size is moderate to large for the highest salary level for pre-reading. For language the positive impact of longer duration is more noticeable.

Table B7 Comparison of Effect sizes for parental salary and pre-school attendance

Salary Groups (Compared with no reported salary including not working and unemployed or parent absent etc)	Pre-reading	Language
£2500-£15000	0.066	0.057
£17500-£27500	0.177*	0.091
£30000-£35000	0.143	0.113
£37500-£66000	0.315*	0.140
£67500 plus	0.502*	0.222*
Salary not known (NK)	0.014	-0.103
FSM (compared to not eligible)	-0.127*	-0.103
Duration of pre-school (compared with no pre-school attended i.e. 'home' children)		
Under 1 year	0.123	0.456*
1-2 years	0.255*	0.379*
2-3 years	0.361*	0.421*
3 years plus	0.403*	0.591*

These results show that the effect size associated with just under one year of pre-schooling is 0.123 for the pre-reading outcome, this a little smaller than the effect of earned family income band £17500-£27500 versus no salary income. Interestingly the effect size associated with one year of pre-school for language outcome is significantly larger than for pre-reading, while the impact of family income for Language is much lower.

Table B8 Comparison of Effect sizes for parental employment and pre-school attendance

Employment (compared with no parent working)	Pre-reading	Language
Mother working only	0.149	0.045
Father working only	0.112	0.097
Both parents working	0.202*	0.119
Parents' employment status NK	0.001	-0.106
FSM (compared to not eligible)	-0.125*	-0.100
Duration of pre-school (compared with no pre-school attended i.e. 'home' children)		
Under 1 year	0.108	0.451*
1-2 years	0.254*	0.380*
2-3 years	0.359*	0.421*
3 years plus	0.430*	0.601*

* p < 0.05

In Table B8 we show the effect sizes for parents' employment status. These are generally smaller than those for family income or pre-school duration. The results reveal that parents' employment status is significantly related to pre-reading attainment, with moderate positive effects (controlling for other significant predictors) for both parents working. Nonetheless, duration of pre-school has a stronger net impact.

The EPPE project collected additional data about family structure (number of parents and number of children in a household). With information about parental employment and salary it would be possible to calculate likely benefit income for those not working or on low salaries. However, given the present findings that indicate a salary effect only at higher levels, and given the availability of FSM data, such further analyses are not needed.

The results suggest that pre-school duration has an impact irrespective of parental salary levels. Only fairly high joint salary bands show a significant net impact on attainment. *Further investment in pre-school may therefore be expected to have a positive impact on more young children than the provision of additional income at modest levels.*

IMPACT OF PRE-SCHOOL AND INCOME FOR LOW AND AVERAGE ATTAINMENT GROUPS

Further analyses were conducted in response to requests to investigate the size of income effects for low attaining groups of children in comparison with average attaining pupils.

To conduct these analyses children were divided into three groups (bottom 25%, middle 50% and top 25%) based on their General Cognitive Ability (GCA). The GCA measure used was collected at entry to the study (age 3 years plus) for the main pre-school sample, and at entry to school for the 'home' group. Each group was further sub-divided into income bands. By including these groups in the multilevel contextualised model, it is possible to establish what extra boost a higher income can give to a low attaining child. The effect size can be compared to the size of other factors including pre-school duration. It should be noted that in these comparisons net effects are calculated controlling for the range of child family and home learning environment measures found to be statistically significant in the main analyses.

Because children are divided into prior attainment groups, the contextualised models become a crude form of surrogate value added model.

Table B9 below shows the results for the two measures of interest reported here.

Table B9 Comparison of Effect sizes for children with low and average GCA by parental salary group and pre-school attendance

Salary Groups (Compared with low attainers no reported salary including not working and unemployed or parent absent etc)	Pre-reading	Language
Low attainers £2500-£15000	0.131	0.077
Low attainers £17500-£27500	-0.013	-0.097
Low attainers £30000-£35000	-0.091	-0.113
Low attainers £37500 Plus ¹⁸	0.298 [#]	-0.062
Average attainers no salary	0.575*	0.857*
Average attainers £2500-£15000	0.402*	0.724*
Average attainers £17500-£27500	0.596*	0.828*
Average attainers £ 3000-£35000	0.493*	0.787*
Average attainers £37500-£66000	0.737*	0.751*
Average attainers £67500 -£132000	0.861*	0.756
Duration of pre-school (compared with no pre-school attended i.e. 'home' children)		
Under 1 year	0.156	0.514*

¹⁸ Due to relatively small numbers, the three highest salary groups were combined for the low attainers.

