

Technical Paper 1 – June 1999

An Introduction to the EPPE Project

*A Longitudinal Study funded by the DfEE
1997-2003*

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

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Technical Paper 1

AN INTRODUCTION TO THE EPPE PROJECT

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The EPPE project is a major five year study funded by the DfES. The research would not be possible without the support and co-operation of the six Local Authorities (LAs) and the many pre-school centres, primary schools, children and parents participating in the research. The important contribution of the Regional Research Officers Anne Dobson, Isabella Hughes, Marjorie Jeavons, Margaret Kehoe, Katie Lewis, Maria Morahan, Sharon Sadler and our part-time Research Assistants has been vital to the project's completion. We are grateful to both the project's Steering and Consultative Committee for their helpful advice on the study.

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EXECUTIVE SUMMARY

This paper describes the research design used in the study of Effective Provision of Pre-school Education (EPPE) funded by the UK Department for Education and Employment. This five year longitudinal study assesses the attainment and development of children between the ages of 3 to 7 years. Research began in 1997 and both quantitative and qualitative methods (including multilevel modelling) are used to explore the effects of pre-school education on children's attainment and social/behavioural development at entry to school and any continuing effects on such outcomes two years later 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 and participation in employment. This paper outlines the research design and discusses a variety of research issues (methodological and practical) in investigating the impact of pre-school provision on children's developmental progress. It sets the design of EPPE within the context of other research studies on the effectiveness of early education and care. A parallel study is being carried out in Northern Ireland and this too is described.

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BACKGROUND TO THE RESEARCH

There has been a rapid expansion of policy and programmes for young children and their families in Britain. First there were 'educational vouchers' and the Desirable Learning Outcomes (DfES 1996), followed soon by Early Years Development and Childcare Partnerships (DfES 1999a, b), and then by Sure Start programmes intended to promote social inclusion in targetted areas (DfES 1999c). These are but a few of the recent initiatives intended to improve educational outcomes for young children. Will these schemes work? Will children enter school 'more ready' to learn or perform better at Baseline Assessment (DfES 1998)? Which are the most effective ways to educate young children? The research project described in this paper is part of the new emphasis on ensuring 'a good start' for children. Its research methods draw on several well known traditions of investigation but its **content**, the questions it seeks to answer about 'effective' ways to educate and care for children, is both contemporary and practical.

Research from other countries

It is in the USA that the most extensive studies of early education have been carried out. Research has shown positive short-term effects of early childhood programmes such as Head Start, a community-based pre-school programme which features early childhood education and parental involvement. In many (but not all) research studies children's participation in Head Start immediately before school had a significant short-term positive impact on academic and social development (McKey, Condelli, Ganson, Barrett, McCokey & Plantz 1985; Lazar & Darlington 1982a;1982b). The major doubts about the effectiveness of Head Start do not concern short-term benefits but rather the long-term impact. Although many authors praise the parental and community involvement which is so central to Head Start (Zigler & Styfco 1993), Head Start programmes vary in quality from state to state and even city to city. Perhaps because of such diversity, few large scale research studies have found lasting, positive outcomes.

A series of meta-analyses carried out on 'experimental' early childhood interventions provides a more optimistic picture. The authors limited their selective meta-analysis to pre-school programmes planned from the start as research projects. Each individual project had an adequate sample size, used norm-referenced assessment tests to establish outcomes, assessed outcomes for comparison/control groups, and followed children well beyond entry to primary school. By these strict criteria the results of 11 carefully monitored programmes were subjected to meta-analysis, a statistical exercise which enables researchers to compare the size of effect across many different studies. Almost all were aimed at disadvantaged children and all were of high quality although small-scale. Lazar and his colleagues compiled information on education and employment of more than 2000 individuals who had participated in early intervention programmes before they entered school. In addition, the researchers carried out interviews with the young adults at age 19 and their families. Results from the meta-analysis showed that attendance at excellent, cognitively oriented pre-school programmes were associated with later school competence and avoidance of assignment to 'special' education. Interviews revealed the parents of children who had participated in the intervention programme had developed higher aspirations for employment of their children. This research suggested that the long-term effects of early childhood education lay not with intellectual gains but with children's remaining in mainstream education and developing positive views of themselves and their futures. Note however that these high quality programmes were set up for 'demonstration' and 'research' – making generalisation to all early childhood programmes impossible.

In 1990 Barnett published a review of early interventions. He added to the original 11 studies

cited in Lazar and Darlington six further studies on large-scale, public pre-school programmes, with follow-up periods ranging from 3 to 12 years. Barnett also came to the conclusion that early childhood interventions had significant long-term effects on the following outcomes: assignment to special needs education, retention at grade and school drop-out. Across the 17 programmes reviewed by Barnett, 48.5 per cent fewer 'intervention' children were placed in special education classes, 32 per cent fewer were retained in grade, and there were 26 per cent fewer drop-outs.

