Research Report DCSF-RR176

Early Years Learning and Development

Literature Review

Maria Evangelou, Kathy Sylva and Maria Kyriacou
Department of Education, University of Oxford

Mary Wild and Georgina Glenny
Westminster Institute of Education
Oxford Brookes University

department for
children, schools and families

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Maria Evangelou, Kathy Sylva and Maria Kyriacou
Department of Education, University of Oxford

Mary Wild and Georgina Glenny
Westminster Institute of Education, Oxford Brookes University

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Address for correspondence:

Dr. Maria Evangelou
Department of Education
University of Oxford
15 Norham Gardens
Oxford OX2 6PY
Tel: +44 (0) 1865 274012
Fax: +44 (0) 1865 274144

Email: maria.evangelou@education.ox.ac.uk

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Professor Paul Harris	Harvard University, Harvard Graduate School of Education
Professor Peter Bryant	University of Oxford, Department of Education
Dr Alison Price	Oxford Brookes University,Westminster Institute of Education

THE RESEARCH TEAM

Principal Investigators

Dr Maria Evangelou
Department of Education, University of Oxford
00 44 (0)1865 274 012 / email maria.evangelou@education.ox.ac.uk

Professor Kathy Sylva
Department of Education, University of Oxford
00 44 (0)1865 274 008 / email kathy.sylva@education.ox.ac.uk

Dr Mary Wild
Westminster Institute of Education, Oxford Brookes University
00 44 (0)1865 488 597 / email mwild@brookes.ac.uk

Georgina Glenny
Westminster Institute of Education, Oxford Brookes University
00 44 (0)1865 488 570 / email goglenny@brookes.ac.uk

Team Consultants

Dr Alison Price
Westminster Institute of Education, Oxford Brookes University
00 44 (0)1865 488 516 / email aprice@brookes.ac.uk

Dr Maria Kyriacou
Department of Education, University of Oxford
00 44 (0)1865 274 046 / email maria.kyriacou@education.ox.ac.uk

Research Assistant

Ms Rebecca Wright
University of Bath Psychology Placement Student
Department of Education, University of Oxford

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Executive Summary

The Secretary of State for Children, Schools and Families announced in June 2008 a review of the Early Years Foundation Stage (EYFS) for 2010; the purpose of the current report was to provide part of an evidence-base to inform this review.

The Early Years Foundation Stage (EYFS) framework, published in March 2007 and implemented in September 2008 builds on and replaces the non-statutory Birth to Three Matters guidance (DfES, 2003), the Foundation Stage curriculum for three and four year olds (QCA, 2000), and the National Standards for Day Care (Sure Start, 2003). Although the purpose of this review is not to examine the range of policies for children and families; it is important to recognise that the EYFS sits in a wider policy context and on occasion the report will make reference to this.

Aims and strategy of the review

The purpose of the review was to consider the original sources on children's development as well as the critical reviews of these. The focus was on research findings published since 2000 as the ultimate goal was to update, rather than to repeat, the evidence base on which the EYFS was originally based. This included the Birth to Three Matters Review (David et al., 2003).

Objectives of the review

Specific objectives were:

1) To identify and review evidence in respect of the process of development for children from birth to age five. Studies of cognitive, social, emotional and brain development were the principle foci.

2) To identify and review evidence of findings pertaining to the distribution of children's development at the end of the academic year in which they turn five years old.

3) To review the evidence that identifies the best supportive contexts for children's early learning and development. This will have a focus on interaction and relationships as well as physical surroundings.

4) To identify, where appropriate, international comparative evidence in relation to objectives 1-3.

5) To identify, where appropriate, substantive gaps in relation to objectives 1-3.

6) To link the findings and the conclusions of objectives 1-5 to the Early Learning Goals and the areas of learning within the EYFS.

The review was conducted in the following stages:

Stage A: Identify themes, generate key words, and early searches of the literature

Stage B: Appraise and evaluate the literature

Stage C: Synthesise the implications of the review findings in relation to EYFS

The review was conducted in a collaboration between the Department of Education, University of Oxford and the Westminster Institute of Education, Oxford Brookes University.

The duration of the review was three months (April to June 2009). In addition, specialist reviewers contributed where appropriate.

Theoretical approach

The review was carried out within a 'constructivist approach to development' (Rogoff, 1990, 2003). This was enhanced by new research from neuropsychology that informs our understanding of both brain development and supportive environments to nurture it (Blakemore & Frith, 2005). In so doing, the report recognised recent conceptualisations of development, in which the various domains of development are interconnected and influence one another.

The literature review focused primarily on research within the 'interactionist' tradition that conceives of development as located within nested social contexts (Bronfenbrenner, 1979). Thus development is constrained and elaborated by cultural contexts and by the architecture of the brain. These nested social contexts include the impact of close family on development and therefore underscores the vital role of parents in supporting children's learning. The further context of neighbourhoods was included in line with Bronfenbrenner's account. A key influence in the recent decades is the work of Vygotsky (1978) which stresses the role of the social and cultural context in children's development. The current literature review does not explicitly review his theories as they are already well established. However, the influence of Vygotsky's socio-constructivist account of learning is evident throughout the review in the repeated evidence of the influence of the social context on learning.

Figure 1 represents the adopted theoretical approach of the review. In keeping with the Bronfenbrenner model, it locates the developing child in the centre. The inner and middle circles include the child's family whether this is a nuclear, extended, single or multiple family context, and the settings for children who attend any type of childcare not carried out by family members. The outer circle is the neighbourhood where the child both lives and may also attend such provision. Myers (1992), elaborated on the Bronfenbrenner model by delineating the factors that may influence the child's development within any or all of these relational contexts.

These include relational factors such as the types of interactions and communication that a child experiences and who these people are (family friends, early years practitioners, peers and neighbours). Myers also describes the impact of the physical environment and the resources available for example the space, amenities and materials. Other facets of the learning environment are the types of routines and special events that shape children's lives. All these are influenced by policies and cultural characteristics (value systems, beliefs etc).

In Figure 1 below these influences have been shown by the arrows that can be seen to operate within all the ecological domains. For example, the role of relationships is vitally important for children's socio-emotional development as well as for their language development.

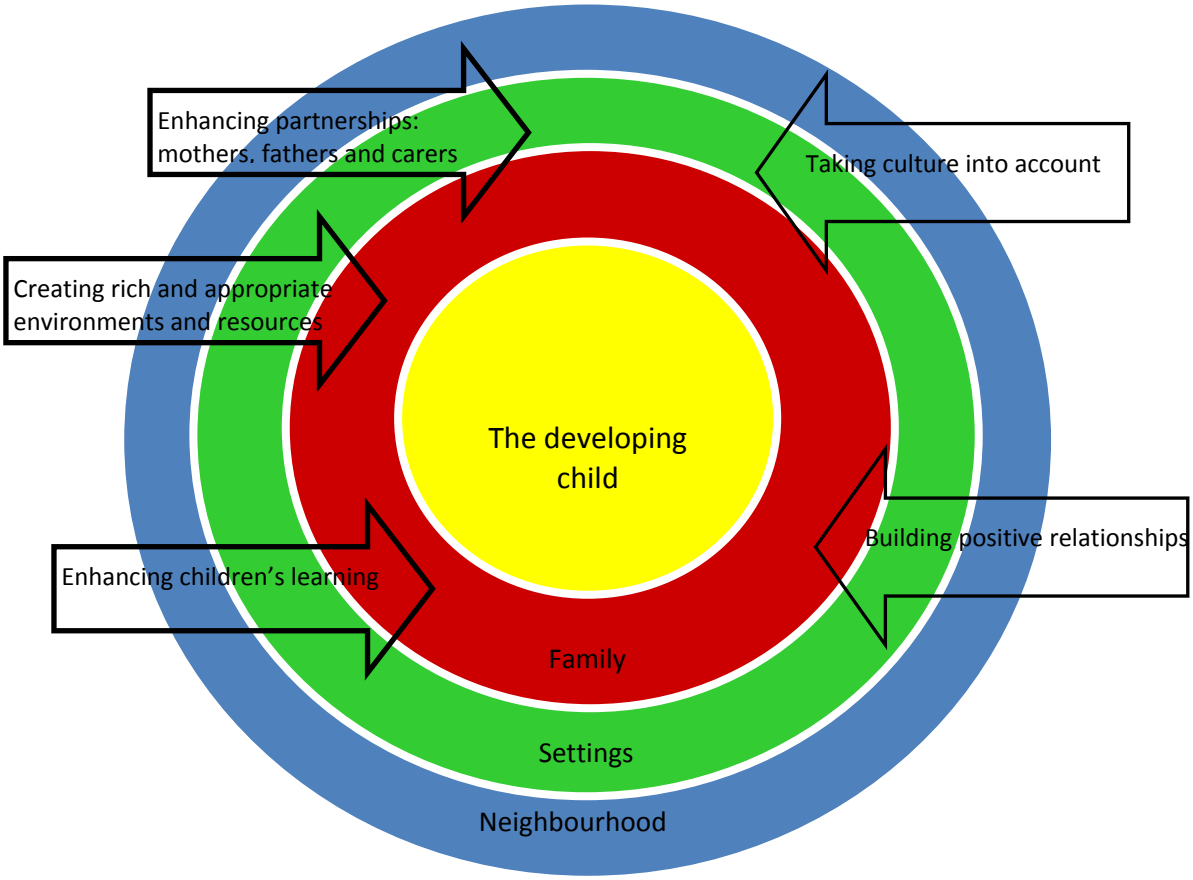


Figure 1 - The contexts of children's development

Framework of the report

In keeping with this theoretical approach the first part of the review explores the 'developing child' at the centre of a series of relationships. In so doing it covers the processes of children's cognitive, social, emotional and brain development from birth to the end of the year they turn five. This incorporates a section for each domain of the EYFS (Personal Social Emotional Development, Communication, Language and Literacy, Problem Solving Reasoning and Numeracy, Knowledge and Understanding of the World, Physical Development and Creative Development). Within each domain themes such as family, settings and neighbourhood environments, international comparisons, and brain development are included as relevant. Research on brain development appears across sections where it impacts on particular domains. This division should be seen as organisational and it does not imply that development can be compartmentalised so readily. Nor should the focus on developmental goals be taken to imply that the EYFS principles are not central to the analysis of the literature. Clearly, a *unique child; positive relationships; enabling environments and learning and development* are concepts that are embedded within the review but they are not used as organising principles for the review.

The second part of the review relates to the enabling contexts of development; these are relationships, the environmental resources and the broader cultural and policy frameworks.

Key Findings of the Review

Key findings related to children's development

Although the literature reviews have been carried out according to 'domains' of child development, there is striking overlap between findings across domains, especially as they relate to the supportive processes for development. Most of these supportive processes take place across all the contexts of development, e.g. contingent responding to children's actions that is attuned to the individuality of the child. Some enabling processes take place most often in early years settings, e.g., planned play activities related to a story shared by the whole group. Another overlap relates to the EYFS domain 'Creative Development'. Although there is a small and unique body of research on specific aspects of this domain, it was decided to deal with creativity within several domains, especially 'Knowledge and Understanding of the World' and in 'Problem Solving, Reasoning and Numeracy'.

- Children are born without a sense of self; they establish this through interactions with others (adults, siblings and peers) and with their culture.

- Children thrive in warm, positive relationships characterised by contingent responses. The 'warmth' of relationships is not a novel concept but there is new research on the importance of adult's responding to the child's initiation, often called "contingent" responding.

- Play is a prime context for development. Again, this is not new, but there are now studies on different kinds of play, especially the ways it can be enriched by guiding, planning and resourcing on the part of the staff in settings.

- Conversation is another prime context for development of children's language, thinking but also their emotions. Again, the vital role for talk and conversations is not new. However, we now know more about the two broad types of conversation; one serves to confirm a child's understanding or feelings, while the other elaborates and extends that understanding.

- Narrative enables children to create a meaningful personal and social world, but it also is a 'tool for thinking'. It is most effective when children are encouraged to form their own accounts, rather than passively accepting those of adults.

- In enhancing children's thinking, it is more important to aim at depth and not breadth. Deep understanding is more important than superficial coverage.

- Early years curriculum needs to provide opportunities for problem solving to develop logico-mathematical thinking rather than only focusing on context specific elements.

- Children's phonological skills are important in learning to read but so is vocabulary. Phonological skills at age 5 are better predictors of reading at the age 7 than at the age 11. Vocabulary at age 5 is a better predictor of the more complex tasks of reading at age 11.

- Developmental theories such as those of Piaget (1983) have been linear, with children following similar pathways to adulthood. New theories assume that development proceeds in a web of multiple strands, with different children following different pathways.

- Findings from neuroscience that apply directly to the EYFS are still sparse; promising research is emerging on the infant's capacity to recognise similarity between their own actions and actions they see others do. This has been linked to 'mirror neurones' in the brain that are being investigated by developmental neuroscientists interested in the neural foundation for understanding actions and persons. Another area of neuroscientific enquiry has been the tendency of the child's brain to generate rules based on small datasets, rules that are resistant to change subsequently.

- Children's self-regulation requires the development of effortful control which facilitates the internalisation of social rules.

- Cultural niches and repertoires must be important considerations in shaping the context of children's learning.

- The concept of children's 'voice' is not new but has become an increasing focus of research.

Key findings related to enabling contexts

The physical contexts for development such as setting or home have different characteristics that are important: people, space, resources - to name a few. We found that the supportive processes within these contexts were often so similar that it made more sense to focus on processes that support and enable rather than the structures, routines and physical resources that comprised specific contexts. We have focused on enabling and supportive processes in Chapter 3 rather than focusing on specific types of settings, such as childminders or all-day versus half-day settings. Key findings related to the contexts of education and care can include:

- Enhancing children's development is skilful work, and practitioners need training and professional support to do it well, including making decisions about children's individual needs and the ways to 'personalise' their learning. For example, it is argued here that the decision as to when to begin phonics instruction should be taken by individual Reception teachers. They will need specific training in this area, and they will need support in their schools and local authorities to make decisions after assessing the needs of individual children.

- 'Talking about feelings' has beneficial effects. Although this has been a self-evident truth for decades, new research on 'Social and emotional aspects of learning' for children shows how it benefits learners of all ages, even children under four.

- Children learn to understand themselves and their worlds through two kinds of thought: narrative and scientific enquiry. Supporting their development means supporting both kinds of thinking. The importance of scientific thinking has been known for several decades, whereas supporting thinking through narrative is much newer.

- Formative assessment will lie at the heart of providing a supporting and stimulating environment for every child. This may require professional development for practitioners and liaison with individuals and agencies outside the setting.

- The quality of both the Home Learning Environment (HLE) and the setting have measurable and independent effects on children's development. Quality includes relationships and interactions, but also pedagogical structures and routines for learning. The HLE characteristics vary with social class, and families from disadvantaged and some ethnic minority groups have lower scores on it. Other studies depict specific

- The art of early years practice is getting the balance right between guided and self initiated learning, either in homes or in settings. There have always been debates about this balance but nowhere have they been as heated as in the context of phonics learning and instruction for children in the Reception class, a debate that spans three decades.

- Some new research has focused on specific practices to link home and setting, e.g., shared, home-made books, DVDs and photo albums. This new research has shown the benefits of such practices.

Chapter 1 - Introduction and Methodology

1.1 Background to the study and key findings

The Secretary of State for Children, Schools and Families announced in June 2008 a review of the Early Years Foundation Stage (EYFS) for 2010; the purpose of the current report was to provide part of an evidence-base to inform this review.

Since 2000, the pace of change within early years has been rapid: encompassing an expansion of pre-school education and care with the focus on increasing the number of places and considerable innovations in the development of curriculum initiatives in early years. Specifically, the Early Years Foundation Stage (EYFS) framework, published in March 2007 and implemented in September 2008 builds on and replaces the non-statutory Birth to Three Matters guidance (DfES, 2003), the Foundation Stage curriculum for three and four year olds (QCA, 2000), and the National Standards for Day Care (Sure Start, 2003). These developments are set within a context of wider policy change that has led to an expansion of places for funded free pre-school education available to children and families, from an earlier age. These developments, coupled with the increasing number of children transferring to school at the year they turn five, raises many questions about the age appropriateness of the curriculum on offer. In addition, the multiplicity of settings where this provision is available across both the maintained and private, voluntary and independent sector raises additional questions about the appropriateness of the curriculum in different contexts and the ability of these contexts to support worthwhile learning opportunities for children. Specific initiatives such as Children's Centres explicitly combining care and education call for the further interrogation of the curriculum implementation in practice. Although the purpose of this review is not to examine the range of policies for children and families; it is important to recognise that the EYFS sits in a wider policy context and on occasion the report will make reference to this.

Key Findings of the Review

Key findings related to children's development

Although the literature reviews have been carried out according to 'domains' of child development, there is striking overlap between findings across domains, especially as they relate to the supportive processes for development. Most of these supportive processes take place across all the contexts of development, e.g. contingent responding to children's actions that is attuned to the individuality of the child. Some enabling processes take place most often in early years settings, e.g., planned play activities related to a story shared by the whole group. Another overlap relates to the EYFS domain 'Creative Development'. Although there is a small and unique body of research on specific aspects of this domain, it was decided to deal with creativity within several domains, especially 'Knowledge and Understanding of the World' and in 'Problem Solving, Reasoning and Numeracy'.

- Children are born without a sense of self; they establish this through interactions with others (adults, siblings and peers) and with their culture.

- Children thrive in warm, positive relationships characterised by contingent responses. The 'warmth' of relationships is not a novel concept but there is new research on the importance of contingency.

- Play is a prime context for development. Again, this is not new, but there are now studies on different kinds of play, especially the ways it can be enriched by guiding, planning and resourcing on the part of the staff in settings.

- Conversation is another prime context for development of children's language, thinking but also their emotions. Again, the vital role for talk and conversations is not new. However, we now know more about the two broad types of conversation; one serves to confirm a child's understanding or feelings, while the other elaborates and extends that understanding.

- Narrative enables children to create a meaningful personal and social world, but it also is a 'tool for thinking'. It is most effective when children are encouraged to form their own accounts, rather than passively accepting those of adults.

- In enhancing children's thinking, it is more important to aim at depth and not breadth. Deep understanding is more important than superficial coverage.

- Early years curriculum needs to provide opportunities for problem solving to develop logico-mathematical thinking rather than only focusing on context specific elements.

- Children's phonological skills are important in learning to read but so is vocabulary. Phonological skills at age 5 are better predictors of reading at the age 7 than at the age 11. Vocabulary at age 5 is a better predictor of the more complex tasks of reading at age 11.

- Developmental theories such as those of Piaget have been linear, with children following similar pathways to adulthood. This is embodied in the 'stepping stones' in the EYFP. New theories assume that development proceeds in a web of multiple strands, with different children following different pathways.

- Findings from neuroscience that apply directly to the EYFS are still sparse; promising research is emerging on the infant's capacity to recognise similarity between their own actions and actions they see other do. This has been linked to 'mirror neurones' in the brain that are being investigated by developmental neuroscientists interested in the neural foundation for understanding actions and persons. Another area of neuroscientific enquiry has been the propensity of the child's brain to generate rules based on small datasets, rules that are resistant to change subsequently.

- Children's self-regulation requires the development of effortful control which facilitates the internalisation of social rules.