1-2 years	0.322*	0.518*
2-3 years	0.381*	0.527*
3 years plus	0.385*	0.659*

*p<0.05, #nearly statistically significant

The results show that increased family income has only a modest impact on pre-reading results for low attaining children (effect size 0.298, verging on statistical significance) for the highest income band (£37500 plus) compared with the low attaining no salary group.

The importance of GCA is illustrated clearly, with much higher effect sizes for all average ability children across all income bands, although the highest income average attaining band once again show the most positive effects in both Language and pre-reading.

These additional results support the earlier conclusion that the net effects for income are identified for Pre-reading rather than language and are mainly evident at the highest income levels.

Duration of pre-school still shows significant and moderate effect sizes net of other influences especially for language attainment.

Quality and duration

Additional analyses were conducted to explore the influence of quality and duration of attendance effects on child attainment at the start of primary school. Pre school centres were divided into three groups low (bottom 20%), average (middle 60%) and high (top 20%) based on total ECERS-E rating, an observational quality measure. These bands were chosen after looking at the distribution of scores to clearly distinguish the low and high quality centres. Because the 'cut offs' were based on centre scores (considered the most valid approach) the numbers of children in the bands varied (around 16% of the sample were in centres with the lowest quality scores but around 24% in centres with the highest scores). Within each quality band children were further divided on the basis of duration of attendance. It should be noted that due to the relatively smaller numbers in the low quality band, the sub divisions by duration are broader. Therefore direct comparisons for the low quality low duration are not possible.

Table B10 shows the net effects for each of the sub-groups.

Table B10 Comparison of Effect sizes for quality and duration

Pre-school group (Compared with no duration, no quality i.e. the 'home' group)	Pre-reading	Language
Low quality low duration (< 24 months)	0.254	0.602*
Low quality average duration (24-36 months)	0.293*	0.540*
Low quality high duration (36 months plus)	0.368*	0.529*
Average quality very low duration (< 12 months)	0.153	0.459*
Average quality low duration (12-24 months)	0.331*	0.459*
Average quality average duration (24-36 months)	0.479*	0.528*
Average quality high duration (36 months plus)	0.545*	0.672*
High quality very low duration (<12 months)	0.256*	0.338*
High quality low duration (12-24 months)	0.381*	0.526*
High quality average duration (24-36 months)	0.346*	0.535*
High quality high duration (36 months plus)	0.622*	1.010*

*p<0.05

It can be seen that in comparison with the 'home' group **all** levels of quality and duration show a significant positive effect compared with none. Overall, longer duration shows a greater benefit than low duration, irrespective of quality. However, the combination of high quality and high duration shows a particularly strong effect size (1.01) for language, and fairly large effect for pre-reading (0.622). To try to distinguish the separate quality effect we can calculate the net

difference between low quality high duration and high quality high duration. For language (1.01-0.529), this gives an estimate of 0.481. For pre-reading the difference is somewhat smaller at 0.254 (0.622-0.368).

The original EPPE analyses modelled the quality measure as a continuous scale in the value added analyses of children's cognitive progress over the pre-school period (but the 'home' group were not included in these models). The results also confirmed a separate significant effect for quality (as measured by the ECERS-E instrument) over and above a larger effect for duration.

COSTS IN RELATION TO PRE-SCHOOL EFFECTS

Limitations of the cost data

There are a number of important caveats to the use of cost data in these analyses. The DfES Sure Start unit has provided estimates of the cost of different types of provision. In addition to the clearly stated problems in obtaining these costs it must be noted that only average costs of the different sectors have been made available to us (previous research projects have pointed to the difficulties in obtaining relevant figures). Hence it is impossible to separate the impact of cost versus other measures of interest (such as quality or qualifications of staff) at centre level. We have robust data concerning quality and staff qualification levels for individual centres and have also calculated value added residuals estimates of the effectiveness of individual centres for a range of cognitive and social/behavioural outcomes. However, type and cost are both confounded in the data available. Therefore, estimates of the impact of centre type are used to provide effect sizes of each form of provision.