Slavin and his colleagues (Slavin et al. 1994) took a different analytic strategy to those who carried out the two meta-analyses described above. Using 'best evidence synthesis' they identified successful programmes which included those identified above but added some new ones as well. These include the Milwaukee Project, The Carolina Abecedarian Project, the Family Development Research Programme, and the Parent-Child Development Centre. From this large list of research studies, including many aimed at very young children, Slavin concluded that high quality early childhood intervention was effective at preparing disadvantaged children for school entry. In addition he found that the more successful programmes were interventions that combined several 'strands' of intervention, involved intensive participation by children and families and lasted for a substantial number of years. It was particularly important to carry out the intervention close to school entry, or, for interventions aimed at very young children, to add a 'top-up' near to school entry.

The most carefully controlled of all USA research was the Perry Preschool Project, later called High/Scope. This curriculum is based on Piagetian theory, but also includes intensive parent participation. The programme has been subjected to careful evaluation for almost 30 years and has consistently shown striking social and economic benefits (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart 1984; Schweinhart, Barnes & Weikart 1993). The study is one of the few pre-school evaluations following an experimental design with random assignment of children to the 'treatment' (i.e. early childhood education) or 'control' (i.e. home) groups. The results showed an initial IQ advantage for pre-school graduates which disappeared by secondary school. The High/Scope evaluators widened their outcome measures to include social and economic behaviours in adulthood. They found startling differences in social adjustment, community participation, and crime between the individuals who attended the programme as pre-schoolers and the control group who had remained at home.

Results from a follow-up at age 27 show that the High/Scope programme intended for disadvantaged young children led to better academic performance, adult employment, and to fewer arrests for criminal activity. See Figure 1. This broad range of positive outcomes is confirmed in other research, especially with regard to crime and delinquency, by Larry, Mangione and Honig (1988) who found that pre-school attendance lowered the rate of anti-social behaviour.

Schweinhart Barnes & Weikart (1993) carried out a cost-benefit analysis of the High/Scope programme and found that for every \$1000 that was invested in the pre-school programme, at least \$7160 (after adjustment for inflation) had been returned to society. These calculations were based on the financial cost to society of crime, special education, income support, and joblessness - set against the running costs of an excellent pre-school programme. The economic analysis also estimated the return to society of taxes from the higher paid individuals who had attended pre-school centres.

There have been two other cost benefit analyses carried out on pre-school interventions, both in the USA. Barnett and Escobar (1990) present data from a pre-school language intervention curriculum studied by Weiss and a comprehensive early day care programme for disadvantaged families studied by Seitz. Both studies showed that the costs of the early childhood programmes were more than offset by the savings later on in the children's schooling and medical care.

It is clear that some, but certainly not all, early childhood programmes lead to improved school adjustment, better jobs and lower rates of anti-social behaviour. In a later study, Schweinhart,

Weikart and Larner (1986) compared the effects of three different curricula: High/Scope (the 'active learning' curriculum used in the Perry Preschool project), Formal Skills (direct instruction) and Traditional Nursery (curriculum centred on free play). In this second High/Scope study they made a direct comparison between the effects of different types of curriculum. At school entry, they found that children from all three programmes had increased IQ's. However, follow-up at the age of 15 showed that children who had attended the formal programme had higher rates of anti-social behaviour and had poorer adjustment to school than those who attended the two programmes based on active learning and play. Only the children who experienced informal learning before school retained the advantage of their early education, an advantage they demonstrated by pro-social behaviour and higher confidence when interviewed as adolescents.

A later follow up of the same cohort at age 23 (Schweinhart & Weikart 1997) investigated the impact of the three different curricula on adult social and economic outcomes in adulthood. The individuals who had participated in the formal, Direct Instruction programme had poor psychological adjustment in the community and poorer grades throughout their secondary school careers. By the age of 23 the graduates of High/Scope and the Traditional Nursery programmes were better off in important ways compared to those whose pre-school education was formal in the Direct Instruction group. Those who had experienced the Direct Instruction programme had been arrested more often (over the lifetime), both felony and misdemeanour, more years of special education, and less adult involvement in community activities. More of the graduates of the informal programmes (High/Scope and Traditional Nursery) were living with a spouse and had fewer suspensions from work for discipline problems. Intriguingly, in-depth interviews revealed that the High/Scope graduates reported significantly fewer instances of 'daily irritation'. They were particularly less likely to report that friends or family were 'giving them a hard time', suggesting a more positive view of their immediate social environment. Thus many children who had experienced a formal, instruction-orientated programme before entering school grew up to be more hostile to authority and also towards their family and peers. This 1997 High/Scope study gives confidence in the results of the first (Schweinhart, Barnes & Weikart 1993) since it too used experimental methods and similar analytic strategies.

The National Institute of Child Health and Development (1997) is currently carrying out a longitudinal study on the effects of day care on children's development between 0 and 8 years. These researchers are using methods similar to those of Weikart and colleagues (McCartney & Jordan 1990) but early results relate more to care in the age range 0-3 years than to early childhood education.