- Cultural niches and repertoires must be important considerations in shaping the context of children's learning.

- The concept of children's 'voice' is not new but has become an increasing focus of research.

Key findings related to enabling contexts

The physical contexts for development such as setting or home have different characteristics that are important: people, space, resources - to name a few. We found that the supportive processes within these contexts were often so similar that it made more sense to focus on processes that support and enable rather than the structures, routines and physical resources that comprised specific contexts. We have focused on enabling and supportive processes in Chapter 3 rather than focusing on specific types of settings, such as childminders or all-day versus half-day settings. Key findings related to the contexts of education and can include:

- Enhancing children's development is skilful work, and practitioners need training and professional support to do it well, including making decisions about children's individual needs and the ways to 'personalise' their learning. For example, it is argued here that the decision as to when to begin phonics instruction should be taken by individual Reception teachers. These will need specific training in this area, and they will need support in their schools and local authorities to make decisions after assessing the needs of individual children.

- 'Talking about feelings' has beneficial effects. Although this has been a truism for decades, new research on 'Social and emotional aspects of learning' for children shows how it benefits learners of all ages, even children under four.

- Children learn to understand themselves and their worlds through two kinds of thought: narrative and scientific enquiry. Supporting their development means supporting both kinds of thinking. The importance of scientific thinking has been known for several decades, whereas supporting thinking through narrative is much newer.

- Formative assessment will lie at the heart of providing a supporting and stimulating environment for every child. This may require professional development for practitioners and liaison with individuals and agencies outside the setting.

- The quality of both the Home Learning Environment and the setting have measurable and independent effects on children's development. Quality includes relationships and interactions, but also pedagogical structures and routines for learning. The HLE characteristics vary with social class, and children from disadvantaged and some ethnic minority families have lower scores on it. Other studies depict specific activities that more advantaged families engage in with their children, increasing the well known social gap that is related to income and parental education. A major theme related to literacy (but also to other areas of development) is the 'home teaching' provided by more advantaged parents. For children who do not experience this kind of home stimulation, an early years setting can compensate, at least in part, through direct work with children and through parental support.

- The art of early years practice is getting the balance right between guided and self initiated learning, either in homes or in settings. There have always been debates about this balance but nowhere have they been as heated as in the context of phonics learning and instruction for children in the Reception class, a debate that spans three decades.

- Some new research has focused on specific practices to link home and setting, e.g., shared, home-made books, DVDs and photo albums. This new research has shown the benefits of such practices.

1.2 Methodology

Aims and strategy of the review

The purpose of the review was to consider the primary and secondary literature related to children's development and the contexts that best support it. The focus was on research findings published since 2000 as the ultimate goal was to update, rather than to repeat, the evidence base on which the EYFS was originally based. This included the Birth to Three Matters Review (David et al., 2003). It should be noted that some seminal publications prior to this date were included as and when appropriate. The timeframe was too short, three months, to permit a detailed review of the voluminous primary literature. Therefore, a dual strategy was adopted combining primary searches by the team as well consultation with experienced developmental psychologists (via the British Psychological Society's Developmental Section) and of course tutors on a range of Early Childhood courses around the country (via the Early Childhood Studies Degree Network). Our literature searches were thus deepened and guided by the advice of psychologists, course tutors and scholarly experts who have been working over the last decade searching the research literature.

Objectives of the review

Specific objectives were:

1) To identify and review evidence in respect of the process of development for children from birth to age five. Studies of cognitive, social, emotional and brain development were the principle foci.

2) To identify and review evidence of findings pertaining to the distribution of children development at the end of the academic year in which they turn five years old.

3) To review the evidence that identifies the best supportive contexts for children's early learning and development. This focused on interaction and relationships as well as physical surroundings.

4) To identify, where appropriate, international comparative evidence in relation to objectives 1- 3.

5) To identify, where appropriate, substantive gaps in relation to objectives 1-3.

6) To link the findings and the conclusions of objectives 1-5 to the Early Learning Goals and the areas of learning within the EYFS.

Methodology

The review was conducted in the following stages:

Stage A: Identify themes, generate key words, and early searches of the literature

1) A preliminary exploration of significant national and international reviews and key publications was conducted to draw out key themes to inform this study (David et al 2003; Bertram & Pascal, 2002; Alexander, 2008; Shonkoff & Phillips, 2000). These were cross-referenced with existing terminology that appeared in curriculum documents for the 0-5 age range since 2000. From this preliminary exploration a list of key words was proposed.

2) The list of words was shared and agreed with the DCSF officials.

3) A short one page questionnaire (Appendix A) was emailed to named members of relevant professional and academic organisations (for example the British Psychological Society - Development Section; the British Educational Research Association Early Years SIG; The Early Childhood Course Tutors Network). This questionnaire had a dual purpose: first, to elicit a list of important research papers since 2000 and second, to cross-check the key words previously identified by the present research team.

4) Initially a series of face-to-face interviews were planned with key national and international experts and other key partners. However, it was subsequently decided that it was more beneficial for the study to carry out telephone interviews and correspond by email to enable a greater number of experts to be consulted. In total the team received 12 replies from our experts' consultations.

Stage B: Appraise and evaluate the literature

1) A template was devised to summarise the selected literature (Appendix B).

2) Fortnightly meetings between the team members took place to ensure that the key words allowed us to illuminate the evidence in the best way.

3) A common template was used to frame our thinking.

4) Both international and national resources were used and key books and journals in the fields of development psychology as well as Early Childhood Care and Education were accessed and reviewed.

Stage C: Synthesise the implications of the review findings in relation to EYFS

1) Synthesised the new research evidence against the objectives of the proposal.

2) The principal findings were mapped to the domains of the EYFS.

3) Highlighted gaps in research.

The review was conducted in a collaboration between the Department of Education, University of Oxford and the Westminster Institute of Education, Oxford Brookes University. The duration of the review was three months (April to June 2009). The geographical proximity of the two departments enabled a process of iterative internal reviews within the team. In addition, specialist reviewers were recruited where appropriate.

Theoretical approach

The review was carried out within a 'constructivist approach to development' (Rogoff, 1990, 2003). This was enhanced by new research from neuropsychology that informs our understanding of both brain development and supportive environments to nurture it (Blakemore & Frith, 2005). In so doing, the report recognised recent conceptualisations of development for example the notion of dynamic systems.

The literature review focused primarily on research within the 'interactionist' tradition that conceives of development as located within nested social contexts (Bronfenbrenner, 1979). Thus development is constrained and elaborated by cultural contexts and by the architecture of the brain. These nested social contexts include the impact of close family on development and therefore underscores the vital role of parents in supporting children's learning. The further context of neighbourhoods was included in line with Bronfenbrenner's account. A key

influence in the recent decades is the work of Vygotsky (1978) which stresses the role of the social and cultural context in children's' development. The current literature review does not explicitly review his theories as they are already well established. However, the influence of Vygotsky's socio-constructivist account of learning is evident throughout the review in the repeated evidence of the influence of the social context on learning.

Figure 2.1 represents the adopted theoretical approach of the review. In keeping with the Bronfenbrenner model, it locates the developing child in the centre. The inner and middle circles include the child's family whether this is a nuclear, extended, single or multiple family contexts, and the settings for children who attend any type of childcare not carried out by family members. The outer circle is the neighbourhood where the child both lives and may also attend such provision. Myers (1992), elaborated on the Bronfenbrenner model by delineating the factors that may influence the child's development within any or all of these relational contexts.

These include relational factors such as the types of interactions and communication that a child experiences and who these people are (family friends, early years practitioners, peers and neighbours). Myers also describes the impact of the physical environment and the resources available for example the space, amenities and materials. Other facets of the learning environment are the types of routines and special events that shape children's lives. All these are influenced by policies and cultural characteristics (value systems, beliefs etc).

In the figure below these influences have been shown by the arrows that can be seen to operate within all the ecological domains. For example, the role of relationships is vitally important for children's socio-emotional development as well as for their language development.

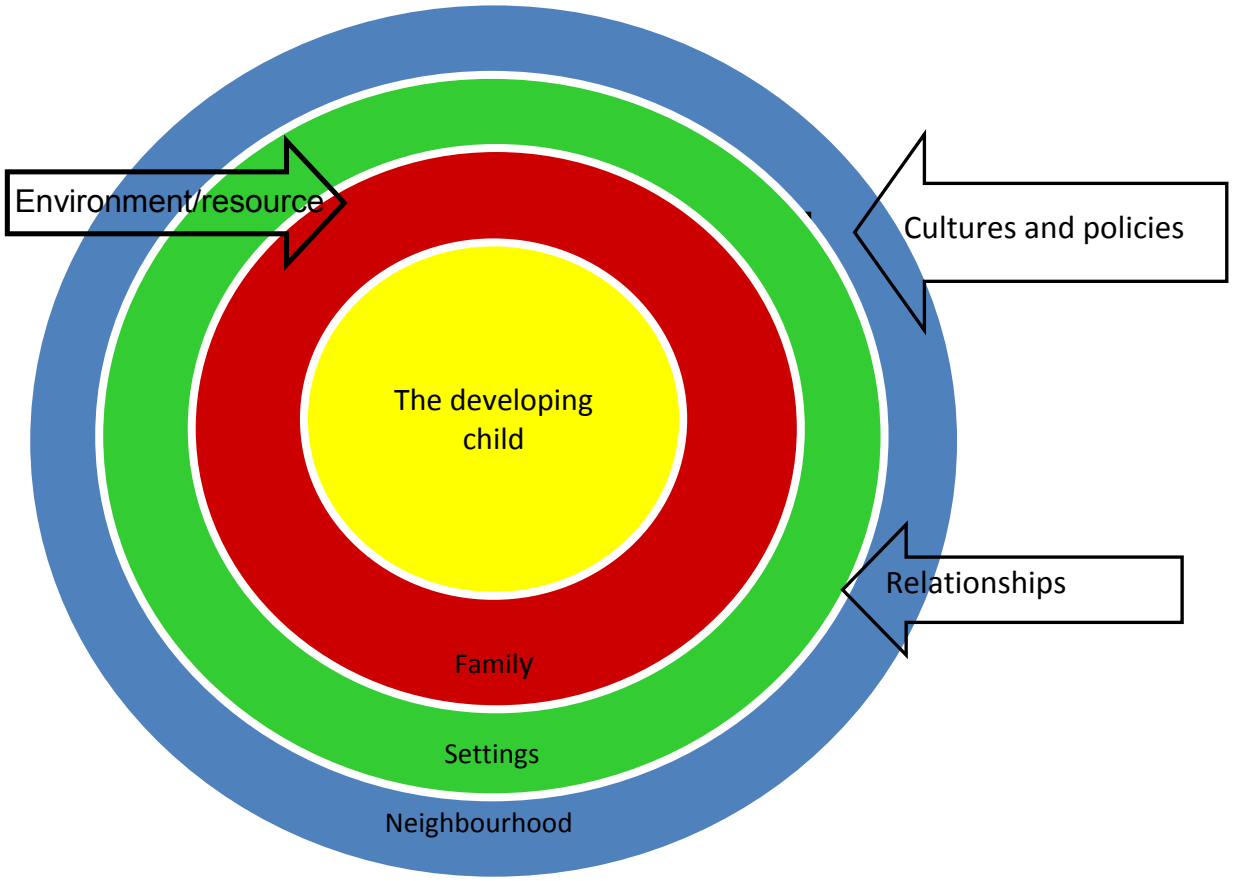


Figure 2.1 - The contexts of children's development

Framework of the report

In keeping with this theoretical approach the first part of the review explores the 'developing child' at the centre of a series of relationships. In so doing, it covers the processes of children's cognitive, social, emotional and brain development from birth to the end of the year they turn five. This incorporates a section for each domain of the EYFS (Personal Social Emotional Development, Communication, Language and Literacy, Problem Solving Reasoning and Numeracy, Knowledge and Understanding of the World, Physical Development and Creative Development). Within each domain themes such as family, settings and neighbourhood environments, international comparisons, and brain development are included as relevant. Research on brain development appears across sections where it impacts on particular domains. This division should be seen as organisational and it does not imply that development can be compartmentalised so readily. Nor should the focus on developmental goals be taken to imply that the EYFS principles are not central to the analysis of the literature. Clearly, a *unique child; positive relationships; enabling environments and learning and development* are concepts that are embedded within the review but they are not used as organising principles for the review.

The second part of the review relates to the enabling contexts of development; the relationships, the environmental resources and the broader cultural and policy context. Any literature review may reveal gaps in knowledge and understanding and where considered noteworthy these are noted in the report.

Chapter 2 - The developing child

This review takes a holistic view of a child's development. Although structured by domain of the EYFS, the developmental accounts in this chapter (sections 2.1 to 2.6) should be read as complementary and interconnected rather than in isolation. Inevitably, the extent of the literature evidence post-2000 dictates the relative scope of each section but neither the order nor the length of any one section indicates any hierarchy of significance.

Each section begins by presenting the existing EYFS requirements. This is followed by a synopsis of recent literature relevant to these requirements. Key findings are highlighted within each domain's section. This will facilitate the planned independent review to determine any restatement or changes to the requirements that may be necessary.

2.1 Personal, Social and Emotional Development

Children must be provided with experiences and support which will help them to develop a positive sense of themselves and of others; respect for others; social skills and a positive disposition to learn. Providers must ensure support for children's emotional well-being to know themselves and what they can do. EYFS, p.22
http://www.standards.dfes.gov.uk/eyfs/resources/downloads/card4_5.pdf

For organisational simplicity cognitive and language development and social and emotional development are reported separately in this report but it is essential to remember that a child's development is in fact holistic in nature. There is considerable interaction between emotion and cognition in seeking to understand children's social behaviour (Lemerise & Arsenio. 2000; Halberstadt et al., 2001a, 2001b; Denham et al., 2002). In section 2.4 of this report, for example, the extent to which babies seemed predisposed to respond to and connect with those around them is noted in accounts of children's development of a theory of mind (Meltzoff, 2004). Gopnick et al. (1999, p 194) suggest that the brain can be thought of a 'social brain'. In their book '*How babies think*' they present a synopsis of findings that reveal that from birth babies can discriminate human faces and voices form other sensory stimuli and babies prefer these human qualities to other stimuli. Within a few days of birth they are discriminating familiar people, such as their mother from others. By 12 months old they are quite clearly referencing and matching their actions such as gazing and pointing to the actions of those around them. Such observations suggest mutuality between different aspects of development and in the account of recent research regarding children's personal social and emotional development that follows this is apparent in many different ways.

As with all the developmental areas covered in this report the potential literature base is vast and the studies and findings highlighted are summative and indicative rather then comprehensive. The account starts with a reprise of the influential theory of Attachment (Bowlby,1953, 1969, 1973, & 1980), focusing on the importance of early relationships for young children development and recent findings regarding the implications of attachment theory for the organised day-care of young children. Subsequent sections consider research regarding the emotional development of children, developing their capacity for self-regulation of emotion and behaviour and the growing distinction of the self from others. There is a brief discussion of the child's development of a theory of mind, their social cognition, which focuses on the child's socio- emotional awareness in relation to others. How this translates into their interaction with peers is then considered. The final section presents an overview of the different ways in which interactions between the child and those around them have been conceptualised, which may have implications for the ways in which the care and education of our young children are structured and implemented.

Attachment

One of the seminal theories of early childhood development is Bowlby's theory of attachment (1953, 1969, 1973, & 1980). Bowlby saw attachment as an evolutionary based and innate process whereby the development of a strong nurturing bond between mother and child is formed during early infancy. By 7-9 months it is well established and is strongly manifest in the separation anxiety that infants of this age will display when separated from their primary caregiver. It is further argued that this first important attachment relationship serves to provide the child with a secure emotional base that may have a significant bearing on their future emotional and social development (Ainsworth et al., 1978). Although the major focus of the literature on attachment has been on the mother-child bond, and indeed this very tight focus has often been used to critique the concept, key proponents of the theory have acknowledged the possibility of other attachment figures in a child's life (Ainsworth et al., 1978).

Despite various critiques and re-visitations, the significance of the theory of attachment as a 'grand theory' of development continues to be recognised (Waters & Cummings, 2000) and was previously foregrounded in the review of the literature conducted for the Birth to Three Matters Framework (David et al., 2003).

The Impact of attachment on development

Security of attachment between mother and child has been linked to a range of socio-emotional outcomes including early conscience development (Laible & Thompson (2000), emotional understanding (Kochanska, 2001a; De Rodney & Harris, 2002), pro-social understandings and self -regulation (Kochanska, 2002; Kochanska et al., 2004). Belsky & Fearon (2002) reinforce the importance of early secure mother-infant attachment for a range of pro-social & school readiness outcomes but also show that *early* insecure attachment can be mitigated by subsequent high-sensitive mothering. This suggests that later experiences can moderate the effect of earlier ones.

The dynamic nature of attachment security is emphasised by Thompson (2000). He argues that rather than being a fixed dimension, it is better conceptualised as a 'developing representation' that can change in the light of the child's ever expanding understanding of their social world. This might be due to specific events such as the arrival of a new sibling or more generally by the child's increasingly sophisticated understanding of social relationships and social codes in the later preschool years.

Resilience

Security of attachment has been linked to the child's developing, and ultimate, sense of self (worth) and in particular to the important concept of resilience. David et al. (2003, p.20) describe resilience as the extent to which 'some children are able to overcome the effects of negative events or experiences'. In their review of the literature David et al. concluded that a key factor enabling children to overcome adversity and challenging life situations was the presence of at least one '*very nurturing relationship*' (2003 p.23).

Since 2003 an important US longitudinal study, the *Minnesota study of risk and adaptation from birth to adulthood* (Sroufe et al., 2005) has been reported on. Spanning 30 years and following 180 children born into poverty from birth it was concluded that resilience in the face of adversity was not some '*invulnerability or other magical quality*' (p. 225) but rather it was borne of both '*a positive platform or balancing supports available later*' (p.227). The early years are identified as a momentous period of development and it is clear that early experiences with carers can form the positive platform that the authors refer to in the emergence of resilience. However, it is also stressed that given 'balancing supports' beyond early childhood it can be possible to mitigate the negative effects of early adverse environments.

The potential to overcome early deprivation - to exhibit resilience - has also been demonstrated in studies of Romanian children who had experienced severe early institutional based deprivation in their home country during the 1990s and were subsequently adopted into UK homes (Rutter et al., 2007). It is potentially significant that the adoptions occurred relatively early in their lives (before the age of 42 months) but follow-up studies at ages 4, 6 and 11 have evidenced 'marked catch-up' in their psychological functioning / well-being. Elsewhere Rutter (1999) notes the variation in individual susceptibly to psychosocial risk, suggesting that both temperamental and cognitive differences in individuals can contribute to this. Encouragingly however he notes that new experiences can offer positive "turning points" for children, and adults, who have previously experienced significant adversities, particularly where the new experiences "directly counter, or compensate for, some risk factor" (Rutter, 1999, p129). Furthermore, the ability to overcome adversity is enhanced when children have a range of coping strategies to call upon, and this may be something that they can develop with support and guidance. Rutter (2006) also suggests that "controlled exposure to risk" may help in fostering an ability to cope in future adversities.