In relation to cost we must interpret these effect sizes with considerable caution because types of provision will differ both between type and within type in terms of quality, qualifications of staff and overall costs. Two sets of analyses are presented to explore effect sizes associated with each type of provider.

- a) **Value added** – where the effect on relative progress over the pre-school period is calculated for each type of provision just for the pre-school sample. Here the local authority day nurseries are used as the reference group (LA day nurseries have the smallest effect sizes in the VA models).
- b) **Contextualised** – where the effect on attainment (at entry to primary school) is calculated for each type of provision versus none (i.e. the reference group is the home sample, for which no pre-school centre costs has been incurred).

Table B11 presents the effect sizes associated with each type of provider based on value added analyses (in these analyses the 'home' group are not included). The results are also expressed in terms of months of development (**in parenthesis**).

Table B11 Value added model : Effect sizes by type of provider

	Versus Local Authority Day Nurseries			
	Effect Sizes and (months in development)			
	Average cost (£) per child p.a.	Pre-reading	Language	Early number concepts
Nursery classes	2,875	0.23 (3.7)	0.14 (2.26)	0.02 (0.27)
Playgroups	922	0.06 (0.75)	0.18 (2.90)	0.18 (2.43)
Private day nurseries	4,183	0.26 (3.28)	0.21 (3.39)	0.17 (2.22)
Nursery schools	2,294	0.19 (2.40)	0.17 (2.74)	0.24 (3.14)
Integrated centres	6,880	0.24 (3.03)	0.28 (4.52)	0.40 (5.24)
Local authority day nurseries	6,205	-	-	-

It can be seen that monthly development varies between type of outcome and sector of provider. The largest 'gain' in months of development is in language for children attending combined/integrated centres. Language skills are widely recognised as one of the best predictors of overall academic attainment throughout education and adulthood, and are a particular focus of current policy interest in the reception period given concerns about poor language skills of many young children at school entry.

Table B12 presents the results from contextualised models where home children are included as the reference group. Thus the comparisons are against no pre-school experience rather than relative between different provider types.

Table B12 Contextualised Model: Effect sizes by type of provider

	Versus 'Home' children			
	Effect Sizes and (months in development)			
	Average cost (£) p.a.	Pre-reading	Language	Early number concepts
Nursery classes	2,875	0.29 (3.66)	0.39 (6.29)	0.28 (3.67)
Playgroups	922	0.21 (2.65)	0.45 (7.26)	0.48 (6.29)
Private day nurseries	4,183	0.65 (8.21)	0.60 (9.68)	0.66 (8.64)
Nursery schools	2,294	0.15 (1.90)	0.40 (6.45)	0.44 (5.76)
Integrated centres	6,880	0.17 (2.15)	0.50 (8.07)	0.55 (7.20)
Local authority day nurseries	6,205	0.23 (3.75)	0.40 (6.45)	0.38 (4.98)

The contextualised model makes comparisons to no pre-school centre experience and measures impact on attainment. It is clear that the effect sizes are larger than in the models of progress. This is because comparisons are made against the 'home' group for whom no cost has been incurred. It must be noted that the larger effect sizes for private day nurseries are likely to be partly due to higher prior attainment of this group (not included in this model) and impact of social advantage of composition (% mothers with a degree or above), which can only be controlled in the value added analyses.

Figures on the basic annual costs per pre-school place (supplied by Sure Start) are shown in Table A. Pre-school providers differ in the number of weeks that they operate, and in the number of sessions a week that they provide. Hence it is appropriate to show how pre-school providers vary in terms of cost per session and this is also shown in Table A. In the final column of Table A the sessional costs are shown as a ratio where playgroup costs (lowest) are taken as unity.

Table A Comparative costs of pre-school providers

	Annual cost per place	Weeks p.a.	Sessions per week	Cost per session	Ratio of costs per session
Nursery classes	2,875	39	5	14.74	3.12
Playgroups	922	39	5	4.73	1.00
Private day nurseries	4,183	48	10	8.71	1.84
Nursery schools	2,294	39	5	11.76	2.49
Integrated centres	6,880	40	10	17.37	3.67
LA day nurseries	6,205	48	10	12.93	2.73

Table B Contextualised model: Benefit in terms of child attainment at start of primary school in months of development.