A direct replication of Schweinhart and Weikart (1997) was carried out in Portugal (Nabuco 1997; Nabuco & Sylva 1995). Nabuco investigated the effects of the three approaches to pre-school curriculum on children's academic and social development at the start and end of first grade in the Lisbon area. The pre-school curricula included High/Scope, a Formal Skills curriculum and a Progressive Nursery programme, all similar to those studied by Schweinhart and Weikart (1997). Each curriculum was represented by five pre-school centres in Portugal, all chosen as "good examples of the curricular model". When children transferred at age 6 to primary school, control children with no experience of preschool were recruited from the same first-grade classes. In this design, children's academic and social progress over the first year in school was measured by comparing control children (classmates) who had not attended pre-school with children who had attended pre-school centres implementing different curricula. Children were not randomly assigned to pre-school programmes so careful matching of children and families was carried out.

The results of this short-term longitudinal study are in complete agreement with those of Schweinhart and Weikart (1997). Children who had attended the High/Scope programme while in pre-school showed significantly higher educational attainment (reading and writing), higher self-esteem, and lower anxiety than matched control children. When compared to children in the Formal Skills group, the High/Scope children performed better on literacy tests, better on self esteem and showed significantly less anxiety than children from the Formal Skills group. When compared with the children in the Traditional Nursery, the High/Scope children showed better

outcomes, although their superiority was comparatively less than in comparison with the Formal Skills group.

Research on the effects of Early Education in the UK

There has been little large-scale, systematic research on the effects of early childhood education. One exception was the Child Health Education Study which showed that children with some form of pre-school education had better outcomes (Osborn & Milbank 1987). The 'Start Right' Enquiry (Ball 1994) reviewed the evidence of this research and concluded that small-scale studies suggested a positive impact but that large-scale research was inconclusive. They recommended longitudinal studies with baseline measures so that the 'value added' by pre-school education could be established.

Other evidence has been provided concerning the influence of different pre-school environments on children's development (Melhuish et al. 1990; Melhuish 1993; Sylva & Wiltshire 1993; Borge et al., 1993). Some researchers have examined the impact of particular characteristics, e.g. gender and attendance on children's adjustment to nursery classes (Davies & Brember 1992), or adopted cross-sectional designs to explore the impact of different types of pre-school provision (Davies & Brember 1997). Feinstein, Robertson and Symons (1998) attempted to evaluate the effects of pre-schooling on children's subsequent progress. This is an ambitious aim and one which was not the prime purpose of the two data sets used in the analyses. There are strong arguments against using birth cohort designs for the study of the influence of pre-schooling. The absence of data about children's attainments at entry to pre-school means that neither the Birth Cohort Study (1970) nor the National Child Development Study (1958) can be used to explore progress over the pre-school period, the period in which they are most likely to be identified. Moreover, for the NCDS the absence of data age 5 (i.e. near entry to school) is an additional limitation. To date, however, no research using multilevel models (Goldstein 1987) has been used to investigate the impact of both type of provision **and** individual centre effects. Thus little research in the UK has explored whether some forms of provision have greater benefits than others. Schagen (1994) attempted multilevel modelling but did not have adequate control at entry to pre-school.

Research into the effects of pre-school education will benefit from longitudinal designs which allow the separation of pre-school influences from those related to the individual child's personal and family characteristics. New research should identify the educational processes, including pedagogy, which are associated with positive effects as children progress and develop. It should also explore the mechanisms of change (Sylva 1994).

In the UK there is a long tradition of variation in pre-school provision both between types (e.g. playgroup, local authority or private nursery or nursery classes) and in different parts of the country reflecting Local Authority emphasis and funding and geographical conditions (e.g. urban or rural). 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 called for both better co-ordination of services along with research into the impact of different forms of provision (Siraj-Blatchford 1995).

RESEARCH METHODS

EPPE IN OVERVIEW

The Effective Provision of Pre-school Education (EPPE) project is a major five year study funded by the UK's Department for Education and Employment (DfES). Research began in 1997 to investigate three issues which have important implications for policy and practice:

- the effects on children of different types of pre-school provision,
- the structural (e.g. adult-child ratios) and process characteristics (e.g. interaction styles) of more effective pre-school centres, and
- the interaction between child and family characteristics and the kind of pre-school provision a child experiences.

A 'school effectiveness' research design was chosen to investigate these topics because this enables 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 (the start of Reception) and at the end of Key Stage 1 (age 7 plus). Such research designs are well suited to the questions addressed by social and educational researchers 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). As yet, such techniques have not been applied to the pre-school sector, although recent examples of value added research for younger ages at the primary level have been provided (Tymms et al. 1997; Sammons & Smees 1998; Jesson et al. 1997; Strand 1997; and Yang & Goldstein 1997). These have examined the relationship between baseline assessment at reception to infant school through to Key Stage 1 (age 7 plus years).

The earliest studies of school effectiveness can be summarised as addressing the question "*Does the particular school attended by a child make a difference?*" (Mortimore et al. 1988; Tizard et al. 1988). More recently the question of internal variations in effectiveness, teacher/class level variations and stability in effects of particular schools over time have assumed importance (Luyten 1994; 1995; Hill & Rowe 1996). As yet research has not attempted to examine the impact of individual pre-school centres using multilevel analysis. 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 which have long 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 is exploring 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 background who have differing pre-school experiences including early entry to Reception from home.
- To separate out the effects of pre-school experience from the effects of education in the period between Reception and Year 2.