Attachment and the childcare debate

The implication of attachment theory for the provision of non-family based care; particularly for infants and very young children, continues to provoke widespread and hotly contested claims about the possibility of long-term negative impacts on children (Belsky, 2001). Since 2000 Belsky and colleagues have been involved in the analysis of the findings of the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care in the USA. This major study followed over 1000 children from birth through to school age. Belsky's team (Belsky, 2006; Belsky et al., 2007) report that benefits are found for early child care in relation to linguistic and cognitive outcomes but there is also a link between greater exposure to centre-based care and (teacher reported) risks of externalizing (anti-social and aggressive) behaviours in children when they reach school starting age. In considering the effect of the quantity of childcare not carried out by family members, there is some evidence (Belsky et al, 2007) that, whilst there was no threshold effect in terms of a particular number of hours per week, there did seem to be a relationship between increased teacher reporting of externalising, or problem, behaviours, at 54 months of age and increasing hours per week in previous child care. However, by the time these children reached 6th grade in school this effect had diminished to the point of being insignificant. It is also noted that this risk is not at a clinical level and that there are complex interactions between the quality, quantity and type of childcare experienced. The completed NICHD study report reiterates this interactive point, emphasising that: '*knowing simply whether a child was or was not ever in non–maternal care provided little insight into a child's development. Children who were exclusively cared for by their mothers did not develop differently than those who were also cared for by others*.' (NIH, NICHD, 2006, abstract).

Within the UK, not dissimilar overall findings emerge from the Effective Provision of Preschool Education (EPPE) study (Sylva et al., 2008) with social outcomes of pre-school education rather less beneficial than the positive effects noted for linguistic and cognitive outcomes. This is particularly so for boys in socially disadvantaged circumstances. However, an important element of the EPPE and related Researching Effective Pedagogy in the Early Years (REPEY) findings (Siraj-Blatchford et al., 2002) is the importance of adult / child relationships as an indicator of quality within the most effective settings. Here again is some resonance with the NICHD study, which noted the importance for positive caregiving of staff who were 'more educated' and 'held more child-centred beliefs about childrearing' (NICHD, 2000).

Multiple caregivers

In reviewing the literature on attachment relationships beyond the traditional mother- child dyad, Howes (1999) states that the key determinants as to whether a child forms a bond with non-maternal caregivers include:

1) Whether the caregiver provides both physical and emotional care

2) Whether that person is a consistent presence within the child's social network

3) Whether the caregiver has an emotional investment in the child.

In the context of care provided not by the members of the family, Howes points out that greater predictability in the pattern of interaction is enabled where a caregiver is consistently present for longer periods of time. Similarly Langston (2006, p.9) stresses that the importance to a child of '*a second or subsidiary positive relationship cannot be overstated*.'

The key person approach in early years settings

One response to the implications of attachment theory and the importance of emotional warmth and security for young children has been to recommend the appointment of 'key persons' within settings (Elfer et al., 2003), such that specific carers are linked to specific children. It should be noted however that adoption of key person approaches can sometimes be problematic, for example if staff members are overly focused on their key children compared to other children in group, or when a child's Keyperson leaves a setting. There can also be emotional implications for practitioners, and indeed families, in forging very close emotional ties to particular children (Elfer, 2007a). Elfer therefore argues for the need for careful continuing professional development for staff around supporting the emotional needs of young children and of themselves as professionals (Elfer, 2007b).

The warmth and contingency of relationships

The notion of contingency and responsiveness is evident in accounts of a child's emotional development. Writing of typical child experiences in the first year of life, Robinson (2003) notes, '*what others do with our feelings actively influences how we express them and in the early years, their effect is powerful*' (p.36). The sense here is that emotional warmth is even more powerful when it is genuinely responsive to the child's own emotions. She further stresses the importance of '*routine, familiarity and the presence of caring adults' in giving' sanctuary to a child*' (p.180). Laible and Thompson (2007), commenting on recent literature in the realms of early socialisation, offer further support for the power of a warm and mutually responsive relationship with adults and the importance of structure for young children '*who are seeking predictability and control to everyday experience*' (p.194).

The central significance of emotional warmth and affection in the development of young children is a recurring theme (Roberts, 2002; Dowling, 2005). Some authors such as Gerhardt (2004) make particularly striking claims for the centrality of emotional experiences in development. She suggests for example, '*cognitive processes elaborate emotional processes but could not exist without them*' (p.6). She further contends that babies need a '*caregiver who identifies with them so strongly that the babies needs feels like hers*' (p.23). Invoking a concept of *emotional flow*. Gerhardt makes connections to research on the development of the brain to support her contentions for the importance of love in development. She draws on a range of supporting studies to suggest that the neuronal connections within the brain are significantly related to emotional experiences, particularly in the latter half of the first year of life, and that different regions of the brain are particularly impacted by socio-emotional experiences at different times during the early years. Thus early

experiences can serve to establish the physiological patterns of emotional response within a child's brain. She argues that they may even impact on the formation of important structures such as the hippocampus. The hippocampus is part of the limbic system within the human brain and is thought to serve important roles in relation to memory and emotion. Gerhardt argues that from the third year of a child's life the hippocampus will start to play a key role in the regulation of stress and thus early emotional experience may therefore have irreversible impacts on a child's subsequent ability to manage and respond to stress.

Elsewhere in the literature, researchers are less convinced of the established nature of such links and their irreversibility. Blakemore and Frith (2005) for example, note that there are some promising findings linking emotional responses to the biology of the brain but that these tend to be in relation to socio-emotional disorders such as autism and Attention Deficit Hyperactivity Disorder (ADHD) rather than as a means to explain more typical development. Nonetheless, the possible interface between emotional and neurological development is already posing some fascinating questions. The discovery of mirror neurones (Section 2.4) for example suggests the primacy of social-emotional experiences in a child's early learning about their world (Goswami & Bryant, 2007).

Emotional competence

It is now commonly accepted (Banerjee, 1997; Denham et al., 2002) that children acquire an understanding of basic emotions such as happiness, sadness and anger during infancy and that more relational or social emotions such as empathy, guilt or shame do not develop until later in the preschool years. Denham et al. (2002) further note that during the preschool years the child faces the key task of managing their emotional arousal in the context of a widening social group that extends beyond the family. Thus, for example, they need to master social conventions around appropriate emotional display rules and allied to this, develop mechanisms to regulate their emotions.

Blair et al. (2004) studied 153 preschool age children over a three-year period. They found that over and above individual temperamental differences, the ability to cope with emotions was significant in encouraging the development of pro-social behaviours. In fact, the authors found that 'facing' emotional problems was beneficial, helping children to develop constructive emotional regulation skills. They suggest a number of possible interventions on the part of carers to support this, including: encouraging children to communicate and to discuss emotions, using stories and other fictional scenarios to aid in the understanding of the emotional preparative of others. It is suggested that such activities also promote trusting relationships between children and their carers, which positively impact on children's emotional awareness and self-regulation.

Eisenberg and Spinrad (2004) highlight the need to distinguish between emotional regulation that stems from others and that which is accomplished by the child alone. Campos et al. (2004) make a similar point, stressing that for infants, emotional regulation takes place in predominantly one to one relationships with primary carers and that at this early stage, the self- regulation of the infant is largely controlled by others. It is suggested that this is partly due to the infant's relative motor limitations. Campos at al highlight the concept of 'social referencing' in which infants are observed to look explicitly towards primary carers for clues as to how to respond socially and emotionally. The authors also discuss the importance of 'social biofeedback', which refers to the way in which exaggeration and mirroring of a child's expression by the adults closest to them can help to not only validate, but also shape the child's emotional regulation. They further note the role that language can play in transmitting important cultural messages about the appropriateness of emotional displays and behaviours.

The shift from reliance of others to self- regulation of both emotion and behaviours is an important developmental transition in the preschool years. This does not mean that adults have no role to play in helping children to manage and regulate their emotions as they move towards school age. Rather they may more deliberately support such development; Denham et al. (2003) for example, on the basis of their empirical work with 3-4 year olds suggest that, '*teaching about feelings may be especially helpful for children aged 4 years old and under*' (p.253). In a later review of literature related to emotional and social competences, Denham (2007) reiterates the benefits of parents and non-family caregivers explicitly continuing to help frame children's growing awareness of themselves in relation to others with the importance of discussing emotions being foregrounded once again.

Self-regulation and the development of moral understanding

Turning from self-regulation of emotion to the self-regulation of behaviour, Kochanska has led a team of researchers in a series of significant and influential studies. Based on a major longitudinal study of 108 children, examining the development of self-regulation in the first four years of life, Kochanska, Coy and Murray (2001b) identify a distinction between situational and committed compliance. Though both involve cooperation with rules on the part of the child, situational compliance is a superficial compliance with an adults wishes usually when the adult is present whereas in committed compliance the child has accepted or internalised the external agenda and acts accordingly irrespective of an adult's presence. Kochanska et al. contend that this committed compliance is ultimately the more powerful since '*the child embraces the caregiver's agenda, and thus experiences compliance as self-generated and not interfering with striving for autonomy*' and is therefore more likely to lead to '*voluntary, thoughtful adaptive and effective self-regulation*' (p.1108). There is typically a transition from situational to committed compliance during the course of the first three years of life. It is important to note, as Schaffer (2006, p.200) points out, that some degree of non-compliance may also be important in development, particularly around the second year of life when the children are learning to assert their own autonomy and independence.

It is proposed (Kochanska et al., 2005) that internalisation of rules forms a significant dimension in children's development of conscience. In the subsequent analysis of their findings, Kochanska et al. find evidence that mutually responsive relationships between mother and child promote the development of committed compliance by children and ultimately the development of conscience.

In further longitudinal studies of 106 children from 22 months of age through to 73 months of age, Kochanska and Knaack (2003) investigated the phenomenon of 'effortful control'. First proposed by Rothbart and colleagues during the 1990's effortful control is defined as the 'ability to suppress a dominant response to perform a subdominant response' (cited in Kochanska and Knaack, 2003). Examples of this would include deferring an anticipated treat, deliberately slowing down one's activities or waiting to take turns. Their findings suggest that strong effortful control can serve to regulate and moderate emotions and behaviour. It was also found that lower effortful control between the ages of two to four was associated with a greater risk of later lack of controlled behaviour. The effortful control trait seems to be a securely established by around 45 months of age. Although the causes of lower effortful control are not possible to define in this study, there is some evidence that maternal power assertion impaired the child's capacities for effortful control. Subsequent data analysis (Askan & Kochanska, 2004) implies that there may be some temperamental base to effortful control, with infants who show caution and inhibition to new situations likely to be less impulsive and to demonstrate stronger effortful control. It is further suggested that caregivers may reinforce such tendencies early on in the child's development.

Summarising their various longitudinal projects in 2006, Kochanska and Aksan make the following key points:

- That moral emotions and conduct emerge as early as a child's second birthday and can be seen, for example in a child's distress over transgressions of rules.

- A child's conscience and their committed compliance are relatively consistent across situations and time.

- Conscience may be partly shaped by trait like characteristics particularly fearfulness / low impulsivity.

- Effortful control emerges in the 2nd year, and predicts internalized conduct.

- Mutually responsive interaction between parent and child impacts positively on moral development.

- Maternal power assertion can undermine the child's moral conduct.

In a review of socialization literature, Bates and Pettit (2007) conclude that the need for sensitive interaction between a child and their caregivers is particularly crucial for children who are high in negative emotionality. Furthermore, they illustrate that challenging and directive parenting can serve to prevent the development of pro-social behavioural inhibitions for more irritable children and that harsh parenting tends to increase the risk of anti-social and aggressive (externalising) behaviours in such children.

The complex interplay between patterns of adult -child behaviours and children's understandings of their place in a social world may be seen in an interesting study conducted by Laible et al. (2008).The study comprised observational analysis of 64 mothers and their children seen on two separate occasions with a six month interval (children aged 30 months and then at 36 months) and mother reported measures of attachment and child temperament. Investigating the levels of conflict observed between mother and child, they found that it was not the level of conflict that proved most significant in terms of attachment security but rather the manner in which such conflict was ultimately negotiated, including levels of justification and compromise involved. Although the study is focused on the mother-child relationship, there may be interesting implications for other key caregivers to consider in helping children to negotiate conflict.

A distinction should be made however between moral judgments and social convention. As Helwig and Turiel (2002) highlight, the two may not be synonymous and an over-emphasis on compliance to social conventions is not necessarily an indicator of moral development. It is important to bear in mind the '*social situation of children's development*' (Hedegaard & Fleer, 2008, p 1); what is considered appropriate behaviours , appropriate parenting and so forth are relative to particular social and cultural understandings.

The self and others

Harter (1999) re-emphasises the long-standing distinction in the understanding of self between the self as an agent (the I self) and the self as the self that is know to others (the me self). Bandura (1997) contends that the newborn 'arrives without any sense of self' (p.164) but gradually, during the course of the first year of life, through the exercise of agency within his/her environment, infants begin to gain a sense of self (of I self). High levels of contingent response by the adults around them can promote this. By about 18 months children are beginning to recognise themselves as distinct from and the others around them and can therefore begin to conceive of themselves in relation to other people (the me self).

Bandura (1997) surveys a range of previous studies and suggests that infants who are provided with early and frequent experiences of mastery develop a more secure sense of self. Focusing on a study of 75 children and their mothers, Kelley and Brownell et al. (2000) have shown that maternal feedback is significant in fostering a sense of mastery and self-esteem between the ages of two and three years. Similarly, the importance for the development of children's self-esteem of adults holding positively oriented conversations affirming their children's feelings has been shown for children aged five to six years in a study in New Zealand (Reese et al., 2007).

A sense of personal identity of a 'self' existing across time is known as the *'temporally extended self'* (TES). Moore and Lemmon (2001) label this the 'narrative self' and its development depends crucially, according to Nelson (2001), on a child being offered opportunities to talk about themselves and to discover the wider concept of identity by talking and sharing stories of other people including fictional characters. As Fivush (2001) states, this involves more than mere recounting; adults need to jointly reminisce about and evaluate past events with young children and also to involve these children in making predictions of future events (Hudson, 2001). This can be supported with the use of prompts such as pictures and photographs of the child and through activities such as allowing the child to draw pictures of what is personally significant to them (Atance & O' Neil, 2001).

Baressi (2001) makes a link between a sense of a TES and a theory of mind- He suggests the ability to separate oneself from ones own desires emerges at about 3 years of age and between ages 3-4 there is a developing sense of the distinctness firstly of ones own desires, and later of ones own beliefs, from those of other people. However as the following section indicates the precise timings for the emergence of a theory of mind may need to be reconsidered.

Social cognition & Theory of Mind

Traditional theory of mind research has emphasised children's understanding of others beliefs and tended to find these to be limited in preschool children (Section 2.4). However in the past decade a team of researchers working with Wellman (Wellman & Phillips, 2000; Wellman & Lagutta 2004; La Bounty et al., 2008) has conducted a series of studies around children's understanding of the intentions and desires rather than the beliefs of others. It now seems that by age two and a half, children are capable of making inferences about the intentions and desires of others (Wellman & Phillips, 2000), forming an important platform for children's later acquisition of a full theory of mind or 'social cognition'. In this context Wellman and Lagutta (2004) suggest that '*explanation plays a central role in children's learning*' (p.494), and that explanation should included giving children specific opportunities to explore, explain and reflect upon the feelings and intents of others. Evidence from a further study of 106 children and their parents at two time points, when the children were aged three and a half and five years, (La Bounty et al., 2008), showed a positive relation between an adult's references to emotions and emotional causality in conversations observed during the sharing of picture books at the earlier age and the child's concurrent and subsequent emotional understanding. Such studies confirm the more established notion that '*children are engaged in talking about themselves and others'* (Bartsch & Wellman, 1995, p.215) and that this forms a natural starting point for structuring their ideas about and responses to others.

It is important to note that children are not just bystanders and observers of their social world (Astington and Barriault, 2001); they are active participants from birth. This early social predilection of babies is described in sections 2.2 and 2.4 of this report. It is difficult to probe the understandings behind an infant's manifest interest in their social world but as Astington and Barriault further suggest it is clear that by nine months old there is intentionality in the baby's engagement of those around them and in the tendency to reference others before framing their own response. For example, if the mother appears fearful of an external

stimulus, the child will react similarly. As the child's ability to use language and to symbolically represent things emerges between one and three years of age, so does the capacity to develop a more extended understanding of the mind. This is when talk about feelings can be especially beneficial and so too can engagement in pretend play, whereby the child creates a relatively safe arena in which to explore the potential feelings and intentions of others. Another powerful enhancer of children's understanding of others is 'shared intentionality' (Tomasello et al., 2005), which can be experienced and fostered in social encounters. Both discussion and play form obvious arenas for shared intentionality.

Saarni (2001a, 2001b), suggests that children learn to make sense of their social context and the accompanying emotions though mental representations or 'scripts' for particular situations. Furthermore, she suggests that, whilst young children do so implicitly, they may also be enabled to understand social and emotional experiences through discourse and narratives of their social experiences. It is important in doing so to recognise the different cultural repertoires of individual children and families, and of the importance of reflecting and nurturing these within settings (Rogoff, 2003; Hedegaard & Fleer, 2008).

The self & peer relations

Dunn (2007) has continued to demonstrate the significance of siblings as sources of emotional support and in the development of social understudying. She also notes the increasing impact of friendships in the life of preschoolers (Dunn, 2006). In an interesting observational study of the social conversations of 43 children aged four years (Cutting & Dunn, 2007), the striking connections between children's social cognition skills and their successful communication with both siblings and friends are noted. It seems particularly advantageous for social relationships for young children to have the opportunity to engage in both cooperative conversation and cooperative play. Grusec and Hastings (2007a) similarly suggest that play interaction provides an important context for children to engage in social reciprocity.

A key figure in empirically based work into emotional understanding, Eisenberg (2005), has emphasised that 'emotional factors are 'at least as important as purely rational ones in explaining moral motivation and behaviour. In a detailed review of her own work and that of others in the field, she makes a strong case for the need to consider how young children can be encouraged to develop empathy for others as the studies reviewed clearly demonstrated links between this ability, moral understanding and a range of pro-social behaviours such as sharing and offering comfort to others. Laible and Thompson (2007) suggest that one effective method may be to engage young children in conversation about feelings, both their own and those of others, and of societal expectations. They suggest that an 'elaborative narrative style', involving open questions for example is likely to be most effective.

A review of literature by Grusec, Davidoff and Lindell (2002) on pro-social behaviours flagged up some findings consistent with the preceding accounts. Specifically, the importance of encouraging a caring orientation on the part of children that is then internalised is noted and the significance of warm and approving relationships from key carers in doing so is highlighted.

Models of adult- child interaction

As discussed elsewhere in the report, the notion of the child as an active player in his/her own development is now widely accepted and within the personal, social and emotional domain we see recognition of this in the increasing acceptance that the temperament of an individual child will impact on a range of their social behaviours. Sanson et al. (2002) refer to an earlier review by Rothbart and Bates (1998) that acknowledges the increasing acceptance of a biological basis to a child's temperament. However, they also stress that the impact of a

child's temperament on their social development will be profoundly mediated by their social environment. Reiterating the 'Goodness of Fit' model proposed by Thomas and Chess (1977), Sanson et al. conclude that the extent to which the child and his social environment are organised congruently will play a major role in the child's positive social development. In conceiving of the child and parent as mutually interacting with one another and progressively shaping the responses of the others, the Transactional Model of development proposed by Sameroff (1975) is invoked.