	Pre-reading	Language	Early number concepts
	Effect Size in months	Effect Size in months	Effect Size in months
Nursery classes	3.66	6.29	3.67
Playgroups	2.65	7.26	6.29
Private day nurseries	8.21	9.68	8.64
Nursery schools	1.90	6.45	5.76
Integrated centres	2.15	8.07	7.20
LA day nurseries	3.75	6.45	4.98

The value added figures on child progress are shown below. Here the effects for pre-school providers are taken with LA day nurseries as the comparison group (this group had the smallest effects in the value added models) and are again shown in terms of months of development.

Table C Value added model: Benefit in terms of child progress over the pre-school period in terms of months of development. (LA day nurseries is the comparison group)

	Pre-reading	Language	Early number concepts
	Effect Size in months	Effect Size in months	Effect Size in months
Nursery classes	3.70	2.26	0.27
Playgroups	0.75	2.90	2.43
Private day nurseries	3.28	3.39	2.22
Nursery schools	2.40	2.74	3.14
Integrated centres	3.03	4.52	5.24

The question of the effects that can be attributed to quality of pre-school provision is of interest. Earlier, this paper gave analyses of quality and duration effects, where the quality measure is derived from observational ratings (ECERS-E). These ratings of aspects of quality are one way of getting a handle on this slippery topic.

Another approach is to consider the residual effects attributable to individual pre-school centres after controlling for all measured child, family, home and contextual factors. These residuals provide measures of effectiveness and can be regarded as the outcome of pre-school quality differences. These quality differences are in turn the result of a range of differences between pre-school centres. The advantage of this approach is that the residual centre effects can be regarded as a proxy for the cumulative effect of all quality differences.

For pre-reading the range of centre residuals effects is 10.43 points on the pre-reading scale. This is a difference between the best and the worst centre in a distribution that is approximately normal. Let's take the centre that is one standard deviation below the mean as an averagely bad centre in terms of quality, and the centre that is one standard deviation above the mean as an averagely good centre in terms of quality. The difference between these is 2 SD units, which is 4.2. This could be regarded as a measure of the effect size of quality (average bad compared with average good). It is a relatively conservative estimate as it is considerably smaller than comparing the very worst with the very best, and the levels of quality compared are ones that are frequently present in the population of pre-school centres. This effect size for quality of 4.2 pre-reading units is equivalent to **4.15** months of development.

Similar computations for language give an effect size for quality of **2.48** months of development, and for early number concepts an effect size for quality of **3.36** months of development.

Finally, the relative effects of increasing family income versus increasing the time the child attends pre-school are explored. This question is best considered where the duration of pre-

school is considered as months of attendance rather than sessions per week as the EPPE results clearly show an effect for number of months while 5 sessions are not significantly different in their impact from 10 sessions a week. The various calculations on income and duration effects show that for children in low income families, one extra year of pre-school (i.e. 3 rather than 2 years) is associated with a similar effect upon pre-reading as increasing family income by £10,000 p.a. The costs table overleaf show that any form of pre-school provision costs a lot less than £10,000, particularly if only 5 sessions a week are provided.

Conclusion

The calculation of effect sizes for specific sub groups of children allows comparison with the effects attributable to other child, family or home environment characteristics. Of particular policy relevance for this paper are the comparisons with the size of family income effects and those of different durations of pre-school. In addition the analyses reported here have extended the study of the impact of different levels of quality and duration of pre-school.

Appendix 1 of the Treasury Paper

This Table shows the grouping of children in relation to Family Income and Duration.

Attainment bands (using gca @ baseline for EPPE pre-sch sample & gca @ reception for home sample) * total family salary (categorical variable) Cross tabulation

		Total family salary (categorical variable)							Total
		No salary	2500-15000 salary	17500-27500 salary	30000-35000 salary	37500-66000 salary	67500-132000 salary	No salary data*	
Attainment bands (using gca @ baseline for EPPE pre-sch. sample & gca @ reception for home sample)	Low attainers @ entry to reception (GCA)	205	133	91	48	55	11	290	833
	Average attainers @ entry to reception (GCA)	241	231	193	139	223	66	340	1433
	High attainers @ entry to reception (GCA)	62	87	115	79	187	96	113	739
Total		508	451	399	266	465	173	743	3005

*no questionnaire or non response of question

This Table shows the grouping of Quality and Duration of pre-school.