- To establish whether some pre-school centres are more effective than others in promoting children's cognitive and social/emotional development during the pre-school years (ages 3-5) and the beginning of primary education (5-7 years).
- To discover 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. second language learners of English, 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 relate the use of pre-school provision to parental labour market participation.

The sample: regions, centres and children

Since the focus of the EPPE study is on the effectiveness of pre-school centres, a birth cohort sample would be inappropriate (insufficient numbers of children attending any one centre would be recruited and, if the sample were random, too few children would be included from certain types of provision). In order to maximise the likelihood of identifying both centre and any type of provision effects, the EPPE sample was stratified by type of centre and geographical location.

- Six English Local Authorities (LAs) in five regions participate in the research. These were chosen to cover provision in urban, suburban and rural areas and a range of ethnic diversity and social disadvantage. (Another related project covering Northern Ireland was instituted in April 1998 [Melhuish et al. 1997].)
- Six main types of provision are included in the study (the most common forms of current provision are *playgroups*, local authority or voluntary *day nurseries*, *private day nurseries* and *nursery schools* and *classes*, centres *combining care and education*).

In order to enable comparison of centre and type of provision effects the project was designed to recruit 500 children, 20 in each of 20-25 centres, from the six types of provision, thus giving a total sample of 3000 children and 140 centres¹. In some LAs certain forms of provision are less common and others more typical. Within each LA, centres of each type were selected by stratified random sampling and, due to the small size of some centres in the project (e.g. rural playgroups), more of these centres were recruited than originally proposed, bringing the sample total to 141 centres and over 3000 children.

In order to examine the impact of no pre-school provision, an additional sample of 200+ children who have had no pre-school experience is being recruited (from September 1997) from the reception classes to which children from the pre-school sample transfer. As with the pre-school sample, the numbers of children who have received no pre-school provision varies in the five regional areas reflecting differences in the amount of provision and access to centres. (It was hoped to have a larger sample of Home children but they were difficult to find.)

Within each pre-school centre children were recruited to the EPPE sample and given a set of baseline assessments within a maximum of ten weeks of entry from the ages of 3 years to 4

¹ The nursery school and combined centre samples were added later (Siraj-Blatchford, Sylva, Melhuish & Sammons 1997) and their cohorts will be assessed somewhat later; results will be reported separately and in combined form.

years 3 months. Children who had been at a centre before their third birthday were also eligible to be recruited to the study and were assessed as close to their birthdate as possible and within ten weeks. In order to obtain sufficient children for the sample at the centre level, children were recruited to the study over a 15 month period (end 31 March 1998). Signed parental consent letters were received for all children in the study.

The progress and development of 3,000+ pre-school children in the EPPE sample is being followed over four years until the end of Key Stage 1. (See Figure 2.) Two complicating factors are that a substantial proportion of children have moved from one form of pre-school provision to another (e.g. from playgroup to nursery class) and some will attend more than one centre in a week. For example, a child might spend each morning at nursery class and perhaps two or three sessions at playgroup. 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 can be exposed. Mobile children are assessed at exit from any one centre so that separate analyses of this group can be conducted.

Details about length of sessions, number of sessions normally attended per week and child attendance are collected to enable the amount of pre-school education to be quantified for each child in the sample.

Child assessments

Four common points of assessment are being used.

Entry to Pre-school (age 3.0 to 4 years 3 months)

Name of Assessment	Assessment Content	Administered by:
British Ability Scales Second Edition (BASII) (Elliot et al. 1996): <ul style="list-style-type: none"> • Block Building • Verbal Comprehension • Picture Similarity • Naming Vocabulary 	Cognitive development battery <ul style="list-style-type: none"> • Spatial skills • Verbal skills • Pictorial reasoning skills • Verbal skills 	EPPE Researcher EPPE Researcher EPPE Researcher EPPE Researcher
Adaptive Social Behavioural Inventory (ASBI) (Hogan et al. 1992)	Social behaviour and emotional adjustment	Centre Staff
<u>Children not fluent in English:</u> Assessed only on the non-verbal BAS II scales (Block Building and Picture Similarity) and social and emotional behaviour.		

These assessments were chosen to provide a baseline against which later progress and development can be compared. The British Ability Scales (BAS subscales) are designed for use with this age range. Research Officers in each region were trained in their use and checked for reliability. They assessed children on a one-to-one basis. Where possible an interpreter was recruited who spoke the child's home language if the child was not fluent in English. Centre staff who were familiar with the child completed an Adaptive Social Behaviour Inventory (ASBI) for each sample child to provide a measure of social and behavioural development.

Entry to reception class (age rising 5 years)

All children were assessed at entry to school, these assessments provide both a measure of current attainment and development at exit from pre-school and serve as a baseline for entry to school. The assessments were chosen to be compatible with the Desirable Outcomes for Pre-School Education (DfES 1996).