The bi-directionality of interactions is increasingly stressed in accounts of the socialisation of children (Maccoby, 2007; Grusec & Hastings, 2007b). It should be noted however, that sensitive parenting may vary even for the same child depending on the nature or 'domain' of interaction since, as Beaulieu and Bugental (2007) suggest there may be occasions when parents and caregivers need to act as in different capacities; sometimes as protectors and sometimes in more hierarchical disciplinary roles. At other times they may need to act as regulators of group situations or to foster mutual understandings with the child.

Dynamic systems accounts

One conceptualisation of development that has risen to prominence over the past 15 years is that of dynamic systems. Derived initially from connectionist modelling of developmental and learning processes, the notion of the multi-connected nature of development has broadened out to cover a range of aspects of personal, social and emotional development. (Lewis & Granic, 2000). Dynamic systems theories draw attention to the fact that individuals are comprised of inter-connected and dynamic facets and that therefore, it is more logical to conceive of development not just as holistic as opposed to domain specific, but also to recognise that the cumulative impact of different elements is more important that the individual aspects. In layman's terms, the sum of the parts is more than the whole. This dynamic systems metaphor can be extended beyond the individual to embrace the family, or indeed early years settings. Both families and settings will have a unique and constantly evolving identity, as the multi-faceted and complex personality dynamics of its individual members and their individual and collective histories shape and re-shape their interactions.

Socio-cultural accounts

Socio-constructivist accounts of development derived from Vygotsky's work (Vygotsky, 1978) emphasise the co-construction of understandings between children and adults, and this is elaborated in detailed studies of children and parents across the world that have shaped Rogoff's notion of development as a process of guided participation (Rogoff, 1993).

The importance of relationships in social and emotional understanding is further highlighted by recent accounts of the centrality of relationships in aspects such as socialization. Both Laible and Thompson (2007) and Kuczynski and Parkin (2007) have suggested that the processes of socialization are best envisioned within a 'social relational model'.

Another key component of Vygotskyan theory is the significance of culture in development. Recently, these ideas have been given new force by the insightful work of Rogoff (2003) and Hedegaard and Fleer (2008). This includes the need to consider cultural conceptions of what is and is not normative development behaviour.

Summary

Three key themes emerge from this review of the recent Personal Social and Emotional development literature. The importance to both a child's development and learning of warmth and security in their principal relationships repeatedly recurs as an underpinning theme. This warm responsiveness must be contingent to the needs of the child and this implies that

adults may need to adjust their response according to the changing needs of the child. This importance of contingent responses to young children is the second key theme of the PSE review. The final key theme is the significance of elaborative talk and evaluative reflection in helping a child come to understand their emotional and social world and their own place within it. It is noteworthy that this concept of elaborative narrative, as opposed to descriptive narrative, as a structuring element in children's developing understanding of self and others supported by engagement in dialogue and play is a theme that is repeated elsewhere in this report.

2.2 Communication, Language and Literacy

> *Children's learning and competence in communicating, speaking and listening, being read to and begin to read and write must be supported and extended. They must be provided with opportunity and encouragement to use their skills in a range of situations and for a range of purposes, and be supported in developing the confidence and disposition to do so. EYFS, p.39* http://www.standards.dfes.gov.uk/eyfs/resources/downloads/card4_6.pdf

This section begins with the ways babies become communicators within the context of their families and the community. They acquire communication skills through responsive interactions with those who care for them. Early communication provides the foundation for vocabulary development and understanding of language which provide the springboard on which children build literacy skills. The section then turns to key early literacy skills, and the role of play in both language and literacy development. The final part of this section considers the early years settings in which young children learn the underpinning skills of literacy. These matters are contentious and the debate on phonics teaching is considered in light of the research literature, the skills of the workforce, and the professional judgements of Reception teachers.

The development of communication and oral language

Communication and relationships

Bruner points out that *'It is obvious that an enormous amount of the activity of the child during the first year and a half of life is extraordinarily social and communicative. Even in the opening weeks of life the infant has the capacity to imitate facial and manual gestures…and they show sensitivity to expression in the mother by turn taking in vocalization'*(1983, p.27). In the highly informative *Birth to Three Matters* framework, David, Goouch, Powell, and Abbott (2003) emphasise that, to become skilful communicators, babies and children need to interact with caregivers who are important to them, with whom they have a warm and loving relationship. It is through these interactions that children become competent language users. According to Karmiloff and Karmiloff-Smith (2001), during its last months in the uterus, the foetus becomes sensitive to the unique qualities of its mother's voice and rhythms of the native language. Researchers have established that babies as young as 4 days old (or even earlier) can distinguish between their native language and unknown languages. For instance, French researchers (see Karmiloff and Karmiloff-Smith, 2001) found that babies suck harder (a measure of their interest) when hearing French than when hearing Russian, but there was no difference in the rate of sucking between Russian and English.

All over the world, children begin to acquire language in similar ways as they construct representations of the sounds they hear (Hoff, 2005). According to Handel (2005), these representations gradually acquire the form and definition of their native language. By the age of 3 months, a baby who vocalises and then gets a response will increase the vocalisation

(David et al., 2003), demonstrating that the baby was attuned to the human voice and responds quickly to it. Snow (2006) points out that mothers will usually alter their speech for babies by simplifying grammar and content, and by using repetition and emphatic intonation.

Children learn language through first combining sounds into words and then words into sentences. The sounds children hear have meanings attached to them and these become incorporated into their vocabulary (Baquedano-Lopez, 2003). Children produce their first words between 10 and 15 months, typically using each word as an isolated unit. Goldin-Meadow (2006) states that they then proceed in two directions, learning (1) that the word can be divided into smaller, meaningful parts (morphology), and (2) that the word is a building block for larger, meaningful phrases and sentences (syntax). At the earliest stages of development, children often use a sequence of sounds consistently for a particular meaning, but the sequence bears no resemblance to the sound of any word in their language (Bates, 1976). 'Proto-words', such as these, and real words are often tied to particular contexts. But soon words become free of specific contexts, marking a point called the 'language explosion' during which children's vocabulary increases markedly, around 15 months. At about 18 months, children begin to produce two-word sentences (Bloom 1979).

The first three years contribute substantially to children becoming highly proficient in language which (a) is the core of their communication with others and (b) begins to guide their own thinking. Because language is learnt on different levels at the same time (Karmiloff & Karmiloff-Smith, 2001; David et al., 2003), children become familiar with phonology, vocabulary, grammar, discourse, and how to use language with amazing speed. Whitehead (2004) emphasises that a child's first word is based on observing, listening, and experimenting with sounds as well as making selective imitations of familiar people in familiar contexts.

In an analysis of the musicality of rhyming games, Trevarthen (2000) found that the same patterns are repeated (for instance the length of utterances by the adult) before the infant makes a contribution in relaxed, mutually enjoyable baby-adult sound repetition play. Peek-a-boo is another game in which babies learn the 'my turn, your turn' rule of conversation (Bruner, 1983).

As children learn the language of their communities, they establish and test hypotheses about language rules through the linguistic feedback they receive. Studies indicate that children who are exposed to a variety of languages develop phonological systems of those languages first in their ability to discriminate the sounds of each language and then to express themselves in it (Hoff, 2005; Saracho & Spodek, 2007). Across all language groups, children use their language to express, convey, mediate and manage actions, feelings and knowledge. Language links the child to people in their world but also to ideas and feelings of the culture.

It is interesting that a particular way of talking to babies is not a skill which is usually taught but nonetheless is a culturally learned behaviour and one that dominates early interactions (David et al., 2003). Bruner's (1986) observation that mothers and carers together create patterns of interaction, co-constructing their own worlds, reminds us that cognition is 'encultured' (Hilton, 1996) and that babies learn how to behave in a particular social setting in collusion with the adults and siblings around them. The first cultural contact a baby encounters is the world of the family.

The Framework *Birth to Three Matters* (David et al., 2003) summarises key messages about 'sociable babies':

- Babies are sociable from birth, using a range of ways to attract attention.

- Babies make social contact through facial expressions, movement patterns, gestures and words.

Many research studies show that babies require relaxed, playful and loving conversations right from birth. Moreover, parents and carers will benefit from the message that engaging in conversations with their babies will boost their language development so that, by the time they are three, they will be skilful at taking turns and engaging in social interactions that include talk. Additional key messages from the *Birth to Three Matters* report which can be useful for practice are that babies require and/or seem to enjoy:

- Turn-taking patterns of interaction.
- Responsive and encouraging interactions.
- 'Motherese', rhyming games, singing and word play.
- Not too much background noise (such as from television).

Finding a voice

Babies are born as curious learners with finely-tuned brains to attend to sounds around them and process them as part of their developing understanding of the world. Babies 'find a voice' in the sense of oral competence but also in the sense of personal, unique expression.

Cooing usually starts at around the 3-month stage and the response of the adult can act as a 'reward' encouraging these early attempts at sound making and interaction (Karmiloff-Smith, 1994). A few months later, babbling (repeating the same sound over and over) begins to emerge in babies' behaviour, especially when they are alone. All babies babble, even the ones with severe hearing losses and even when they receive no reinforcement other than the sound of their own efforts (David et al., 2003).

In a longitudinal study of 21 babies and their parents, Markus et al. (2000) found that language at 18 months was related to differences in earlier infant caregiver joint attention episodes (the frequency, quality, responsiveness and duration of such episodes). They have also reported a link between this finding at 18 months and the children's later scores on both the MacArthur Communicative Development Inventories and Bayley Scales of Infant Development at 21 and 24 months of age. The authors conclude that the more babies experience shared talk and activity, the more articulate they become as talkers. Additionally, a study by Kokkinaki and Kugiumutzakis (2000) observing the interactions between fifteen babies aged between 2 and 6 months and their parents found no differences in the infants' vocal imitations of either parent in terms of frequency, pauses, and total duration of the interactions. However, there were differences in the nature of some of the sounds imitated. When interacting with their fathers, both boys and girls of around 2 years old tend to use more speech directives whereas with their mothers they use more expressions about their reactions to objects and events, indicating that children use language differently with different people and to achieve various ends (David et al., 2003).

The Framework *Birth to Three Matters* (David et al., 2003) suggests the following developmental sequence as children become more competent users of language:

- Babies enjoy experimenting and using sounds and words to represent objects around them.

- Young children use single word and two word utterances to convey simple and more complex messages.

- Children use language as a powerful means of sharing feelings, experiences and thoughts as well as widening contacts.

Making meaning through language and expressive arts

Babies can actively process the sounds they hear long before they understand words or grammar. Karmiloff and Karmiloff-Smith (2001) explain that research has shown that the capacity for speech perception in the foetus, newborn or very young infant is impressive. But the authors make a distinction between speech perception and language, arguing that speech discrimination does not imply 'language' when there is much more to language learning than the ability to recognise the human voice or segment a stream of speech. Children learn language through incidental learning contexts which do not appear didactic, yet provide valuable learning opportunities. Saracho and Spodek state that *'it requires learning not only linguistic features and knowledge of the language, but simultaneously learning the social knowledge needed to participate effectively in the new discourse community'* (1993, p.6). Through a range of conversations with a variety of adults and peers, children's knowledge of their own language is developed. In addition to knowledge about both vocabulary and grammar, children learn a set of rules to generate utterances that are appropriate in their social situation. According to Bruner, *'social realities are not bricks that we tip over or bruise ourselves on when we kick them but the meanings we achieve by the sharing of human cognitions'* (1986, p.122).

According to Hart and Risley (2003), adults' one-to-one interactions with babies have pervasive effects on language development. It is through developing knowledge of language from exposure to the cues given by more knowledgeable others and the 'models' they offer that young children learn how to 'mean' and how to make sense of what is going on around them (Bruner, 1986).

Research consistently emphasises the importance of children's construction of meaning in their language learning. McKeown and Beck (2005) argue that children will succeed in language learning when they experience linguistic interaction as opposed to mere exposure to linguistic information (such as watching television). The learning process about language learning is highlighted in Hart and Risley (1995; 1999; 2003) in a longitudinal study. In their first study, Hart and Risley (1995) focused on children learning to talk by recording their exposure to and involvement in language beginning with their first words. Their findings indicated that children's exposure to a large and complex vocabulary at home made a significant difference to their language development at age 3 and literacy development at age 9. In their second study, Hart & Risley (1999) examined their data in greater depth and inferred that reciprocal conversational interactions between children and their parents influenced children's verbal and cognitive competence. They found that, when children engage in conversations, they are motivated to respond and practise appropriate responses to a specific situation, hence providing a response with an utterance that made it possible for the conversation to continue. They observed that children who successfully engaged in conversations were able to make themselves understood, communicate their needs and wants, interpret what others said and respond to them, and take turns during the conversation. Hart and Risley (1999) emphasised turn-taking in baby play with caregivers. Through face-to-face, turn-taking play with caregivers, children learn rules for conversational exchange. They also learn about social reciprocity (Singer, 2001).

Dunn (1984) emphasises the role of siblings in supporting babies' and young children's meaning making. In her research (with older children), Gregory (2001) describes the 'potential for synergy' (David et al., 2003) between siblings as they play together with younger children, repeating, imitating, listening, echoing, challenging, and so on. However, in such cases, older children are also learning through consciously practising what they know and through translating official meanings into personal sense for the younger child (Gregory, 2001). In these interactions, the mutuality of the learning opportunities benefits both older and younger children.

Given opportunities, children under three can use other ways of expressing themselves, such as through movement and dance, singing, and other expressive arts (David et al., 2003; Davies, 2002). Learning how to make meaning draws on specialised auditory knowledge (David et al., 2003) developed in the womb and progressing as the child processes the sounds, rhythms and basic building blocks of words and grammar (Karmiloff & Karmiloff-Smith, 2001).

As children grow up, become more independent and are able to speak for themselves, they are able to notice and select opportunities for further language development. Children need to come into contact with language that includes subordinate clauses, passive constructions, unknown expressions, and unfamiliar idioms. McKeown and Beck (2005) suggest that it is important for children to learn to use explanation and elaboration in their responses as well as to relate their ideas in a dialogue. This is an essential factor to help children acquire and use language that is divorced from the here-and-now (i.e. decontextualised). Understanding decontextualised language is the primary source for abstract learning (McKeown & Beck, 2005). Social play can provide a valuable natural context for children to go beyond the here-and-now into imaginary realms, especially as Harris (2000) suggests that pretend play is often the bridge to decontextualised thought; i.e. meanings that transcend the here-and-now.

The importance of vocabulary

Vocabulary is one of the most robust long-term predictors of good literacy development (Snow, 2006). Research has shown that children with large oral vocabularies are unlikely to have problems learning to read (Snow 2006, Hart & Risley, 1995) - a finding that highlights the huge social class differences in vocabulary size amongst preschool-aged children which becomes particularly important towards the end of primary school. In some studies, vocabulary correlates more strongly with global comprehension than with word reading measures (Muter, Hulme, Snowling, & Stevenson, 2004) but in other studies (for example, Snow, Tabors, Nicholson &Kurland, 1995), the relationship between vocabulary and word recognition is also quite strong.

The most consistent finding is that vocabulary skills, particularly expressive vocabulary skills, are related to the development of reading (for reviews, see Wolf & Bowers, 1999; Wolf, 1999). Goswami (2001) suggests that phonological awareness is directly enhanced by more word knowledge, as it provides the valuable opportunity for more precise comparison of the sounds that differentiate phonemically similar words (for instance, *hen, pen, ten* but also *head, peck, tell* and *held, pecked, tent*). Thus, phonological awareness and vocabulary interact in children's reading development, with each supporting the other. So vocabulary is important in its own right but also in its interaction with phonological development.

Conversation is the most effective way for children to practice and refine their language skills, including vocabulary. The ongoing verbal give-and-take provides valuable opportunities for speaking and listening and the child gets immediate feedback. Dudley-Marling and Searle (1991) have recommended using 'talk around the edges' instead of the formal question-answer drill. It is important that preschool children experience a range of receptive and expressive language, including children's poetry, storytelling, and creative dramatics (Naude, Pretorius, & Viljoen, 2003).

The key early skills for literacy learning

Before they have had any formal literacy instruction, young children acquire many skills that are directly relevant to later literacy development. There is general consensus that early emerging literacy-related skills include some familiarity with the alphabet, and the ability to link sounds to letters, name and print some letters (perhaps in their own names), recognise signs and letters in the environment or handle books and other literacy artefacts appropriately.

According to Snow (2006), the first steps towards literacy include children recognising some books by their covers, knowing how to hold books upright and turn pages, listening when read to, expecting to be able to understand pictures in books, distinguishing pictures from print, recognising some letters, and producing purposeful-looking scribbles. Children then learn that text in books is different from notes or lists, and may scribble, pretend-write, or draw with a communicative purpose. Once they have mastered these skills, children move on to knowing about titles and authors of books, tracking the print when being read to from familiar simple books, naming all and writing most of the letters, recognising and spelling some simple words, spontaneously questioning events in stories and information books, and using (mostly) invented spelling in writing.

Theories of child development have historically favoured linear progressions that simplify and tend to homogenise development (Piaget, 1983; Fischer et al., 1997). In contrast to these linear models, Ayoub and Fischer (2006) propose that a child develops along a web of multiple strands and that different people develop along different pathways. Within this new developmental theory, children will acquire and master emergent literacy skills at different ages and according to different, even non-linear, patterns.

Early emerging capacities that seem conceptually to relate to literacy may not all be strong predictors of later literacy development (Snow, 2006). Meta-analyses of longitudinal studies of literacy development (for example Scarborough, 1998) make clear that early emerging skills (such as phonological awareness) are more reliable predictors of early literacy development than others (such as letter knowledge). According to Snow (2006), it is important to bear in mind that that early decoding skills will support early literacy development but that vocabulary seems more important for later literacy achievement, especially comprehensions of texts.

‘Hearing’ the sounds in words: Phonological awareness

There is one component of literacy development that is particularly important and has been demonstrated to relate more strongly to reading than vocabulary in preschool and Year 1 children, and this is phonological awareness (Snow, 2006; Anthony & Lonigan, 2004; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004). Long before they recognise printed letters children learn to discriminate the sounds that create meaning in their language and those who are proficient at this skill go on to become good readers. The development of phonological awareness can be fostered by many everyday activities preschoolers engage in, such as reciting and learning rhymes (Bryant, MacLean, & Bradley, 1990; Bee & Boyd, 2007) or playing word games (Serpell & Hatano, 1997). Identifying factors that promote children’s literacy, Williams and Rask (2003) indicated that it is essential for children to ‘hear’ (or discriminate) the sounds in words to develop awareness of the small sounds that make up words. Early games and nursery rhymes can thus contribute to children’s later reading success. Fisher and Williams (2006) similarly argue that poems and repetition of nursery rhymes help children learn the sounds of their language and enhance their phonemic awareness as they learn to ‘hear’ the individual phonemes in words.

There is some evidence that phonological awareness can be taught to children who are weak at it. Findings from studies in Germany, Scandinavia, and the US (Ron-Nelson, Benner, & Gonzalez, 2005) demonstrate that if children are trained in phonological awareness during the preschool years, their reading skills in Year 1 are stronger. However, this is a complex issue: although there is broad agreement on early 'teaching' of oral skill such as sound discrimination, there is a hot debate about when is it best to teach letter-sound relationships.