ECERS-E 3-way split (centre level) * amount of time (grouped2) in pre-school (dosepreb+dosepres) (for pattern, number and pre-reading) Cross tabulation

		Amount of time (grouped2) in pre-school (dosepreb+dosepres) (for pattern, number and pre-reading)					Total
		0<dose≥ 12	12<dose≥ 24	24<dose≥ 36	dose>36	no pre-school ie home	
ECERS-E 3-way split (centre level)	No pre-school ie home	314	0	0	0	0	314
	Low quality (lowest 20%)	0	13	142	226	41	422
	Medium quality (middle 60%)	0	306	638	475	203	1622
	High quality (highest 20%)	0	237	315	73	46	671
Total		314	556	1095	774	290	3029

Appendix C

Effective Pre-School and Primary Education 3-11 (EPPE-3-11)

Abstract:

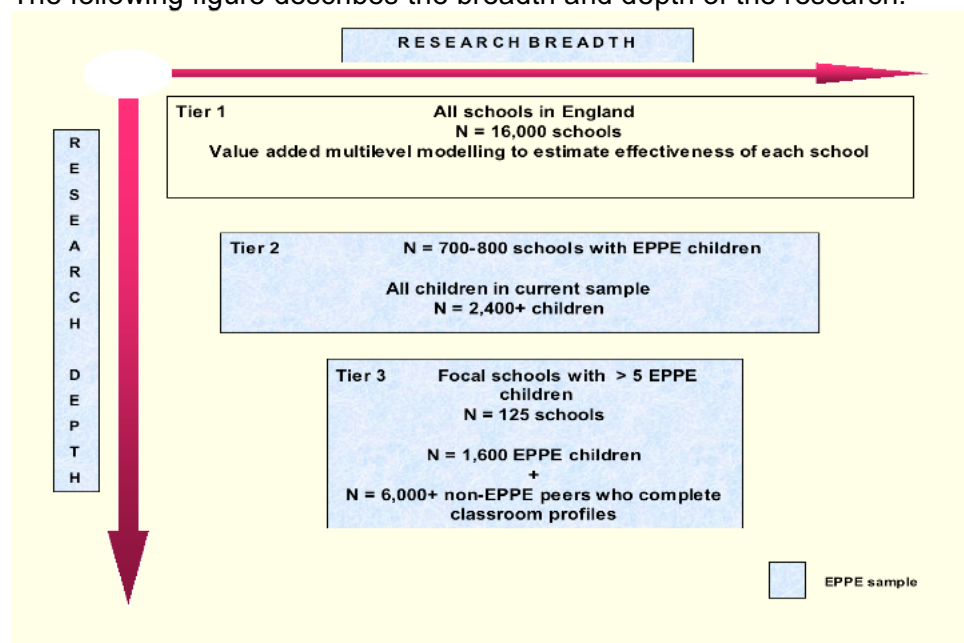
The Effective Pre-School and Primary Education 3-11 (EPPE 3-11, 2003 – 2008) project will continue to build on the extensive data collected in the original EPPE study, following the children up to the age of 11 at the end of Key Stage 2. EPPE 3-11 is interested in the continuing effects of pre-school education, the characteristics of effective primary schooling, the learning trajectories of resilient and vulnerable children and the contribution to pupil progress of out of school learning. This quantitative data will inform school observations which will document the practices and processes at classroom level which influence children's cognitive and social/behavioural development. The study combines statistical analyses of pupil outcomes (attainment, attitudes, SEN, etc.), observational and interview data on educational processes.

The main EPPE research officially ended in August 2003. The research findings have had impact at national, LEA and practitioner level. EPPE has provided evidence for two Treasury spending review rounds and has helped secure significant additional resources for early years education and care. The roll out of the new Children's Centre programme has been influenced by the research findings. As EPPE have a unique sample of 3,000 children, with plotted individual learning trajectories, the opportunity to use the sample to answer further research questions presented itself. The Effective Pre-School and Primary Education 3-11 (EPPE 3-11) Project is an extension to the main EPPE study and follows the same cohort of children to the end of Key Stage 2. This five year extension has been developed to explore four related themes in a series of embedded research tiers.