All sample children were assessed on

Name of Assessment	Assessment Content	Administered by:
British Ability Scales Second Edition (BASII) (Elliot et al. 1996):	Cognitive development battery	
<ul style="list-style-type: none"> • Verbal Comprehension • Picture Similarity • Naming Vocabulary • Pattern Construction 	<ul style="list-style-type: none"> • Verbal skills • Pictorial reasoning skills • Verbal skills • Spatial skills 	EPPE Researcher EPPE Researcher EPPE Researcher EPPE Researcher
BAS Early Number Concepts	Reasoning ability	EPPE Researcher
Letter Recognition	Lower case letters	EPPE Researcher
Phonological Awareness (Bryant and Bradley 1985)	Rhyme and Alliteration	EPPE Researcher
Adaptive Social Behavioural Inventory (ASBI - R) (Hogan et al. 1992)	Social and emotional behaviour, hyperactivity and settling-into-school	Class Teacher
<u>Children not fluent in English:</u> Assessed only on two of the non-verbal BAS II scales (Picture Similarity and Pattern Construction) and social behaviour. In addition they were assessed on BAS II Copying, a measure of spatial ability, (Elliot et al. 1996), which was also administered by the EPPE researcher		

The ASBI was also adapted and extended by the EPPE team to cover a greater range of behaviours considered appropriate for school age children by incorporating selected additional items from other published tests, covering hyperactivity and prosocial behaviour.

Exit from reception class (sub-scale sample of 1,000+ children including all Home Children)

The sample children were/are assessed on

Name of Assessment	Assessment Content	Administered by:
British Ability Scales Second Edition (BASII) (Elliot et al. 1996):		
<ul style="list-style-type: none"> • Early Number Concepts • Word Reading 	<ul style="list-style-type: none"> • Reasoning • Reading single words 	EPPE Researcher EPPE Researcher
Letter Recognition	Lower case letters	EPPE Researcher
Phonological Awareness (Bryant and Bradley 1985)	Rhyme and alliteration	EPPE Researcher
Dictation Test (Clay 1985)	Phonological approximation to written words	EPPE Researcher
Adaptive Social Behavioural Inventory - Revised (ASBI - R) (Hogan et al. 1992)	Social emotional adjustment behaviour, hyperactivity and settling-into-school	Class Teacher
<u>Children not fluent in English:</u> Assessed only on the non-verbal BAS II scale (Early Number Concepts and Copying) and social behaviour		

Outcome measures at age 6 plus include

Name of Assessment	Assessment Content	Administered by:
Primary Reading: Level 1 (NFER-Nelson)		Class Teacher
Maths 6 (NFER-Nelson)		Class Teacher
Strengths and Difficulties Questionnaire (Goodman 1997) for extended study	Hyperactivity, conduct problems, peer problems, emotional problems and prosocial	Class Teacher

Outcome measures at age 7 plus include

Name of Assessment	Assessment Content	Administered by:
Primary Reading: Level 1, and possible Level 2 (NFER-Nelson)		Class Teacher
Basic Mathematics (NFER-Nelson)		Class Teacher
Strengths and Difficulties Questionnaire (Goodman 1997) extended for study	Hyperactivity, conduct problems, peer problems, emotional problems and pro-social	Class Teacher
Attitudes to School Questionnaire	Children's views on academic and social activities	Completed by child
Record of conduct / emotional problems		From school records
National Assessments	Reading, Writing and Maths: National Assessments Science: teacher assessed	From school records

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

Educational and sociological research has provided much evidence of the important impact of personal, social and family background on educational progress (see reviews by Hutchison et al. 1979; Mortimore & Blackstone 1982; Sammons et al. 1983). Melhuish (1994) has indicated that parental involvement, which is recognised to contribute to school success (Topping 1992), can be influenced by pre-school practices.

Parent interviews were administered to provide detailed information about parent education, occupation and employment history, family structure and attendance history. In addition, details about the child's day care history and health problems, and parental attitudes and involvement in educational activities (e.g. reading to child, teaching nursery rhymes, television viewing etc) have been collected.

Pre-School Characteristics and Processes

Regional Field Officers made regular visits to pre-school centres, maintained notes about each centre and observed staff. Information about centre characteristics is also obtained by means of interviews with centre directors. Aspects covered include: group size, child staff ratio, staff training, aims, policies, curriculum, parental involvement. Regional officers liaised in each

authority with a Regional Coordinator, a senior officer with responsibility for Early Years, and these individuals helped gain cooperation of centres.

Process quality characteristics include the day-to-day functioning within settings (e.g. child-staff interaction, child-child interaction, and structuring of children's activities). Previous research has shown these variables to influence children's development (Melhuish 1993; Petrogiannis & Melhuish 1996). Information about process quality characteristics is being obtained by means of the Early Childhood Environment Rating Scale (ECERS) which has been recently adapted (Harms, Clifford & Cryer 1998) and the Caregiver Interaction Scale (Arnett 1989). All Field Officers have been trained and checked for reliability in administering these instruments. The ECERS include the following sub-scales:

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

Sylva, Siraj-Blatchford, Taggart & Colman (unpublished) have developed four additional ECERS sub-scales covering educational quality in terms of: Language, Mathematics, Science and Environment, and Diversity. Using the four additional sub-scales centres are rated on 11 subscales altogether.

Case Studies

In addition to the range of quantitative data collected about children, their families and their pre-school centres, detailed qualitative data will be collected using case studies of several outlier pre-school centres (chosen retrospectively on the basis on the multilevel analyses of intake and outcome measures covering the period baseline to entry into reception).