Linking sounds to letters

Bee and Boyd (2007) argue that a child does not have to acquire phonological awareness in the preschool years as phonological skills can be learned in the primary school through formal instruction. However, many researchers have shown that the more exposure to phonological instruction before school, the faster a child learns to read (Segers & Verhoeven, 2004). In addition, large gains in phonological awareness occur between children's fourth and fifth birthdays (Justice, Invernizzi, Geller, Sullivan, & Welsch, 2005). Finally, the relationship between phonological awareness and the rate of literacy learning in the early childhood years was also found in languages such as Chinese (McBride-Chang & Ho, 2000) so it may be a universal prerequisite to reading.

There are two kinds of phonological skill: the ability to break words down into syllables, and the ability to break down words into the smallest units of meaning, the phonemes. The contribution of phonemic awareness to children's reading has led to calls for systematic instruction in linking letters and sounds in the US (National Institute of Health and Human Development, 2000). Such curricula, however, have led, in some cases, to the idea that phonemic awareness is an end in itself rather than a stepping stone to improved literacy. There is evidence, however, that a total of approximately 20 hours of explicit instruction in phonics is enough to have a positive impact in almost all children. This evidence is taken from the National Reading Panel's meta-analysis (Ehri, Nunes, Willows, Valeska Schuster, Yaghoub-Zadeh, & Shanahan, 2001) involving children aged 2-6, with both low and mid-high socio-economic status. There is also evidence that involving children with more playful activities such as word games and 'invented spelling' (a strategy used by children when they attempt to write) lead to phonological awareness, reading and writing skills. It is impossible to specify an age at which explicit phonics instruction is most effective as this will depend on each child's oral language, cognitive skills underpinning literacy such as short-term memory, and their literacy experiences at home or in the setting.

In a large sample of 13,609 children in the US, Xue and Meisels (2004) found that achievement in literacy was significantly higher for preschool children (from both affluent and poor families) when practitioners reported using both 'integrated language arts' and phonics together. 'Integrated language arts' instruction included, composing and writing stories, performing plays, writing stories in a journal, retelling stories, reading aloud, making predictions based on text, communicating complete ideas orally, learning new vocabulary, shared reading, and writing with encouragement to use invented spellings if needed. Additionally, the study showed that children with low initial performance benefited less from 'integrated language arts', as measured by direct measures of achievement and more from phonics instruction, when compared to children who had better language skills at the start of the year.

The best approach to phonics appears to be informal activities in a play context that helps children link sounds to letters, and this should take place (for most children) before the age of 5. What matters is the skill of the practitioner to do this in a playful way, and his/her use of professional judgement as to when it is appropriate. Thus, phonics instruction may be appropriate in the Foundation Stage for some, but not all, children. This matter is re-visited at the end of the Communication, Language and Literacy section.

Shared reading and writing

'Shared reading' provides one way of boosting daily reading using 'big books' (Whitehead, 2004). In frequent shared reading sessions the practitioner demonstrates all the skills and insights that an experienced reader brings to a text. Subsequent readings will begin to engage children more closely with the text and discussions of the plot and the character can develop children's skills as critical readers as well as their comprehension of text (Browne, 2009; Snow and Juel, 2005). According to Whitehead (2004), an even closer focus on print is ensured as the adult draws the child attention to recurring names, repeated phrases, rhymes and words (some of which children might already know from previous book readings and environmental print experiences). Such a close focus on print also helps children and adults to talk about the nature and functions of punctuation as they encounter the mechanics that occur in literature.

Approaches that involve savouring words, discussing and creating writing problems have come to be called 'shared writing' (Whitehead, 2004). Shared writing can take the form of the practitioners and small groups of children jointly creating large books that may be based on personal experiences, the adventures of their favourite storybook character, or some favourite classroom investigations. Makin and Whitehead (2004) argue that this approach maximises children's creative ideas and composing skills, and also enables the practitioner to share the processes and conventions of writing with several children at the same time.

Play, language and literacy

Research has shown that young children's literacy learning can best be promoted in a play setting and incorporating literacy activities in the children's play environment can facilitate emergent literacy. In literacy-related play experiences, children select and utilise their linguistic skills that are essential for literacy development in a social context. Social contexts become pressing venues for introducing children to literacy knowledge and practices, where children develop their language and literacy through their everyday social activities. Children use play as an important resource to explore their developing conceptions of the purposes and characteristics of print in the pre-school years (Einarsdottir, 2000). Other researchers have shown that children engaged in reading and writing activities through play (Bergen & Mauer, 2000; Saracho, 2003; Kendrick, 2005).

During play, children gain more awareness of different points of view (their own and others), which helps them in their communication with peers and adults. In addition, they gain more knowledge of their physical world as they assume a variety of roles and transform their objects to convey their ideas and feelings about the social world (Saracho & Spodek, 2006). For example, children plan play procedures through discussions and explicitly negotiating rules, relationships, and roles (for instance, 'you be the baby and I'll be the mother'; Toohey, 2000). Katz (2001) described children's language development through play. She observed that, during play, children interacted with each other and with adults, participated in labelling, negotiated procedures through conversation, and organised a series of play events in sequence. In a study of 3-4 year olds during spontaneous play with a telephone, Guillen (2002) found that children selected appropriate genres and discourses and stimulated their use of technological literacies. According to Baquedano-Lopez (2003) this is the focus of children's learning in relation to their activities, actions and discourses of their social reality. Kendrick (2005) analysed a play narrative on a theme of playing house exploring the relationship between literacy and identity in the social and cultural world of a young girl growing up in a multilingual and multi-literate household in Canada. Kendrick (2005) concluded that that systematic examinations of children's play narratives influenced literacy learning and the construction of self in early childhood education.

During play, young children use language in literate ways, while they use literacy as they see it practised (Saracho &Spodek, 2006). Assessing the research that examined the interactions between literacy and play, Roskos and Christie (2001) performed a critical analysis of 20 current studies on the interface of play and literacy. They found that the conclusions of 12 of the 20 studies supported the view that play can promote literacy learning by providing settings that promote literacy activity, skills, and strategies; serving as a language experience that can build connections between oral and written modes of expression and providing opportunities to teach and learn literacy. Studies have also shown that the adult's support during socio-dramatic play enhances children's language development (McGee, 2003).

Vukelich's (1994) study on the importance of providing children with opportunities to play in a print-rich centre with literacy-related guidance from the practitioner, yielded significant results. Her results indicated that the participating children recognised words from a list without the graphics and context of the play environment. Saracho and Spodek (1998) emphasised the importance of parental involvement in children's literacy development through play. During the interactions, parents used literacy-related materials, strategies and activities that integrated play and literacy (such as reading and telling stories; listening to children's stories; engaging children in predicting sequence in stories; expanding children's vocabulary through stories; using puppets to retell stories; reading poetry; dramatising, discussing and writing stories).

Literacy skills for children in preschool and multi-age programmes have been found to be developed through play by embedding literacy materials within play settings. The results of these studies indicated an increase in children's use of literacy materials and engagement in literacy acts (Kress, 2003; Einarsdottir, 2000, Kendrick, 2005). A longitudinal study indicated that children with high levels of play with literacy materials in preschool could spontaneously read signs and had greater pretend verbalisations in a 'town-building' activity at age five (Bergen & Mauer, 2000). In their study, a relationship was found between symbolic play and children's developing phonological awareness in the early years. The authors reported that during play children used language and isolated the sounds of language from its meaning.

Activities to support reading and emergent writing

Figure 2.2 shows three supporting strands of literacy development.

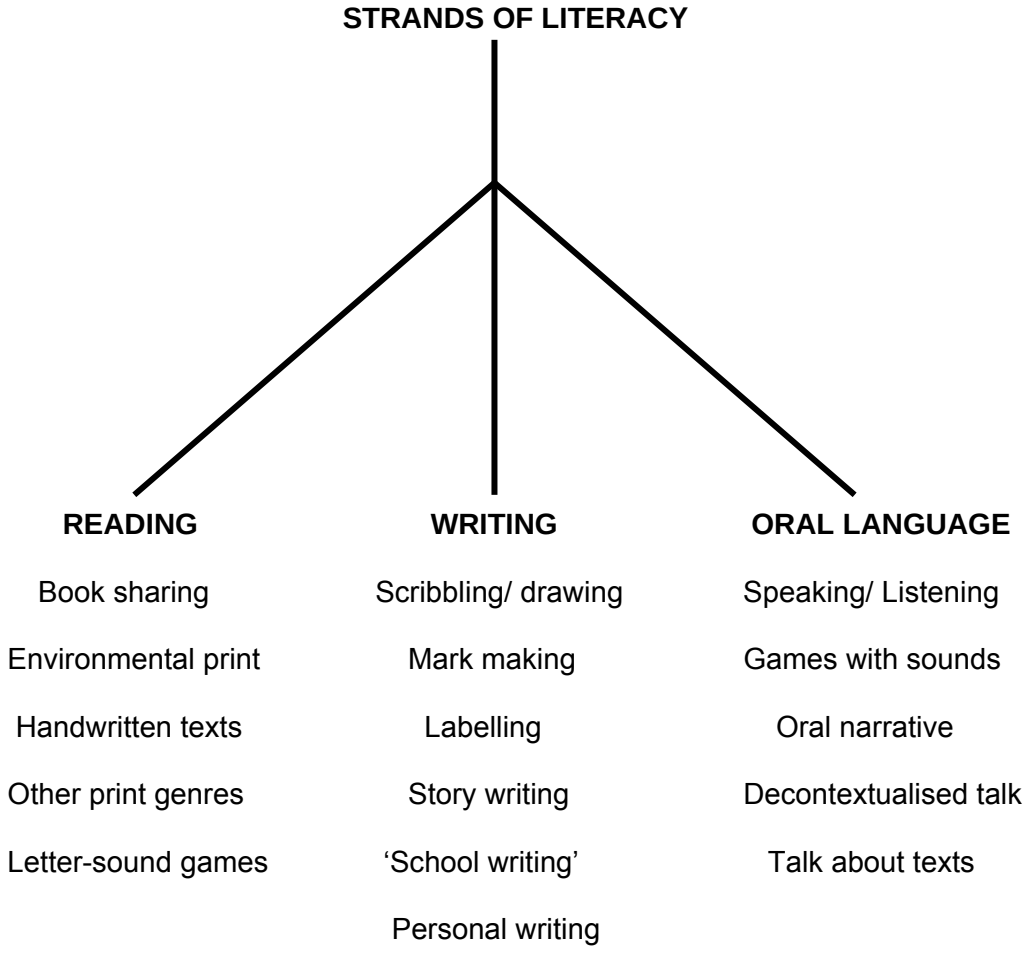


Figure 2.2 - Activities that support the three strands of literacy

Source: Adapted from Hannon, P. (1995). *Literacy, Home and School: Research and Practice in Teaching Literacy with Parents*. London: The Falmer Press.

Recounting tales and sharing books through listening and speaking

Many approaches to early literacy start with sharing picture books with young children, and the books certainly provide essential experiences of listening to a tale told, hearing book language and looking at a story carried forward by pictures as well as text. According to Whitehead (2004), it is important that the connections between the book and the child's world are built by sensitive talk at the appropriate times. To gradually unpack the layers of story and create meanings children need opportunities for conversations about books and stories as well as time to examine them closely and sort out their feelings and responses to them.

Learning to read pictures is a sophisticated skill that continues to develop as part of a general ability to 'read' film, art, and television images (Whitehead, 2004). But perhaps the most fascinating literacy development in these early stages comes when children begin to put themselves and their worlds into the books. For example the excitement of knowing that 'My granny has got one of those', or 'I ran away in the supermarket once!' provides the motivation for going on looking at books as they become meaningful in human terms.

Sharing meanings, however, is a richly complex feature of human behaviour and requires more than reading and talking about books. The experiences that children bring to school and group settings and the new experiences they encounter there must be re-enacted in different symbolic ways, such as through singing, dancing, music-making, drawing and painting, role-play, construction equipment, play artefacts and natural objects (Whitehead, 2004; Browne, 2009). Opportunities for children to share their thinking and learning with significant key persons enables them to feel 'at home' in the world and culture of school and group and make their own important contributions to it.

Emergent writing

Bee and Boyd (2007) make clear that some of the strategies used to teach reading also help children learn writing. Instruction in sound-symbol connections, for instance, helps children learn to spell as well as to read. Good writing, however, is far more than just spelling - it requires instruction and practice, just as reading does. Graham and Harris (2000) suggest that, in addition to handwriting, it is important for children to learn about language mechanics, such as appropriate uses of words and grammatical endings, as well as how to edit their own and others' written work. These skills are best taught in Year 1, although a few children in the Foundation Stage may have them already.

Fox and Saracho (1990) suggest that an outcome of helping children attend to print in the environment might be that they become more sensitive to the form of written language in everyday activities, whereas sharing books might result in children gaining awareness of the structure of stories and the function of print.

The transition from a non-writer to a writer who has full command of the alphabetic system for the transcription speech takes place in the broad context of children's interactions with their home, child care, and school environments. Bee and Boyd (2007) suggest that it is, therefore, important to observe the behaviours of young children as they engage in writing and to listen to their comments as they reflect upon their written productions.

Writing and reading messages

It is essential that children's contributions in the forms of stories, anecdotes and narratives become important components of the early years literacy programme. Families are often willing to make up simple books about their children and their daily lives and many schools have developed a policy for inviting parents in for this purpose (Whitehead, 2004). This approach has proved to be a very strong incentive for families from diverse cultures to make their languages and worlds part of the literacy learning and multi-lingual book-making in the early years setting (Kenner, 2000).

The most significant piece of meaningful writing for young children is their first name (Hall & Robinson, 2003). Whitehead (2004) suggests that 'games with names' can be a powerful way into early writing and communication if we follow children's developing interests and observations and provide plenty of examples of names in use. Children's interest in important words, words permeated with meaning and feeling, is usually accompanied by a desire to write or make them (Makin & Whitehead, 2004). Children make their marks in wet sand, mud, clay or with paints, pencils and crayons, or in different places such as the centre and playground notice board, the fencing around the garden, drain grids and so forth. These may not be in the full conventional form but just a promising scatter of component letters. According to Lierop (1985), this attachment to the letters of a name is often expressed in terms of real affection. This is a reminder that learning literacy is bound up with feelings and emotions.

According to Whitehead (2004), children's varied but informative writing from the environment should not be ignored. Young children may have learnt to read and write at home by investigating such materials and asking questions about them.

Whitehead (2004) argues that children's discoveries can be extended by carers and early years settings in many different ways. She suggests that, with a little more effort and the involvement of families and the wider community; parents and early years settings can make a collection of packages and cartons they can 'read' to cook food or grow plants, share children's delight in familiar advertisements, shop carrier-bags, rhyming and repetitive slogans and well-known logos and signs. These materials make bridges between home and early education settings as they encourage talk and play, and provide important insights into the symbol and sound correspondences of the alphabet.

It is essential to allow for a great variety of experiences in early literacy. While some write their own names and play with plastic alphabet letters, others create whole pages of pretend writing and fold papers into booklets. In the earliest stages of literacy, many children will be aware of alphabets because families often buy them as picture books, posters or wall charts (Whitehead, 2004; Snow, 2006). It is important that the collection of alphabets in an educational setting is varied, appealing and as relevant as possible.

All these suggestions provided by Whitehead (2004) reflect the varied interests and stages that children may go through. Becoming a reader and a writer is a very personal business and the ways to do it are unique as are the many cultural, ethnic and religious settings in which children get started.

Collaborative approaches to literacy

Initially adults play a major supportive role as linguistic informants and readers for younger children but as children's own literacy skills develop, they can be practised and extended in collaborative ways. Browne (2009) suggests that it is possible to boost, to a great extent, children's writing and reading by encouraging them to both share their knowledge about writing and their reading skills with their peers. Children can read to each other in book corners, library areas and playgrounds. Children may also incorporate literacy-like features in their role-play and good provision for literacy-enriched play can encourage children to play together in socio-dramatic or role-play areas, extending each other's literacy (Hall & Robinson, 2003; Makin & Whitehead, 2004).

Encouraging independence in reading and writing

A crucial aspect of early literacy development is personal autonomy - the clear establishment of a sense of control over one's learning experiences. According to Whitehead (2004), progress in writing is bound with autonomy and children need to be involved from the start in forming opinions and having views about their own writing successes and difficulties. She suggests that this can be established by writing back to the children about their work, and also discussing with them the effectiveness of their writing for its purpose and audience.

Similarly, Browne (2009) notes that as part of the process of encouraging independent reading, it is important that early years educators find ways of developing children's self-correcting strategies. She suggests that it all depends on the practitioner's professional sensitivity and judgement about not rushing in too soon with word-perfect correction, but at the same time not leaving a child floundering too long so that confidence and meaning decrease.

Snow and Juel (2005) and Whitehead (2004) suggest that considerable thought and flexibility should govern the Reception teacher's approaches to the 'hearing' of young readers.

Reading aloud to other adults or peers, will help when children are anxious to practise their emerging competence. The authors emphasise 'sharing' experiences rich in *both* oral language and text.

Debates concerning Communication, Language and Literacy: A concluding note

We have identified crucial characteristics in early learning experiences in infancy, especially in conversation and play with caregivers. The importance of give-and-take games, of children finding a voice and feeling confident in it - these must guide the organisational patterns of settings and inform the creation of staffing structures to support warm and individual personal relationships to help children in meaning-making. This area of research is not contentious.

However, one of the most important questions within this review is 'at what age should children be introduced to phonics instruction?' The research does not provide a clear answer to this question, and it's interesting to note that the Select Committee on Children, Schools and Families (House of Parliament, 2009) recommended dropping from the EYFS the five early learning goals dealing explicitly with reading and writing. The Government replied to Parliament (DCSF, 2009) that it disagreed with its recommendation about the five early learning goals and was firmly convinced they should continue, at least until the formal review of the EYFS in 2010. The rebuttal was stiff: Government believed that many children in the Reception Class were 'ready' for appropriate phonics work, and indeed would benefit from it. No doubt the Government's stance owed much to the Independent Review of the Primary Curriculum published earlier by Sir Jim Rose (2009). The policy choices are quite clear, but what does research tell us?

1. A robust experimental literature. There is a vast literature (reviewed with depth and rigour in the Independent Review of the Teaching of Early Reading, the Rose Review, 2006) on the effectiveness of early instruction in phonics. Rose reviewed the huge literature demonstrating that small, experimental programmes of phonics instruction lead to better reading scores in children who have been randomly assigned to treatment or control groups. The control children have usually followed 'normal educational practice', although some control groups are offered specific experiences rich in 'whole language' but devoid of systematic teaching of letter-sound relationships. The bulk of the experimental literature on the effectiveness phonics instruction refers to children between 4 and 5+ years, children of Reception age in England. There is no doubt as to the findings because study after study reports similar beneficial, short-term effects. What needs to be unpicked is their relevance for a national system of education, the broader context of motivation as an outcome, and the contribution to reading of the home learning environment.