The four main research questions are:

- 1 *Do the effects of pre-school continue through to Key Stage 2?*
- 2 *What are the characteristics of 'effective' primary classrooms and schools?*
- 3 *Who are the resilient and the vulnerable children in the EPPE sample?*
- 4 *What is the contribution of 'out-of-school learning' (homes, communities, internet) to children's development?*

The following figure describes the breadth and depth of the research.



Tier 1 – Primary School Effectiveness study

The aim of the first tier is to compare the effectiveness (and trends in effectiveness) across Key Stage 2 of all primary schools in England. This study will provide effectiveness measures for the schools in the EPPE sample and allow us to place the schools EPPE children attend in the context of all other schools in England. This study will constitute the first major multilevel value added study of the effectiveness of primary schools in England.

Tier 2 - The continuing effects of pre-school education

This study aims to establish whether the effects of pre-school that were apparent at entry to school continue through to Key Stage 2 for 2400+ children in 700+ schools. Statistical models will examine the extent to which pre-school centres have any continuing impact on pupil attainment at age 11, after controlling for children's performance in relevant assessments at entry to reception (rising 5) and for social background. The study will identify children who have 'succeeded beyond the odds' and children whose early profiles were sound but who later underachieved, despite average or good early profiles. The study will investigate the factors associated with these resilient and vulnerable trajectories. The study will also continue to monitor the progress and development of various groups of children 'at risk' of SEN as identified in the linked EYTSEN extension study.

Tier 3 - Investigating educational processes

Approximately 1600+ EPPE children attend 125 focal schools. These EPPE children and their classmates will help us investigate in more detail the contribution to children's outcomes of classroom and school processes. This research will also provide further information on classroom and school climate and other processes related to children's attainment and social development. The multilevel modelling techniques applied in the full sample study will be used, but in this case the range of predictor variables will include measures of classroom and school processes. Thus, we will have available more information on classroom and school processes to include in the statistical models explaining educational effectiveness and resilience.

Appendix D The Effective Provision of Pre-School (EPPE) Project Technical Papers

Technical Paper 1 - An Introduction to the Effective Provision of Pre-school Education (EPPE) Project
ISBN: 085473 591 7 Published: Autumn 1999 Price £8.50

Technical Paper 2 - Characteristics of the Effective Provision of Pre-School Education (EPPE) Project sample at entry to the study ISBN: 085473 592 5 Published: Autumn 1999 Price £4.00

Technical Paper 3 - Contextualising EPPE: Interviews with Local Authority co-ordinators and centre managers ISBN: 085473 593 3 Published: Autumn 1999 Price £3.50

Technical Paper 4 - Parent, family and child characteristics in relation to type of pre-school and socio-economic differences. ISBN: 085473 594 1 Published: Autumn 1999 Price £4.00

Technical Paper 5 – Characteristics of the Centre in the EPPE Study: (Interviews)
ISBN: 085473 595 X Published: Autumn 2000 Price £5.00

Technical Paper 6 - Characteristics of the Centres in the EPPE Sample: Observational Profiles
ISBN: 085473 596 8 Published: Autumn 1999 Price £8.50

Technical Paper 6A - Characteristics of Pre-School Environments
ISBN: 085473 597 6 Published: Autumn 1999 Price £8.50

Technical Paper 7 - Social/behavioural and cognitive development at 3-4 years in relation to family background ISBN: 085473 598 4 Published: Spring 2001 Price £5.00

Technical Paper 8a – Measuring the Impact of Pre-School on Children's Cognitive Progress over the Pre-School Period. ISBN: 085473 599 2 Published: Autumn 2002 Price £8.50

Technical Paper 8b – Measuring the Impact of Pre-School on Children's Social/behavioural Development over the Pre-School Period. ISBN: 085473 683 2 Published: March 2003 Price £8.50

Technical Paper 9 - Report on age 6 assessment
ISBN: 085473 600 X Publication Date Autumn 2004

Technical Paper 10 - Intensive study of selected centres
ISBN: 085473 601 8 Published: Autumn 2003 Price £11.00

Technical Paper 11 - Report on the continuing effects of pre-school education at age 7
ISBN: 085473 602 6 Publication Date: Autumn 2004

Technical Paper 12 - The final report ISBN: 085473 603 4 Publication Date: Autumn 2004

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 Price £8.99

Researching Effective Pedagogy in the Early Years 2002 (REPEY): DfES Research Report 356. Siraj-Blatchford, I., Sylva, K., Muttock, S., Gilden, R. and Bell, D. London: DfES, HMSO

Early Years Transition and Special Educational Needs (EYTSEN) Technical Paper 1: Special Educational Needs across the Pre-school Period.