The methodology of the EPPE project is thus mixed. These detailed case studies will use a variety of methods of data gathering, including documentary analysis, interviews and observations and the results will help to illuminate the characteristics of more successful pre-school centres and assist in the generation of guidance on good practice. Particular attention will be 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 and it will be important to examine field notes and pre-school centre histories to establish the extent of change during the study period.

ANALYTIC STRATEGY

The EPPE research was designed to enable the linking of three sets of data: information about children's attainment and development (at different points in time), information about children's personal, social and family characteristics (e.g. age, gender, SES etc), and 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 take account of the clustered nature of the child sample, children being nested within centres and centres within local authority areas. The first phase of the analysis will adopt these three levels in models which attempt to identify any centre effects at entry to reception.

Given the disparate nature of children's pre-school experience it is vital to ensure that the influences of age at assessment, amount and length of pre-school experience and pre-school attendance record are investigated. 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 will include prior attainment (British Ability Scales (BAS) sub scales), Adaptive Social Behavior Inventory (ASBI) score, and child characteristics (personal, social and family). The need to adjust for measurement error in explanatory variables (e.g. baseline assessments) has been illustrated by Woodhouse et al. (1996). The BAS subscales have published reliability estimates ranging between 0.82 (Picture Similarities) to 0.89 (Block Building). The EPPE multilevel analyses will seek to incorporate adjustment for measurement error and to examine 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 any differences increase/decrease over this period will be explored. This will enable equity issues to be addressed.

After controlling for intake differences, residual estimates of the impact of individual pre-school centres (with their associated confidence limits) will be used to select approximately 12 outlier centres from the 141 in the project for detailed case studies. In addition, the proportion of i) total and ii) unexplained variance in children's performance in the various assessments conducted at entry to reception classes attributable to the centre level will be calculated in models with and without control for child intake characteristics (prior attainment and personal, social and family characteristics). (See the appendix).

In addition, multilevel models will be used to test out 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) the variation in children's scores on the various measures assessed at entry to reception classes will provide evidence about whether particular forms of provision have greater benefits in promoting such outcomes by the end of the pre-school period. Multilevel analyses designed to test out the impact of quantitative measures of pre-school process characteristics, such as the scores on various ECERS scales and measures derived from the Pre-School Centre Director's interviews, will provide evidence of which measures are associated with better outcomes (cognitive and social/behavioural) at rising five. Through this we hope they will contribute to the development of current thinking about the characteristics of effective pre-school provision (e.g. as outlined in Ball 1994).

Identifying continuing effects of pre-school centres at KS1

Cross-classified multilevel models have been used to examine the long term effects of primary schools on later secondary performance (Goldstein & Sammons 1997). In the EPPE project it is planned to use such models to explore the possible mid-term effects of pre-school provision on later progress and attainment at primary school (age 7). (See appendix) The use of cross classified methods explicitly acknowledges that children's educational experiences are complex and that over time different institutions may influence cognitive and social/behavioural

development for better or worse. Cross-classified models will be used to partition the variance in the selected measures of children's educational outcomes at age seven between pre-school and primary school components. This will allow the relative strength of any continuing effects of individual pre-school centre membership to be ascertained, in comparison with the primary school influence. These models will examine the extent to which pre-school centres have any continuing impact on pupil attainment at age 7, after controlling for children's performance in relevant assessments at entry to reception (rising 5). Hill & Goldstein (1997) have developed a method for analysing educational data sets where there is missing data concerning the units (e.g. school) to which a particular student belongs. Such approaches may be relevant to the EPPE study where child mobility between pre-school centres can be high.

THE LINKED STUDY IN NORTHERN IRELAND 1998-2003

The Effective Pre-school Provision in Northern Ireland (EPPNI) is part of EPPE and is under the directorship of Professor Melhuish, Professor Kathy Sylva, Professor Pam Sammons and Professor Iram Siraj-Blatchford. The study explores 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 will help to identify the aspects of pre-school provision which have a positive impact on children's attainment, progress, and development, and so provide guidance on good practice. The research involves 70 pre-school centres randomly selected throughout Northern Ireland. The study investigates 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.

SUMMARY

The EPPE project breaks new ground in its methodology for investigating the influence of pre-school provision on children's subsequent progress and development. The use of mixed methods (both multilevel quantitative techniques and qualitative case studies) should prove more fruitful for policy makers and practitioners than reliance on only one form of data gathering and analysis.

The project seeks to provide important new descriptive information about the use of different types of pre-school provision in a range of geographical and socio-economic contexts. It is intended to examine in particular the relationship between children's personal, social and family characteristics and patterns of pre-school use and to investigate children's pre-school 'career paths' from three to entry to primary school and through to the end of Key Stage 1.

An 'educational effectiveness' design was chosen to enable modelling of the complicated effects of amount and type of pre-school provision (including attendance) experienced by children and their personal, social and family characteristics on subsequent progress and development. Measures of both cognitive and social/behavioural outcomes are being studied. Due to the focus on measuring children's verbal and numerical skills from age three onwards, the research should help to inform current debates about how to raise literacy and numeracy standards, as well as illuminating the relationship between cognitive and social/behavioural development at different ages. The use of multilevel models for the analysis will enable 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 relationships between measures of pre-school centre processes and children's progress and development will be explored. The results of these analyses and the findings from the qualitative case studies of selected centres will help to inform both policy and practice.