2. The longer term effects of early phonics instruction, including motivation. The narrow experimental studies where children are randomly assigned to individual instruction (e.g., the ground breaking work by Bryant and Bradley, 1985) show clear benefits of phonics. There are also non-experimental designs where children's development is studied 'naturally' in settings following a wide range of instructional practices. In these larger scale studies children are traced several years later so that their reading attainment can be assessed and linked to the kind of reading instruction they experienced. An important study of this type was carried out by Xue and Meisels (2004). They found that children benefited most from a combination of phonics and 'language arts' pedagogy. However, more able children appear to benefit most from language arts combined with phonics, whereas less able children benefited most from phonics. This makes clear the fact that the more and less able children do not necessarily have similar learning patterns.

However, in the experimental literature little account is taken of children's longer term outcomes or their motivation to read. In most of the studies the learning outcomes are a narrow range of reading assessments, with no account taken of children's motivation to read,

or indeed of their psychological adjustment to school. We need more research on the long term effects of phonics instruction on motivation, especially on children who are very young (National Reading Panel, 2000).

3. Extending experimental findings to a national system? Pressley et al. (2001) has carried out a masterly review of interventions related to reading. He points out problems with concluding that instructional programmes shown to be effective in small, experimental studies will necessarily have the same results when implemented by law / regulation across a national educational system. Learning and instruction do not take place in a vacuum; they are embedded in social and cultural systems that include the workforce (with deeply held values and discrete professional skills), parents and their expectations/parenting skills, and social class systems such as the highly stratified one in the U.K. Pressley et al. (2006) warn us:

> *Although we recognize that there has been great progress in studying fairly simple interventions (e.g. teaching students to sound out words…we also recognize that the evidence-based reading instruction being delivered to schools is composed of many components that can be delivered over years of instruction, some validated in basic research and some not. Scientific analyses of such interventions are needed for they are interventions that matter in the lives of children…The educational intervention community is going to have to rise to the challenges involved in analysing complex, multiple-year treatments in ways that are methodologically and ethically defensible.* (p. 13)

The added complexity of an educational system surrounding each classroom makes us cautious about generalising experimental results system-wide. These studies prove conclusively that smaller scale programmes with committed, often volunteer, practitioners can lead to large positive gains in a narrow range of tests. Pressley's work warns that we cannot extrapolate the positive benefits seen in experimental studies to country-wide practice in which practitioners are required to implement a pedagogical approach with which they may not be in sympathy. Critics before 2000 (the cut-off date for this review) warned against extrapolation to national systems; newer research studies, such as Pressley's large-scale review, are placed in an analytic framework broad enough to encompass the system in which the classroom is located. In this broader framework, the benefits of early and systematic phonics instruction for most children aged 4-5 have not been conclusively proven. There is less doubt about the importance of phonics for most children over 5.

4. Age of entry and phonics instruction. Questions about phonics instruction in the Reception class have been inextricably intertwined with the age of entry to school. Children entered Reception 25 years ago as rising 5's or 5 year olds. Now, children enter the Reception class ranging in age from very young 4s (whose birthdays may be in August) to children who have just turned 5. This is a very different age profile to that when the British tradition of 'teaching reading in the Reception year' began. A recent review of birthdate effects from Cambridge Education (Sykes et al. 2009) suggests that many 'children around the age of 4 may not be ready for the environment they encounter in the Reception class', especially children near the age of 4 if their communication and concentration skills are poor. The Rose Review on Early Reading makes clear that practitioners should use their professional judgement in teaching phonics to children younger than 5. However, evidence submitted to the Select Committee (from Inspectors, Headteachers, parents) suggested that phonics are being 'instructed' to almost all children in the Reception, with few practitioners using their 'professional judgement' to withhold phonics from children not yet ready. This may be a flaw in the implementation of national policy and not in the policy itself. Further research is needed on the circumstances when the practitioner makes a decision to concentrate on oral language rather than letters and sounds, and how often this option is chosen.

A vast and well respected literature concludes that many (the majority) of children in the Reception year will happily and successfully learn phonics within a rich, learning environment that includes exposure to high quality books and with an emphasis on oral language. The real nub of the issue concerns those children (perhaps the majority in disadvantaged classrooms) whose oral language abilities and capacity to concentrate will not support them in smooth and efficient phonics instruction. Sykes et al. (2009) demonstrated that birthdate effects (where the youngest children in any year group do less well than older children in subsequent academic performance) were weaker in countries that began formal education at age 6 and higher, as in Scandinavian countries. This suggests that delaying the start of formal instruction to age 6 may make it possible for the youngest children in the year group to succeed, whereas such children will do less well in systems that begin formal instruction at age 5. Again, the idea of avoiding birthdate effects is not a new one but the evidence from other countries has been amassing since 2000. Moreover, less emphasis on phonics in Reception would allow more time for other aspects of the curriculum, especially outdoor play and oral language activities.

5. Inequalities in the home learning environment. Many studies on the Home Learning Environment (e.g., Melhuish et al., 2008) show that early learning activities in the home strongly predict children's academic performance later in primary school. The EPPE study has shown conclusively that more middleclass parents (defined by occupational status and parental qualifications) provide rich learning activities in the home, including daily reading with children, taking them to the library, engaging in oral language games and songs, and teaching about letters and numbers through such materials as plastic letters on the fridge. These activities were much less common in disadvantaged families, and EPPE suggests that children from disadvantaged backgrounds enter the pre-school (around 3) and the primary school (around 4+) much less prepared and able to begin the formal study of phonics. More detailed research by Foy et al. (2003) show that parental activities related to stories and books were related to rhyme awareness but not to phonemic awareness. However, phonemic awareness was related to specific parental efforts at 'reading instruction'. Thus, parents who read to their children may be stimulating phonological awareness of the sounds in language such as rhyme, whereas linking sounds to units of meaning, especially text, requires more deliberate instructional activities such as plastic letters.

Foy and Mann (2003) found that phoneme awareness appeared to be more closely linked to instructional aspects of the home literacy environment that operate primarily by enhancing vocabulary and letter knowledge. Thus, we see that phoneme awareness is increased by parental teaching and also by computer activities that build early reading skills. In contrast to phoneme awareness, rhyme awareness (detecting larger units of language, such as the initial sound in a rhyme followed by the stem) was more closely aligned to parental involvement with children's literature. This association was independent of the children's age and suggests that children whose parents provided a rich offering of books for shared reading tended towards stronger rhyme skills whereas children of parents who provided tutorial support for letters and sounds had children with strong phonemic skills. It was not the frequency of exposure to books and text but rather the type of exposure that seemed to matter. Thus, large scale studies such as EPPE in the UK, and smaller scale studies such as that by Foy in the US all point to the same conclusion: middle class families give their children an extra boost to reading by specific educational practices at home.

6. Does this matter? Age of entry and social class: It is agued here that the issue of whether to teach reading and writing in Reception is closely tied to the age of children who are enrolled in Reception and to parental literacy activities at home. Because children are currently enrolled in Reception between the ages of 4 and 5, rather than the between 5 and 6 of several decades ago, it means that a substantial minority of children do not have the oral language skills nor the ability of concentration to do well in phonics instruction. However, not teaching phonics in the Reception would mean that the middle class child would forge ahead

of disadvantaged peers who are not supported by their parents at home (And so the gap might widen even more.) Children from less stimulating homes definitely will benefit from instruction in letter-sound relationships, as well as in support for vocabulary, and this should take place in schools. The real question is - at what age should it begin? And for all, or for some?

7. Supporting professional judgement when to begin phonics. The research evidence reviewed by Rose and, indeed the subject of many scholarly reviews in technical journals, shows that children benefit from phonics instruction between the ages of 4 and 5. It may be that Reception class teachers should be encouraged first to create an environment rich in oral language. Next, they should move on more formal phonics instruction when the practitioner, in his / her professional judgement, thinks that the individual child will benefit. The Rose Review stated quite clearly that it was up to the professional judgement of the practitioner when to begin phonics instruction. However, this has not been followed in schools and many Reception teachers are beginning phonics work with children they do not believe will benefit best from it. Therefore, the phonics debate is not a matter of research evidence; it is more an issue of de facto implementation. The majority of children in Reception classes do indeed learn from phonics instruction and go on to successful careers as readers. However, as pointed out in the Cambridge Assessment Review, a sizable group of children between 4 and 5 do not have the necessary foundation skills for formal work in language instruction and these children would probably benefit from a Scandinavian style of education in which formal education is delayed until (at least) age 6. The research suggests that practitioners should begin phonics instruction 'when the child will benefit from it', and that will be during Reception year for some children, but not until year 1 for others. "Personalised" learning is highly relevant to teacher's judgement about when to teach phonics. Should the early leaning goal be an 'aspirational one', with fewer than 30% of children achieving it, or should it be delayed until Year 1 so that a large group of children do not 'fail to reach an expected goal'? In an ideal scenario, the practitioner would focus strongly on oral language and on shared reading of books in the Reception, with support in phonics for those children who are ready for it and eager for it. If in the practitioner's professional judgement a child is not ready, that child needs support in the foundation skills of oral language and concentration.

Whitehead (2004) argues that it is critical that literacy is not concentrated on in a way detrimental of other aspects of early years environment. Indeed, the research literature shows that literacy itself will suffer if it is not established on a broad and deep foundation of worthwhile experiences of symbolising and representing meanings through skills such as movement, dance, music, listening, talking, drawing, story-telling, as well as scientific and mathematical investigations. This list of 'literacies' (Edwards, Gandini, & Foreman, 1996) provide a balanced early years education which can be pursued in ways that are open-ended and sensitive to where children are in their thinking and learning.

If the approach of early childhood practitioners is unpressured and reflects their confidence in children's abilities to reflect and learn for themselves when supported by their peers and adults who care for them, there should be less danger of a work-play split in the early childhood curriculum (Whitehead, 2004; Bruner, 1986).

2.3 Problem Solving, Reasoning and Numeracy

Children must be supported in developing their understanding of Problem Solving, Reasoning and Numeracy in a broad range of contexts in which they can explore, enjoy, learn, practise and talk about their developing understanding. They must be provided with opportunities to practise and extend their skills in these areas and to gain confidence and competence in their use. EYFS, p.61
http://www.standards.dfes.gov.uk/eyfs/resources/downloads/card4_7.pdf

Theories on the teaching and learning of early mathematics have changed dramatically over the past two decades as the early pessimistic view (Thorndike, 1922; Piaget,1965), which focused on what young children cannot do, gave way to a highly optimistic view focussing on what young children and even babies are able to do mathematically (Gelman & Gallistel,1978; Hughes,1986; Wynn,1998). Baroody, Lai and Mix (2006) now argue for a 'middle ground view' arguing that the optimistic view has proved too hopeful in the light of more recent research. It is therefore important that such research is considered in detail.

Furthermore there is increasing evidence that, though the causality is yet not established (Baroody et al., 2006), achievement in mathematical activity on entry to school is a clear indicator of subsequent achievement in the later years of schooling as shown by studies in England (Aubrey et al., 2006), the United States (Clements & Samara, 2008) and Finland (Aunola et al., 2004), highlighting the need for effective preschool education.

The majority of this research is in the area of number and arithmetic. This section will therefore look first at research into children's learning of numerosity, counting, and calculation. The shorter section following will consider shape, space and measures and then the implications for teaching mathematics in early years settings and for a review of the curriculum in this stage of education will be considered.

Recognising number ('Numerocity')

Wynn's (1998) research into babies' understanding of numerosity demonstrated that children in their first year of life are sensitive to number, able to recognise 'how many' without counting (known as subitization) and recognise the difference between sets of one, two or three objects and even reason about changes in numerosity expecting that if an object is hidden and another placed with it behind the screen, two will be seen when the screen is removed. This evident pre-counting sensitivity to number led initially to some researchers proposing an innate nonverbal counting mechanism which enabled the rapid learning of counting words and an understanding of the use of counting in their subsequent years (Gelman & Meck, 1992).

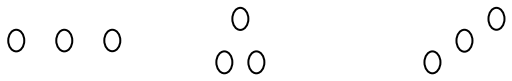
While there had been much subsequent research confirming Wynn's findings in babies (Feigenson, 2004; Chen, 2009), others have challenged the suggestion of an innate verbal counting mechanism showing that there is not a clear continuity between subitization (LeCorre et al., 2006; LeCorre & Carey, 2007), which may be based on spatial representation rather than a pre-counting (Lecuyer, 2004) and counting. Huttenlocker, Jordan and Levine (1994) found that three year olds, who could sometimes subitize to three and reason about changes, were still not able to solve nonverbal addition problems within this number range. Dowker (2008) found that, in children with atypical mathematical development, the small number subitization and number operation ability is preserved while counting and more complex number calculation is impaired, suggesting that the two mechanisms are not contiguous. While subitization may help develop a concept of

numerosity which can be applied to larger numbers (i.e. the concept that a number refers to a characteristic of a set of items; Lipton, 2005), Rips et al. (2006) argue that further number development requires not just recognition of quantity but the concept of 'the next word after', (i.e. ordinal number; see also Fias & Verguts, 2004).

Cappelletti et al. (2007, see also Benoit et al., 2004; Halberda & Feigenson, 2008) therefore propose two levels of evolution of numerosity: '*the biological evolution of elementary, non-symbolic numerical abilities*' and '*the cultural evolution of higher level symbolic mathematics*' which includes counting and calculation (p.74).

Given the evidence on discontinuity between subitization and counting noted above, there is little recent published research on the development of number in children between the ages of 0-1 year and 3-5 years. Mix's (2002) detailed study of development of number competence of one child, from infancy through early childhood (12 to 38 months), showed that the child's competence was heavily context-dependent, with social activities such as giving things to people offering more opportunity than more mathematical activities such as matching sets.

There is insufficient research to specify clearly the implications of these finding for early years education but they would indicate both starting from the child in terms of offering meaning and language for small number in subitization contexts and also the cultural necessity to teach counting (Benoit et al., 2004), cardinality and ordinality (Rips et al., 2006). More specifically, Baroody et al. (2006, p.196) suggest that toddlers 'may benefit from seeing a variety of examples and non-examples of the intuitive numbers' (1- 3), and from encounter with quantities arranged to form different recognisable number patterns, e.g. seeing 3 as



in order to further develop their understanding of number. While Mix's work would indicate that socially contextual activities are more effective than non-contextual mathematical contexts.

Counting, cardinality and one to one correspondence

The key principles of counting identified by Gelman and Gallistel in 1978 still form the core understanding of children's counting development.

However recent research highlights two aspects of counting which may need attention in early years setting. The first of these is one to one correspondence: the 1:1 principle of counting notes the matching of one number word to each object. Traditionally the early years curriculum has therefore contained 1:1 matching activities, for example one cup to each saucer as a precursor to counting however, as Thompson (2008) and others have noted there is little or no evidence of transfer from object to object matching to object to word matching. If the 1:1 principle is to be learnt it should be through more emphasis on 1:1 number word to object matching when modelling counting. Rather than focussing on matching sets of objects by 1:1 correspondence, more could be made of recognising equivalence, greater than and less than when comparing sets (Sophian, 2007) to encourage logico-mathematical reasoning (Numes, 2007).

The second relevant aspect of counting relates to the cardinal principle, in that the count word assigned to the final object indicates the cardinality (how many) of the whole set. Although these ideas are closely related, counting and cardinality are separate things which children need to understand (Bermejo et al., 2004). In relation to the discussion above,

cardinality is more closely related to numerosity and subitizing than counting. Rather than focusing on 1:1 matching outlined above the curriculum could better focus on comparison of unmatched sets in order to give purpose for counting and comparison. Puppets have been used successfully to model errors in counting procedures and cardinality (Muldoon et al., 2007a) and getting children to explain, rather than just identify mistakes, was found to be especially beneficial (Muldoon et al., 2007b). The idea that number words and written symbols (Rogers, 2008; Lipton & Spelke, 2006) represent quantity rather than being a function of counting and the relationship between consecutive counting numbers as representing one more or one fewer (Sarnecka & Carey, 2008) could have greater emphasis in the early years curriculum.

One way of emphasising cardinality may be through gesture. Modified gestures to support speech and scaffold communication, have been found to be a feature of maternal communication in young children (O'Neill et al., 2005). Gesturing is common even when counting things that are not present, enabling children to keep track during the counting process (Alibali & DiRusso, 1999; Graham, 1999) and lightening the cognitive lead of the task (Goldin-Meadow et al., 2001). Suriyakham (2007) found that children were more likely to use gesture if it was used by their parent or caregiver. Of particular interest was that children who learnt to use not just 1:1 pointing gestures but also a circular 'altogether' gesture at the end to indicate that the final count word refereed to the total set had better a understanding of cardinality, as indicated by the 'give a number' task.

Calculation

Calculation both builds on and draws upon early understanding of number and counting (Baroody et al., 2006). So, understanding of calculation appears to be developed in two ways - one based on the innate understanding of number and the other on counting. Early experiments showing babies able to recognise when items had been added to or removed from a set of hidden objects indicate an innate understanding of calculation (McCrink and Wynn 2004). Working with 3 year olds, Slaughter et al. (2006) have found children are able to understand such tasks with larger numbers, recognising which set would have more when some was added or taken away. Their work indicates an understanding of addition and subtraction at the age of three which is not yet demonstrated through their emergent counting abilities.

This early understanding needs to be related to the use of counting to solve calculation problems in the real world rather than just counting objects 'because they are there' (Muldoon et al., 2005). Gelman (2006) found that 2½ - 3 year old children were more accurate in counting a set of objects in order to check their own estimate of a simple calculation task than when asked to count the same number of items without purpose.

Since subsequent problems in mathematics learning can result from inadequate informal learning in the early years or a lack of connection between informal mathematics learning and more formal school mathematics. A child who cannot count forwards or backwards confidently will have difficulty solving addition or subtraction problems with more advanced strategies such as counting on or counting back. Teaching children to solve addition problems by counting on (5 + 3 is solved by counting 5, 6, 7, 8) was found to be detrimental to children's understanding if it resulted in a learned procedure rather than being based on a secure understanding of the counting words in order (Weiland 2007). More could be done in the early years to develop knowledge of the counting words, forwards, backwards and from a given number other than one, in order to aid subsequent calculation strategies.

Shape, space and measures

In comparison with the amount of research on children's understanding of number outlined above, there is a paucity of research on other areas of the mathematics curriculum in the early years.

Understanding of the concept of shape seems to be, if not innate, then learned very early. From birth babies seem to be able to distinguish between open and closed geometric shape (Turati et al., 2003), three month old babies can be shown to already distinguish between different three dimensional shapes (Poirer et al., 2000) and babies at around five months can be taught to identify the irregular angle in an isosceles triangle (Lourenco, 2008). Similarly, Shusterman et al. (2008) found children able to use ideas of angle and distance to solve mapping problems.

The role of language in mathematic learning

There is a considerable range of research into the role of language in mathematics in the early years and the importance of having appropriate provision to foster discussion (Evans, 2002). Children in foundation settings can be seen to use a range of mathematical metalanguage during play (Coltman, 2006). Story books also offer a context for mathematical discussion (Anderson et al., 2004; Casey & Young, 2004; Van den Heuvel-Panhuizen, 2008). However, Diaz (2008) found that early years practitioners were often unresponsive to the range of mathematic utterances during block play indicating the need for staff development in recognising and responding to mathematics in play situations (see also Morton, 2003).