ISBN: 085473 680 8 Published Autumn 2002 Price £8.00

EYTSEN Technical Paper 2: Special Educational Needs in the Early Primary Years: Primary school entry up to the end of Year One. ISBN: 085473 681 6 Published Summer 2004 Price £8.00

EYTSEN Technical Paper 3: Special Educational Needs: The Parents' Perspective
ISBN: 085473 682 4 Published Summer 2004 Price £8.00

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Visit the EPPE Website on : <http://www.ioe.ac.uk/projects/eppe>

Glossary of terms

'Anti-social / Worried' At primary school entry, teachers rated the social behaviour of EPPE children using the CSBQ. A factor analysis of the 45 items resulted in the extraction of 6 underlying factors. Primary school entry factor 4 measures the child's tendency to show behaviour that is disruptive to others or that is aggressive or destructive. Often, but not always, such behaviour occurs together with indications of worry or upset by the child. This scale is termed 'Anti-social / Worried'. Similarly, a factor analysis of the ASBI (rated by a pre-school worker at entry to the study) resulted in the extraction of 5 underlying factors with entry to study factor 4 and 5 measuring 'Anti-social' and 'Worried / Upset' behaviour.

ASBI The Adaptive Social Behaviour Inventory (ASBI) (Hogan et al, 1992) is a rating scale consisting of 30 items completed by a caregiver of a child. The items can be combined to produce factors that are measures of different aspects of the child's social behaviour.

'at risk' The EYTSEN report acknowledges that the term 'at risk' is a complex one which will differ depending on the particular criteria used. In the EYTSEN study 'cognitive risk' is defined as 1 sd below national average and '*strong cognitive risk*' as 1 sd below sample average. 'Social/behavioural risk' is defined as 1 sd below sample average. These provide definitions of children who may be seen to be 'at risk' on the basis of their cognitive attainment or Social/behavioural development at entry to pre-school.

Attendance The number of sessions attended at the target centre by an EPPE child from entry to study (BAS assessment) until exit from target pre-school centre (from attendance records of pre-school centre). This measure provides a crude indicator of amount of pre-school experience.

Baseline measures Social/behavioural ratings given by the careworker at entry to the study. These social/behavioural scores are subsequently employed as prior social/behavioural measures in a value added analysis of pupils' social/behavioural outcomes.

Birth weight Babies born weighing 2500 grams (5lbs 8oz) or less are defined as below normal birth weight, fetal 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 Caren, 1989).

Caregiver Interaction Scale (CIS) A rating scale consisting of 26 items completed by an observer of the interactions between caregivers and children. The items are grouped to produce 4 subscales: positive relationships, punitiveness, permissiveness and detachment. The CIS was developed by Arnett (1989).

- Positive relationships is a subscale made up of 10 items indicating warmth and enthusiastic interaction with children by the caregiver.
- Punitiveness is a subscale made up of 8 items indicating harsh or over-controlling behaviour in interaction with children by the caregiver.
- Permissiveness is a subscale made up of 4 items indicating avoidance of discipline and control of children by the caregiver.
- Detachment is a subscale made up of 4 items indicating lack of involvement in interaction with children by the caregiver.

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

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

Compositional effects The impact of peer group measures on a child's individual outcomes. For example, when the characteristics of children in a centre (measured as a centre level aggregated variable) show a significant relationship with outcomes at the individual child level,

after controlling for the same variable at the individual level. For further details see Harker (2001).

‘Confidence’ At entry to the study, pre-school workers rated the social behaviour of EPPE children using the ASBI. A factor analysis of the 30 items resulted in the extraction of 5 underlying factors. Entry to study factor 3 measures the child's apparent confidence in his/her own ability and is termed ‘Confidence’.