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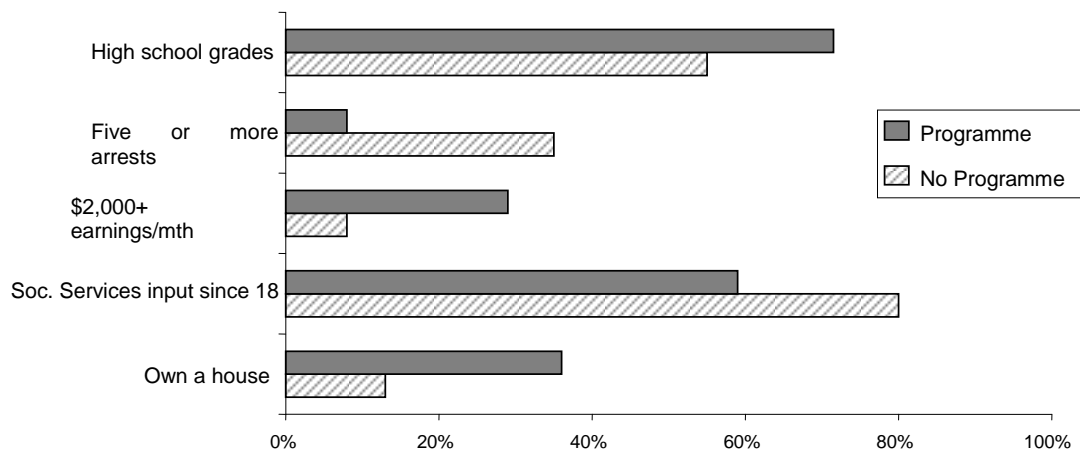
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Figure 1