Pedagogy

Research into children's cognitive development should not, however, dictate curriculum and pedagogy which could become over formalised. For example, just because babies can identify the irregular angle in an isosceles triangle does not mean that teaching them to do so is necessary. Aubrey (2003) reports on a European study which shows that beginning formal instruction at an early age does not improve subsequent mathematical achievement. However, appropriate provision is beneficial as shown by the EPPE project in England (Sammons et al., 2004) and in the Big math for little kids project in the United States (Greenes et al., 2004; Ginsburg, 2006). Kamii et al. (2004) conclude from their study of block play with 1-4 year olds that it is better to define the early years curriculum in terms of logico-mathematical knowledge during problem solving, rather than in terms of learning specific elements of the primary school curriculum, while encouraging the use of mathematics, both counting and calculation, in problem solving situations across a range of activities was found to be more effective than early introduction of symbolic representation of number (Gilmore et al., 2007).

Learning about shape has been found to be more effective in babies through handling shapes than visual representation (Streri, 2005) and through an adult scaffolding the children's learning in problem solving contexts in 3-5 year olds (Coltman et al., 2002). These findings are in line with others in the learning of number in social context, through play, problem solving (Saxe et al., 1991) and playing games (Culter et al., 2003).

In a review of pedagogy for mathematics in the early years Gifford (2004, p.99) argues for a pedagogy:

> '*considering children's mathematical learning in terms of cognitive, physical, social and emotional aspects. A range of cognitive processes, an emphasis on large-scale activity, and multisensory learning, concerns for children's self esteem and agency in their own learning, diverse home experiences and supported pair and group situations*'.

She finds the current curriculum for 3-5 year olds sends mixed messages to practitioners.

Summary implications for practice

- The importance of problem solving in social context as the medium for mathematics learning in the early years over more formal mathematical tasks;
- The use of picture books as a context for problem solving and using mathematical language;
- Delaying formal mathematics, especially operating with symbols until children have appropriate conceptual development of number and number operations;
- The importance of effective practitioner staff development in recognising and responding to mathematical situations and language when they arise;
- The use of gesture in counting and cardinality.

Summary implications for curriculum reform

- Starting with 1,2,3 , representations and number words to develop the concept of numerosity, including the representation of cardinal number by number words;
- Further developing the importance of one more and one less in relation to counting and numerosity, not just seeing as the next or previous counting word;
- Counting forwards and backwards and starting from a number other than one;
- Replace ideas of 1:1 matching with the bigger ideas of equality and inequality of sets;
- The need for more research into children's development of measure concepts, particularly in the light of the William's Report recommendation that capacity and time should be introduced into the EYFS.

2.4 Knowledge and Understanding of the World

Children must be supported in developing the knowledge, skills and understanding that help them to make sense of the world. Their learning must be supported through offering opportunities for them to use a range of tools safely; encounter creatures, people, plants and objects in their natural environments and in real life situations; undertake practical 'experiments' and work with the range of materials. EYFS, p. 75
http://www.standards.dfes.gov.uk/eyfs/resources/downloads/card4_8.pdf

Piaget argued that a fundamental aspect of the way children make sense of the world is through the seeking out of the patterns that connect different objects and experiences. These patterns become elaborated into what he refers to as schema and the elaboration of these schema, in turn, become templates for looking at, acting in and explaining the world. However, schema are not just ways of framing experience as it comes along; they provide a focus of interest for the child's intellectual energy, and the search for objects and experiences which fit the child's schema and confirm their expectations, seem to be highly motivating. Schema provide a focus for action, when they acquire a new capability children apply it as often as possible and the achievement of mastery, as for the achievement of understanding, seems to be particularly rewarding (Bruner, 1966).

This search for pattern, what Piaget calls 'assimilation', also results in disconfirmation when something does not seem to fit the current schema and expectations are confounded. This intellectual crisis, referred to by Piaget as disequilibrium, has to be resolved through an elaboration or redefinition of mental organisation, which Piaget refers to as 'accommodation'. Piaget's account of the dynamics at the heart of the learning process continues to provide a persuasive explanation of the relationship between the learner and the curriculum and indeed current science, maths and technology curriculum's draw directly from Piaget's theoretical model (CASE, CAME etc). However other aspects of Piaget's theoretical framework, whilst continuing to provide a signpost for research activity, have now been substantially elaborated or overturned. It is now thought that children begin the process of developing concepts from infancy rather than in a later phase of a staged approach as Piaget proposed. Piaget's work also begs the question of why particular ways of patterning the world might be selected by infants as being meaningful. Recent research has been concerned to explore not just the capabilities but the particular interests of the infant brain.

Infants' explanatory frameworks - knowledge about the physical world

Baillargeon (2004) has reviewed a number of research studies that have focused on trying to establish *what* knowledge infants possess about the physical world and on *how* they attain this knowledge. These studies have focused on particular aspects of the physical world for example; physical objects being supported or falling, being in front or behind other objects or colliding with other objects. She and her colleagues have used the fact that infants look reliably longer at events that violate as opposed to confirm their expectations, to construct a model of their understandings of physical space over the first years of life.

They have found infants of two and a half months can recognize that an object continues to exist after it becomes blocked although their understanding of the conditions under which objects should and should not be blocked is very limited. From a large number of examples of such tests of infant expectation, Baillargeon concludes that infants behave as if they are formulating rules about how events might operate and with experience they revise and refine these rules and elaborate their concepts about how things work. So for example, in experimental conditions, they will predict that a box with a part of its base resting on another box will not fall at 3 months, but understanding the amount of the base of the box that needs to rest on another box to produce stability is not present until twelve and a half months.

However typically these kinds of understandings do not start developing until 6 months when children are able to sit up and play with blocks in space, experience the conditions in which blocks fall or don't fall. Prior to this although their experience will have contained events showing one thing on top of the other, they will have had little experience of seeing things fall. The new learning seems to be triggered by the experience of unpredicted outcomes and the experience of unpredicted outcomes will be dependent on the experiences to which children are exposed. These unpredicted outcomes are only likely to occur in a play context as adults automatically place objects on top of other objects so that they do not fall. However when Baillargeon specifically taught the relationships between objects, infants were able to achieve competence earlier.

Learning to categorize

Quinn (2004) has reviewed research on infants' ability to classify objects in the world, using a familiarization and novelty preference procedure. That is infants look longer at novel objects thus allowing researchers to make assumptions about what they already know about. He found that three and four months old infants could form separate categorical representations for cats and dogs and they could do this before distinguishing more super-ordinate categories. However, Mandler and colleagues (2004), adopting both object examining and sequential touching procedures, have reported that infants and toddlers between 7 and 24

months more readily formed global representations, for example differentiating between animals and vehicles than basic level representations, differentiating between cats and dogs. Mandler has argued that the differences of capability logged by these different research approaches are due to different kinds of representation of data that the children are making (for more detail, see below). The earlier findings of competency are a function of children making perceptual distinctions whilst the later findings are more complex conceptual representations. With the perceptual representations the differences logged by the brain are affecting behaviour but are not available for conscious scrutiny as with the conceptual representations. Children appear not to be able to make the more global category distinctions at the younger age because the members of global categories are too perceptually variable to be compared using a visual perception system alone.

Psychological essentialism in children

The precocity and speed with which certain kinds of knowledge are learnt by young children has led some researchers to argue that the brain must be wired to receive particular information, much as Chomsky argued for a language acquisition device. Thus a number of researchers have proposed that infants' reasoning is facilitated by a few core principles that might be innate concepts for example Spelke (2000) has proposed that infants interpretations of physical events are constrained from birth by the core principles of *continuity* (objects exist and move continuously in time and space) and *solidity* (two objects can not exist in the same space at the same time).

Innate understandings of biology

Similarly, Gelman (2004) has argued that children have a tendency to search for hidden, non-obvious features that make up the core identity of biological categories. She gave 3-4 year olds three drawings to compare, depicting a leaf, a beetle and a beetle that looked like a leaf. When the children heard the ambiguous figure referred to as a bug they were more likely to extend new information on the basis of this conceptual label than on the basis of overall visual similarity. Gellman also gives examples of children's early understandings that properties are fixed at birth. Her team have conducted a number of studies, across international contexts, where children learn about a person or animal whose parents are switched at birth. For example children learned about a baby kangaroo who lived with goats from birth and were asked would it be good at hopping or climbing and would it have a pouch? Children as young as four reported it would be good at hopping and would have a pouch, and this answer was the reliable response for children of six, across cultures.

However Gelman also found that children of five would predict that a child who is switched at birth will speak the language of his original parents rather than his adoptive parents. This tendency for young children to see behaviour as well as physical properties as fixed was further explored by Taylor et al., (2009). They examined performance on a switched-at-birth reasoning task comparing children aged 5-10 and adults on concepts of animals and human gender. They found that the younger children (5-6) treated animal species and human gender as equivalent and tended to reject the idea of environmental influence. The ten year olds and adults, on the other hand, viewed gender linked behavioural properties as open to environmental influences and used environment based mechanisms to explain gender development.

Gelman also notes the importance of abstract themes like causation in young children's understandings of categories. For example three year olds will attribute an animal's actions to the animal itself and not to an outside force. Gellman argues that these sophisticated beliefs about core identities appear early in childhood with very little prompting, she refers to this as psychological essentialism. Taylor et al, conclude that '*essentialist beliefs have the potential to influence children's developing gender identity as well as their attitudes and actions toward others*' (p.479).

Jump-starting a theory of mind

Meltzoff (2004) reviewing work on the origins of social cognition, proposes an innate toolkit that jump-starts an infant's theory of mind. He argues that infants have special neural-cognitive machinery, coupled with experience with their own actions, to structure their experience of themselves and others. A key aspect of this machinery is the ability to imitate. Meltzoff reports studies that show imitation, for example of tongue protrusion, is in place on the day children are born. Meltzoff and others have also found that infants can correct their imitative movements and imitate from memory. He explains this by proposing that this imitative capacity seems to arise from cross modal matching. Infants recognize an equivalence between the acts they see others do and the acts they do themselves, '*there appears to be a very primitive and foundational 'body scheme' that allows the infants to unify the seen acts of others and their own felt acts into one common framework'* (p.13). That is the infant feels what s/he sees and perhaps most importantly, begins to build a model as the other as 'like me'. This leads Meltzoff to believe that the most salient distinction for an infant is between '*human acts versus other events'* or possibly *'acts that I can intend versus other events'* (p.22). This is an alternative to the innate foundational ideas offered by Gelman and others of 'recognising the difference between living things and non-living things'. Although Gelman herself refers to these ideas as 'skeletal principles' that organise children's early experience that may or may not be 'wired in'.

Natural pedagogy

Csibra and Gergely (2009) have applied this idea of innate ideas about the self and others to argue for a notion of natural pedagogy. They argue that young children have an innate receptivity to, and preparedness for, particular kinds of communicative intention that assists their understanding. Four month old babies prefer to look at faces that are looking directly at them rather than aside and to persons speaking in a warm and enthusiastic intonation (also known as motherese). Six month old children will follow the gaze of an adult if cued to do so by eye contact or child directed speech but not without such cuing.

Clustered together these informal theories seem to provide very young children with an intuitive understanding of physics, biology, psychology and language and they provide:

- fundamental units for dividing up all objects and events into a few basic categories
- an explanation of many phenomena in terms of a few fundamental principles
- explanations of events in terms of unobservable causes.

Whilst there is agreement that learning mechanisms are required, there is debate about the configuration of these innate concepts and *how many inborn constraints need to be fed into those learning devices along with perceptual data… how big the primitive basis actually is* (Mandler, p.61). Whilst arguing for the innately specified analytical mechanism Mandler argues that a few innate biases are sufficient to derive concepts about the world from perceptual information. One such bias is the proclivity to attend to paths of motion. She believes that it is what objects are doing rather than the objects themselves that attracts the infants attention, and this attention to what things are doing leads to the development of key concepts such as agent and goal.

The developing brain

Another explanation of core knowledge theories comes with growing understandings of brain function. Meltzoff and Decety (2003) argue that their accounts of infants ability to recognize an equivalence between the acts they see others do and the acts they do themselves correlates with the activity of *mirror neurones* in the brain. Mirror neurones are found in ventro-lateral premotor cortex, just in front of the motor cortex. They are activated both when a person reaches and when observing other people reaching in the same way. Thus the brain is activated by the movement of another providing exactly the kind of feedback for imitation that Meltzoff and colleagues describe. These mirror neurones are similarly activated by auditory as well as visual input and are thought to enable the infant to gain voluntary control over their vocalisations as they refine their performance in line with an adult model. These findings question the notions of innate ideas discussed earlier, providing the alternative possibility that the bias of the infant mind comes from the interpersonal connectedness that mirror neurones generate.

Brain science has also raised questions about the nature of young children's learning and drawn attention to the importance of some of the more passive mechanisms that make an important contribution to the way learning takes place (Saffran, 2003). For example, firstly in the way in which the brain logs the statistics of events which are then represented in neural networks and secondly the associative learning and pattern recognition. All three mechanisms underpin the achievement of speed and fluency of performance in procedural learning tasks (see the next section).

The desire to find a framework for looking at cognitive change that can bring together learning from neuroscience and developmental psychology has led to whole system approaches to cognitive development (for example Westermann et al., 2007). Such study has shown that gene expression can be influenced in very specific ways by environmental experience. Similarly neural activation patterns are constrained by the morphology and connection patterns of their underlying neural structures, which are in turn shaped by previous experience. These kinds of complex interactions can only be understood systemically and have particular implications for atypical development. In contrast to theories which assume disorders arise from isolated failures of, or selective damage to, particular functional areas, atypicalities in one area of the system are likely to have ramifications across the system setting up constraints which alter the developmental trajectory in a variety of unpredictable ways.

What is a concept and how is it formed?

As the earlier discussion of categorization demonstrated, one of the problems of infant research is that while children can behave as if they know these rules it is impossible to tell how conscious this learning is. This raises the question of how much of what they 'know' is consciously available to them? What takes place automatically and what requires attention? Mandler (2004) argues that learning is represented in two distinct ways, as *procedural knowledge* and *declarative knowledge*. Procedural knowledge is largely unmonitored, requiring repeated opportunities for exposure and repetition, in tightly defined contexts or bounded events. Exposed to experience, the brain slowly picks out repeated themes and actions which enables the infant to navigate the world with increasing competence. Further, there is evidence that these repeated themes are derived from the statistical structure of the events viewed. However, whilst the infant may have awareness of this knowledge they are not able to represent the knowledge as concepts that they can bring to mind when they are absent. Declarative knowledge, on the other hand, is selective, requires attention to be encoded and needs to be processed serially. This more effortful process brings the advantages of enabling learning to take place in a single trial. It is accessible to conscious awareness, and therefore describable through language or drawing, and available for use in other contexts.

The procedural - declarative distinction has to do with fundamentally different kinds of information represented in different kinds of ways. Mandler gives face recognition as an example of procedural knowledge. As a part of the visual input system we have sophisticated knowledge of faces that takes place automatically but is not conscious so that if something changes, we often notice that change has happened but are not sure what it is, for example a new haircut , glasses or beard? Factual knowledge, on the other hand, is an example of declarative knowledge. Facts are conceptual in nature having been extracted from experience, simplified and re-described, they are available for conscious attention and manipulation. She also argues that infants have a rich conceptual life before language is learned as these declarative representations are well represented by image schemas. She also notes that the kind of spatial representations such schema would involve, dovetails with the spatial analysis of the meanings that underpin language for example described by Lakoff and Johnson, (1980) and indeed the more recent work of Pinker (2007) linking verb structures to the ways we move in space.

Understanding goals and intentions

The strength of infants' imitative response has provided a problem for researchers in understanding what is meant by their response. Meltzoff (2004) found at 6 weeks infants were more influenced by spatial positioning than facial recognition when tracking adult identity but there was also evidence that infants used typical gestural acts as a way of keeping track of individuals. Thus they seem to recognise a face but are actually tracking a position and a gesture.

Similarly if the infant turns their head in the direction of the adult's head does this mean the infant is marking the head turning as significant, for example following the adults gaze? Research from a range of sources has demonstrated that the infant's readings of other peoples' goals and intentions begins to emerge between about 9 and 15 months. However Meltzoff's findings (building on Butterworth and Itakura (2000) and others suggest that although children appear to follow the adults gaze from early infancy it is not until their second year when they move beyond simply coding of other people's physical actions to understanding their significance as a means of referencing a particular object or event. Using the behavioural re-enactment procedure Meltzoff found that at 18 months, infants would imitate correctly acts that were demonstrated unsuccessfully, exemplifying their ability to pick up on the underlying intention of the act. Interestingly they did not imitate the failed attempts of an inanimate device performing the same movements. Meltzoff concludes:'*18 month olds interpret the person's actions within a psychological framework that differentiates between the surface behaviour of people and a deeper level involving goals and intentions'* (p.20).

Building on early concepts about the world - the development of causal reasoning

In an attempt to have a better understanding of how young children are learning concepts, researchers, for example Kuhn (2004) and Siegler (2005) have looked at children tackling the same kind of task, on a number of different occasions, over a period of time. The defining feature of this approach is the high density of observations over the period of learning that is being observed. This has been called a 'microgenetic' approach and it aims to specifically address the ways in which children acquire new knowledge over time. Researchers using the microgenetic approach are interested in change at two levels, firstly how children's knowledge and understanding changes over the learning period and secondly how the strategies used to develop knowledge and understanding develop.

To monitor such change researchers need to attend to the whole cycle of learning, for example in the case of problem solving within scientific inquiry, this is defined by Kuhn as consisting of four stages: inquiry; analysis; inference and argument. Thus children need to be able to generate a theory but also co-ordinate this with an appreciation of the role of evidence in supporting a falsifiable claim. In a study testing whether children would prefer evidence based explanations rather than explanations based on a plausible theory, 4 year olds gave evidence based answers less than a third of the time, whilst 6 year olds were correct the majority of the time. However, the tendency to use evidence or not, also varied with the complexity of the task and the real world understandings the children had already mastered. What Kuhn and others conclude is that evidenced based argument does not emerge at a particular time but rather is achieved at successively greater levels of complexity over an extended period of time.

From such studies Kuhn argues that scientific thinking is a particular form of discourse and scientific discourses have at their centre the question 'how do you know' and as this question becomes more refined it raises the further question, 'what is the support for your statement' . '*When children participate in discourse that poses these questions, they acquire the skills and values that lead them to pose the same questions for themselves'* (2004, p.392). From this work Kuhn and her colleagues conclude that much current science education doesn't necessarily involve scientific thinking, information may be presented and phenomena demonstrated without children asking themselves any scientific questions. Kuhn argues for the importance of inquiry based approaches in order to develop this crucial scientific thinking but she has also demonstrated that just interacting with materials will not be sufficient for scientific thinking to be generated, '*the teacher needs to do something with the child's response in a way that leaves the child with a richer, more elaborated representation than the child had previously*' (2004, p.393). This involves the teacher understanding that they need to convey to children the importance of not just 'what happens' or 'how it happens' but 'why it happens' and this in turn requires the teacher to have such understanding themselves.