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 social/behavioural development at entry to primary school, controlling for child, family and home learning environment characteristics (but not prior social behaviour). These models are equivalent to the cross-sectional multilevel models in Section 2 of EPPE Technical Paper 8a exploring children's cognitive attainment over the pre-school period, controlling for significant child, parent and home learning environment characteristics.

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.

‘Co-operation & Conformity’ At primary school entry, teachers rated the social behaviour of EPPE children using the CSBQ. A factor analysis of the 45 items resulted in the extraction of 6 underlying factors. Primary school entry factor 2 measures the child's co-operative behaviour and conformity to group norm and is termed ‘Co-operation & Conformity’. Similarly, a factor analysis of the ASBI (rated by a pre-school worker at entry to the study) resulted in the extraction of 5 underlying factors with entry to study factor 1 measuring ‘Co-operation & Conformity’.

CSBQ The Child Social Behaviour Questionnaire (CSBQ) is an extension of the ASBI and has 45 items concerning a child's social behaviour rated by teachers at entry to school. The items can be combined to produce factors that are measures of different aspects of the child's' social behaviour.

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, 1999d) 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 although in the case of EPPE, both cognitive and social/behavioural) while controlling for the influence of intake differences in child / student characteristics.

'Empathy & Pro-social' At primary school entry, teachers rated the social behaviour of EPPE children using the CSBQ. A factor analysis of the 45 items resulted in the extraction of 6 underlying factors. Primary school entry factor 5 measures the child's ability to show empathy or understanding for another child's feelings and is termed 'Empathy & Pro-social'.

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

Factor scores Factor scores for each child were calculated by averaging the ratings given by the teacher / pre-school centre worker for the questions that form each factor.

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

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.

'Independence & Concentration' At primary school entry, teachers rated the social behaviour of EPPE children using the CSBQ. A factor analysis of the 45 items resulted in the extraction of 6 underlying factors. Primary school entry factor 1 measures the child's ability to play or work independently showing a certain level of concentration and is termed 'Independence & Concentration'.

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 correlation The intra-centre correlation measures the extent to which the scores of children in the same centre resemble each other as compared with those from children at different centres. The intra-centre 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 pre-school settings. This gives an indication of possible variation in pre-school effectiveness.

Language attainment Composite formed by adding together the scores for two of the BAS assessments (naming vocabulary and verbal comprehension).

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 (e.g. young children, pre-school centres, LEAs), 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.

Outliers Pre-school centres where children made significantly greater/less social/behavioural developmental gains than predicted on the basis of prior social behaviour and other significant child, parent and home learning environment characteristics.

Pedagogical strategies Strategies used by the educator to support learning. These include the face-to-face interactions with children, the organisation of the resources and the assessment practices and procedures.

'Peer Sociability' At primary school entry, teachers rated the social behaviour of EPPE children using the CSBQ. A factor analysis of the 45 items resulted in the extraction of 6 underlying factors. Primary school entry factor 3 measures the child's ability to play or work well with peers and in groups and is termed 'Peer Sociability'. Similarly, a factor analysis of the ASBI (rated by a pre-school worker at entry to the study) resulted in the extraction of 5 underlying factors with entry to study factor 2 measuring 'Peer Sociability'.

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

Principal components analysis This is a statistical technique for extracting the most important underlying factors from the correlations (measures of association) between a set of variables, and hence enables many separate variables to be reduced to a few underlying factors.

Prior attainment factors Measures that describe pupils' achievement at the beginning of the phase or period under investigation (e.g. 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 LEAs) 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, playgroups 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 non-manual, intermediate non-manual, skilled non-manual, skilled manual, semi-skilled manual, unskilled manual, 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 percent of cases fall within one standard deviation of the mean and 95 percent of cases fall within two standard deviations.

Target centre A total of 141 pre-school centres were recruited to the EPPE research covering 6 types of provision. The sample of children was drawn from these target centres.

Value added models Longitudinal multilevel models exploring children's social/behavioural developmental gains over the pre-school period, controlling for prior social behaviour and significant child, parent and home learning environment characteristics. These models are equivalent to the value added multilevel models in Section 3 of EPPE Technical Paper 8a 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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