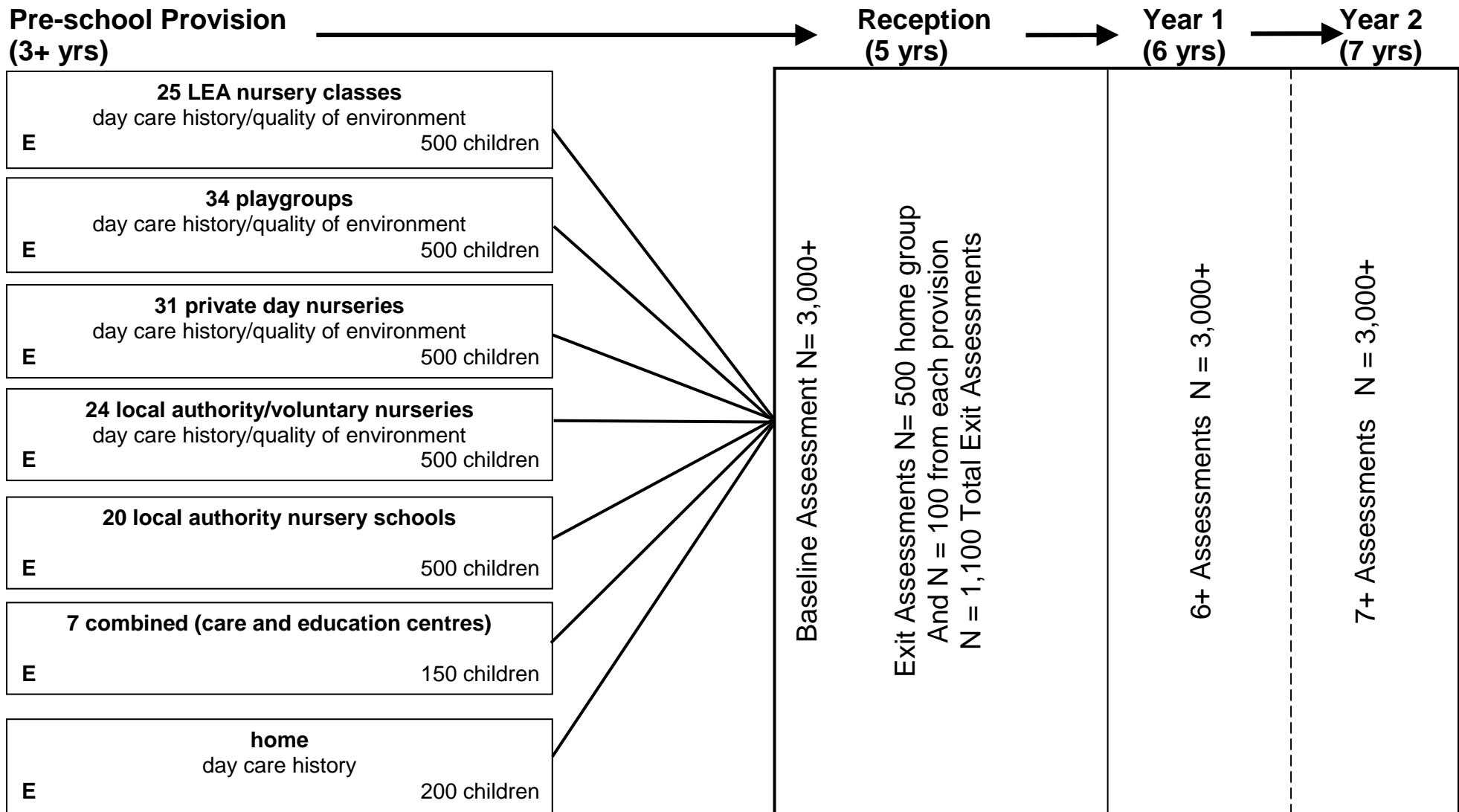
Perry Preschool (High/Scope) Outcomes



(Schweinhart, Barnes & Weikart, 1993)

Figure 2

Plan of Study



E Entry Assessment

APPENDIX

MULTILEVEL METHODOLOGY

“In order to describe the complex reality that constitutes educational systems we require modelling tools that involve a comparable level of complexity. I also wish to argue that, while we need continually to elaborate our models, we will almost certainly remain a long way from perfect descriptions; the journey is important, even though we may never arrive at our destination” (Goldstein, 1998, p.2).

Many social systems, education in particular, typically have a hierarchical organisation in which units (e.g. pupils) at one level are grouped within units at the next higher level (e.g. classes), which are themselves grouped together (e.g. schools) to form another level of aggregation. This gives three levels the lowest (level 1) being that of the pupil: level 2 being that of the classroom: level 3 that of the school. If we are interested in the factors which influence students’ educational outcomes (e.g. examination performance) then it will be important to include the characteristics of the pupils themselves (e.g. sex, age, prior attainment) and information about their classes (e.g. teacher interactions, grouping strategies etc) and their schools (e.g. policies, school type etc.).

Multilevel analyses utilise regression techniques which explicitly take account of the hierarchical structure of data (the fact that pupils are grouped into specific classes, and classes into schools). The issue of appropriate and valid ways of measuring and reporting on schools’ performance (as measured by pupils’ examination or test results or other outcomes such as attendance or attitudes) and the construction of performance indications has become increasingly relevant due to the policy of publishing ‘league tables’ of schools on examinations results. Academic interest in the fields of school effectiveness and improvement has expanded rapidly during the last two decades. Methodological advances, particularly the availability of the appropriate statistical software for the analysis of multilevel data using models such as the ESRCs Multilevel Models Project enable more efficient estimates of school differences in pupil achievement (especially of the value added or progress made over time) to be obtained.

Goldstein (1987) provides a detailed description of multilevel models in educational and social research and Paterson & Goldstein (1991) provide a useful summary of this approach. The method allows the calculation of estimates of schools’ effects upon pupils’ educational outcomes after controlling for the impact of relevant pupil background characteristics (e.g. sex, age, social class, low income) and of prior attainment. There is now substantial academic agreement concerning the need to employ multilevel methods to enable efficient estimation of class and school-level effects and the kinds of data required for valid comparisons to be made.

An educational effectiveness research design and multilevel methods were selected for the EPPE study due to its focus on the effects of pre-school type and of individual pre-school centres.

More recent developments of multilevel methodology (Goldstein, 1995) include the development of cross classified models. Such models would be essential to allow the simultaneous analysis of pre-school and primary (infant) school effects on achievement at Key Stage 1. Cross classified models would allow the simultaneous estimation of the separate and joint effects of pre-school and primary school attended whilst controlling for relevant child-level to personal and family characteristics.

Cross-classified multilevel analyses will be used to analyse data where units (i.e. children) can be classified along more than one dimension - for example, by both pre-school and by later primary school attended (see Goldstein, 1995). The figure below illustrates a random cross-classification at level 2.

Example of children cross-classified by pre-school and primary school centre

	Primary School 1	Primary School 2	Primary School 3	Primary School 4
Pre-school centre 1	XX	XXXX		XXX
Pre-school centre 2	X	X	X	
Pre-school centre 3	XX	X		XX
Pre-school centre 4	XX	XX	XX	XX

The basic cross classified model

$$y_{ij1j2} = \sum \beta_k x_{kij} + u_{j1} + u_{j2} + e_{ij}$$

$$var(u_{j1}) = \sigma_{u1}^2, \quad var(u_{j2}) = \sigma_{u2}^2, \quad var(e_{ij}) = \sigma_e^2$$

Thus the total level 2 variance is the sum of a between pre-school centre and a between primary school variance.

Where: At level 2 subscript 1 refers to pre-school centre
At level 2 subscript 2 refers to primary school

y_{ij1j2} The primary school response variable e.g. a child's score on an outcome measure (e.g. reading test result) at age 7 (end of Key Stage 1).

x_{kij} A pre-school predictor variable e.g. child's BAS score at entry to reception.

In addition process variables related to the characteristics of pre-school provision would be tested using such models to establish which characteristics of pre-school education account for variation in children's subsequent attainment.

Goldstein, H. (1998) Models for reality: new approaches to the understanding of educational processes. A Professional Lecture, London: Institute of Education, University of London.

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