Causal reasoning

Schultz et al. (2008) note the ease with which young children (mean: 57 months) use sparse data about unique entities to infer abstract physical causal laws that involve identifying the entity as a member of a class and establishing rules for the way that class of entities behave. Further, they found that in the face of counter evidence children would infer an unseen factor to maintain their original hypothesis suggesting a sophisticated level of abstraction. Schultz et al. argue that this rapid learning and apparent resistance to counter-evidence arises from a common underlying process. They propose that inductive bias's constrain the formation of hypotheses . '*Our oft noted difficulty in learning from data that violates our prior beliefs may be an ineviatable by product of the inferential processes that support rapid learning initially*' (p.221). Schultz et al. also conclude that it is precisely this limitation that underpins our capacity to generate scientific knowledge.

> '*Children's ability to engage in this reasoning suggests that imaginative leaps of scientific insight may have humble origins in our ability to infer abstract principles that - by limiting the hypotheses we consider - lead us to consider more than meets the eye'* (p.222).

Strategies for problem solving

Siegler (2005) reports on a number of studies carried out with colleagues using the microgenetic approach. His findings confirm children as actively constructing strategies to solve problems and reflecting on their success and failure but also using a range of passive mechanisms such as statistical learning, associative learning and pattern recognition. The

passive mechanisms seem to be particularly important in achieving fluent and automatic performance which in turn frees up working memory to enable more of the strategic problem solving and reflection to take place.

Some findings have been counterintuitive, for example Siegler and colleagues have found that children adopt new strategies even when old strategies are working well, and this maintenance of old strategies occurs even when children can explain the value of new strategies. He concludes that '*learning tends to follow irregular paths involving regressions as well as progress, short lived transitional approaches, inconsistent patterns of generalization, and other complexities'* (2005, p.770). This analysis has led Siegler to develop the idea that learning develops in *overlapping waves.* By this he means that children choose, from their available strategies, ones that fit the demands of particular problems or circumstances and that yield desirable combinations of speed and accuracy. He gives the example of toddlers on ramps, moving between quicker and riskier strategies, such as walking and running on shallower ramps and slower and less risky strategies such as crawling and bottom shuffling on steeper ramps. Similarly, in problem solving activities, children rely more or less on basic or more sophisticated strategies depending on the difficulty of the task.

Variability of learning

'Perhaps the most consistent phenomenon that has emerged in contemporary studies of children's learning is the great variability that exists within the thinking of each individual' (Siegler, 2005, p.772). Siegler has found that this intra personal change applies across age groups and over the long term it represents a move from less to more advanced strategies. However over the shorter term there is much overlapping of strategies. For example he found that when four year old children were given a single digit addition task on two occasions in the same week they swapped strategies a third of the time and about 40% of the time these strategies moved from a more advanced to a less advanced approach. Further, he found that the use of more strategies in initial trials was positively correlated with more effective learning subsequently. Siegler proposes that a possible explanation for this is that because new strategies are constructed from components of existing approaches, they are more likely to emerge when relevant precursor strategies have been recently activated. Siegler also noted that some studies showed that successful strategies were achieved without a trial and error process, again showing the parallel learning, in this case perhaps the kind of imitative strategies discussed earlier in the work of Mettzoff (2004).

Research as to rate of learning also shows great variability. Siegler draws on a range of evidence to show that the rate of discovery and the rate of uptake of a new piece of learning do not necessarily follow each other immediately. For some tasks discovery was immediately followed by uptake and for others the consistent use of the newly discovered approach might take many more trials, even when the child was able, at an early stage, to explain why the new strategy was superior to the old one. Being able to verbalise the value of the strategy did not automatically lead to its use.

Feedback

Siegler and colleagues' studies (2005) also provide evidence on the role of feedback in learning. Whilst they found that feedback normally enhances learning progress, good learning also occurred without feedback. They demonstrated that a possible mechanism for such learning was children's self-explanations. Siegler draws on studies on a wide range of tasks that have found that children who seek causal understandings of a domain both learn and understand better than do peers who do not seek such understanding. Indeed studies where children were asked to explain why observed events occurred, showed greater learning than when children were given feedback or were able to spend more time on the

task. In comparing tasks where children were asked to give reasons why correct answers were correct and why incorrect answers were incorrect, the greatest learning occurred for the children giving the explanations of incorrect answers. Prompting such self-explanations was particularly valuable for encouraging transfer across related tasks. The added value of explanations of incorrect answers seemed to come from the deeper processing involved (longer response times) and possibly from the weakening of the associative strength of the flawed strategies.

Young children's processing of secondary sources of evidence

How do young children make sense of information and ideas that they cannot experience directly? Tullos and Woolley (2009) report on a number of studies that have demonstrated that children as young as three can distinguish reality from a range of non-realities. Extending this work they sought to establish what clues children rely on to determine what is true and what is not true. Their studies demonstrated that four year old children were able to use their own sensory perception, testimony from others and the context in which a novel entity is presented to assign reality status and five and six year old children were able to explain the evidence they were using to establish these reality conditions.

Tullos and Woolley (2009) found that the ability to assign reality status develops significantly between the ages of 4 and 6. Interestingly, children were not necessarily more credulous when they were younger. Four year olds were more likely to have a pretend bias in their viewing of events and more likely to reject the existence of improbable entities, whilst the six year old children were more willing to admit the possibility of unusual events if the evidence suggested they were true. However, they found that children tend to neglect relevant evidence when it conflicts with their prior beliefs and the children without prior beliefs on the question studied were much more successful at using evidence to draw accurate conclusions. They conclude that what appears to be developmental changes in children's ability to distinguish fantasy from reality, may be reflecting underlying general abilities, in this case, the ability to evaluate evidence.

Trust in Testimony

Harris and Koenig (2006) point out that for much of our learning we do not have first hand evidence to draw upon but are dependent on the testimony of other people. Through such testimony children have access to data they would not be able to gather for themselves, for example information about microscopic processes or remote historical or geographical events. By listening to, trusting and making sense of such testimony they dramatically amplify their access to information and speculation about the world.

Harris and Koenig demonstrate through a number of research studies, that four and five year olds are able to conceptualise objects or processes that are normally hidden from view, drawing on other people's testimony. The studies show that children both trust such testimony from reliable sources and are able to make inferences from the information given. For example, Slaughter and Lyons (2003) found that children of four and five years old, who had been exposed to relevant testimony about the bodies internal organs, appreciate both the proper function of a given body part and that such parts and processes have life maintaining functions. When these children were questioned about death, they were more likely to understand the biological implications of death than children who did not know about these basic bodily organs and their functions. Further, a training programme teaching about body organs and processes improved children's responses to the questions about concepts of death, even though these were not considered on the programme. Thus, children at this age, were able to make inferences from testimony to develop theories about life and death not discussed in the original testimony. Even though testimony may be received in an incomplete and piecemeal fashion, children are able to rework that testimony and its implications to derive a coherent account of the objects or events related.

Further, Harris and Koenig (2006) point out the prevalence of children's 'why' questions, usually asked when children have identified something that seems to them to be an anomaly. Thus in addition to the Piagetian notion of resolving uncertainty through active experimentation, children also see adults as trustworthy sources of information to resolve issues that puzzle them. Indeed, these 'why' questions can be persistent and result in sustained dialogue, characterised by Tizard and Hughes (1984) in their detailed study of 4 year old girls talking to their parents, as 'passages of intellectual search'. Harris and Koenig (2006) argue that this trust in adult testimony is mediated by the context of the discourse in which the testimony occurs. So that talk of germs is absorbed within continual matter-of-fact references that are uncontested whilst Santa Claus and the tooth fairy are surrounded by avowals of belief, that suggest to the child that there is doubt as to their existence. Alternatively, Harris and Koenig propose that the children are sensitive to the degree of concensus that occurs between different conversational partners as to the reliability of particular entities or ideas.

Reliable sources of information

Judgements about the quality of the information are made but so also are judgements about the reliability of the source. Rakoczy et al. (2009) review evidence that selective trust is emerging in four year old children and resulting in increasingly sophisticated judgements about what counts as a reliable source of information. So they prefer adults' opinions on adult matters and children's opinions on children's matters; they judge people as reliable and unreliable and are able to take account of particular circumstances in which someone normally reliable may be unreliable in a particular case. They also show skills in understanding what data should be considered as 'correct' in a normative way and what data is opinion about which there can be personal choice, for example food preferences.

The use of ICT in children's cognitive development

In coming to know and understand their world young children in the 21st century also need to become aware of the technological aspects of that world. They are '*children of the digital age*' (Marsh, 2005, p.3). This is exemplified in a national survey in the USA of children's experience with electronic media from age 6 months to 6 years in which Rideout et al. (2003, executive summary) conclude that there is evidence of young children 'growing up immersed in media'.

However there are many controversies surrounding the extent to which young children should be allowed to spend time 'immersed' in such technologies particularly in their earliest years. The types of concerns, summed up by the Alliance for Childhood. (Alliance for Childhood, 2000) include the potentially deleterious physical impact of sitting at and focusing on computer screens for prolonged periods, the potential for social isolation and the potential adverse cognitive effects of undermining the needs of children, particularly very young children, to learn through physical and autonomous exploration of their world. Such concerns are reiterated in the context of children's TV viewing by Sigman (2007).

More specifically Greenfield (2008) notes the malleability of the brain in early childhood and is concerned that the ability of children's brains to make and lay down effective neuronal connections; to make ordered sense of their sensory experiences may be compromised by the media emphasis on '*here and now, fast paced sensory experiences*' (p 48). Furthermore, she argues that the '*strongly visual. Literal world of the screen*' (p.48) may stunt the development of the imagination and the child's developing construct of their own identity. Elsewhere in this report (Section 2.4 above) there are indications that in early infancy the ability to infer from screen based experiences may be in actuality quite limited. This may mitigate some of the issues raised by Greenfield but raises other concerns about early childhood experiences and practices that are over reliant on media; leaving children sat for long periods before a TV screen for example.

These are potentially serious concerns raised by eminent individuals in the developmental research community and they must be taken on board in any analysis of the ways in which children can come to understand the undeniably technological basis of the modern world. It is unfortunate in this respect that direct empirical evidence is difficult to find and, because of the nature of some of the claims, would be difficult to investigate practically and ethically with young children.

However, it should also be noted that there is some empirical evidence, though not at the neurological level, of benefits accruing to young children though interaction with ICT in their early years. Smith (2005) conducted a longitudinal study of a single child over a single year of his life from age 2 ½ to 3 ½. The study focused on his exploration of and engagement with CD-ROM storybooks. The study showed that there were positive impacts on his dramatic play, with the child also becoming more proficient in manipulating objects in the real world to symbolically represent elements from the storybooks. Making such conceptual links between different contexts requires the holding of ideas within his mind and could therefore be a positive cognitive challenge. This is an advantage over and above the increasing command of the technological tools he was using.

Robinson & Turnbull (2005) conducted another longitudinal study of one child, Verónica, from birth to age 6. Throughout this period they combined information from direct observations with information form parental interviews & correspondence. They chart the complex skills and competencies that Verónica utilises to make sense of her multi-textual world and paint a picture of a child being competent and proactive in interacting with the world of technology from her earliest days.

Moving beyond studies of individual children, the competency with technology and young children's interest in understanding such elements of their experience is also demonstrated in Gillen et al.'s (2005) investigations around children and mobile phone technologies across three countries, Canada, Italy and the UK. They demonstrate positive interest in such aspects of real life and further show that even within their first year infants positively model their communicative and language learning opportunities around such aspects of everyday life. It is important to note that the authors are not suggesting that young children should routinely use mobile phone technology and indeed there are still many questions to be resolved about the safety of mobile phones and young children. Nevertheless, the Gillen et al. study does evidence the need to perceive of children as competent assimilators of their technological world and highlights the potential benefits for communication and language development from play with simulated versions of everyday technologies.

Roberts and Howard (2005) emphasize similar active engagement with television. Specifically, they video recorded 20 children aged between 14 and 24 months as they watched TV. The TV programme the children were watching was the BBC programme *Teleteubbies*, specifically designed for pre-school children. During the course of the study the children exhibited very high levels of attention and concentration, as well as joining in with the various activities (a 'Para- social' response).

It is of course difficult to draw conclusions from relatively small-scale research studies such as those just outlined above. However, they do offer indications of the possible benefits for children of engagement with ICT beyond an imperative to become familiar with an important part of their world. However as Lankshear and Knobel (2003) noted there is a paucity of empirically based studies relating to children before the age of 5 and the use and developmental implications of ICT. This lack of research evidence is also highlighted by Stephen and Plowman (2002, 2003).

More recently, Aubrey and Dahl (2008), on behalf of BECTA, conducted a review of literature pertaining to ICT for children in the Early Years Foundation Stage age-range. Their review continues to highlight a 'pressing *need*' (p.50) for further research particularly for the developmental effects for the birth to three-age range. They reiterate the prevalence of technological experiences in the lives of young children today and the need, therefore, for specific focus on providing opportunities for children to engage with a diverse range of technologies. They also point out that differential access to ICT experiences at home (the digital divide) remains an issue although it is less extreme than in pervious studies of patterns of access and usage.

Focusing on developmental issues Aubrey and Dahl highlight a number of specific studies suggesting that ICT can enhance learning The following table provides some examples cited in the Aubrey & Dahl review and whilst not comprehensive gives an indication of the range of curriculum areas that can be enhanced by use of ICT, specifically computer software.

Table 2.1 - Curriculum areas that can be enhanced by use of ICT

Study authors	Learning advantages	Age range
Haughland (1990; 2000)	Computer software led to gains in intelligence, non-verbal skills, structural knowledge, long-term memory, manual dexterity, verbal skills, problem solving, abstraction and conceptual skills	2-4yrs
Calvert Strong and Gallagher (2005)	Computer base stories a can enhance children's developing knowledge and understanding of the world. NB:Children who controlled the computer demonstrate more attention and involvement than those who watched an adult control the experience.	Pre-schoolers of mean age four years and eight months
Attewell and Battle (2003)	Benefits associated with home computing and measures of self-esteem	Young school-age children.
Weiss, Kramarski and Talis (2006)	Learning of mathematics can be enhanced by multimedia experiences	Four-and-a-half and five-and-a-half years
Li, Atkins and Stanton (2006)	Positive impact of computer use on school readiness and psychomotor skills	three and one-half to five years of age,

Aubrey and Dahl conclude that technology can impact positively on development in three main ways:

1. *developing dispositions to learning that thread through personal, social and emotional development and across the EYFS in general;*

2. *extending knowledge and understanding of the world in the broadest sense of communication, language and literacy, problem solving, reasoning and numeracy, creative development and recreational / playful behaviour; and*

3. *acquiring operational skills.* (Aubrey and Dahl, 2008, p5)

Although they recognise the lack of empirical evidence, particularly large-scale studies into the health implications of ICT, Aubrey and Dahl suggest that a balance in the types of experiences offered to young children as well as 'adult mediation' may mitigate against the possibility of significant negative effects. Contrary to suggestions that technology can be socially isolating they cite studies by Chung and Walsh (2006) Clements (1998), which demonstrate that technology may serve as a 'catalyst for social interaction' (Aubrey and Dahl, 2008 p 29). They also note findings that suggest that boys and girls may respond differently, with girls more inclined to utilise the computer as a shared activity, although overall the extent of computer use is no longer as gender differentiated as in the past.

Notwithstanding the continuing lack of directly developmental research, there have been two important research groupings investigating the most effective ways to utilize ICT in pre-school settings, the Developmentally Appropriate Technology in Early Childhood (DATEC) project (Siraj- Blatchford & Siraj- Blatchford, 2003: Siraj- Blatchford & Whitebread, 2003) and the work by Plowman and colleagues at Stirling University (Stephen & Plowman, 2003; Plowman & Stephen 2005; Plowman &. Stephen, 2007).

Both groupings emphasize the important point that ICT incorporates a wide range of technological applications. Plowman and Stephen point out that a definition of ICT must embrace smart toys, remote control devices, photocopiers, telephones, fax machines, televisions, and computers as well as toys which simulate real objects such as mobile phones, laptops, cash registers, microwave ovens, and barcode readers. They further highlight, though, that the emphasis in settings can be disproportionately focused on computers. The Europe-wide DATEC project similarly urges the need to conceptualize ICT in its broader sense and recommends seven key principles for the use of ICT in early years settings:

1. Ensure an educational purpose

2. Encourage collaboration

3. Integrate with other aspects of curriculum

4. Ensure the child is in control

5. Choose applications that are transparent

6. Avoid applications containing violence/ stereotyping

7. Be aware of heath and safety issues

Most of these principles are readily comprehensible but points 4 and 5 may warrant further explication. Ensuring that the child is in control means not overly relying on closed computer applications such as drill and practice programmers or other technological applications that present children with problems to solve that are closed in that they have only one possible answer. It is argued that more creative problem solving devices are much more beneficial for children's creativity and motivation to learn. The need for applications to be transparent is similar, requiring that technological functions should be clear and intuitive - the need for a direct link between the child's action and the response afforded by the application whether computer, digital camera or other technological device is emphasized. Both these aspects enable children to feel a sense of mastery over technology - to be in control and to utilize technology as a tool for learning. The need for children to be in control of the learning process is re-emphasized in a subsequent analysis of a range of ten new ICT initiatives for children aged 4-8 sponsored by the i3, European Commission Intelligent Information interfaces programme (Blatchford, 2004).

It is important to stress that the concept of control does not imply that young children are simply left to do what they will with new technologies. This is a point stressed by the work of the Stirling University team already mentioned above. Based on their observational work in eight pre-school setting involving over 400 children aged 3-4 years old (Plowman & Stephen, 2005; Plowman & Stephen, 2006), it is suggested that the computer will not necessarily enhance learning unless there is 'guided interaction' on the part of practitioners. Active interaction can be direct (proximal) or more diffuse (distal). Proximal guided interaction will involve careful monitoring of children's activities when working with a computer and intervention to help a child when they struggle or suggestions for the child to progress their

learning; exactly the sorts of pedagogic practice that practitioners might routinely use in relation to other play activities. Distal guided participation refers to the less direct ways in which practitioners can support and facilitate learning with computers, for example by enabling access to computers, planning the type of activities available and so forth. Again these are the sorts of pedagogic practices that might be routinely applied to other learning areas within an early years setting. However, it is suggested that practitioners often feel less confident in relation to ICT than other areas of learning. Both the Plowman and Siraj-Blatchford accounts stress the need for ICT to be incorporated into early years practice with the same keen awareness of pedagogic beliefs and theories of learning that practitioners would consider in other contexts for early years learning.

Summary

Recent literature on the ways in which young children develop knowledge and understanding about the world provides more evidence for the constructivist analysis of learning that underpins current early years practice. However, our understandings of the conditions under which children formulate rules about how the world works, have been elaborated in a number of ways.

Passive and active constructions

Firstly, there is an inter-play between passive and active constructions. Children seem to be capable of making basic perceptual distinctions about the physical world, for example about the stability of objects resting on top of each other, before they are able to sit up and actually engage in manipulating the objects. Mandler (2004) argues that this perceptual analysis provides a basis for what she calls procedural knowledge which allows us to act in the world without necessarily being consciously aware of what we are doing. However, once infants are in a position to manipulate objects they quickly develop much more sophisticated and accurate models of what is required for objects to maintain stability, and these experiments build towards conscious awareness, which Mandler refers to as declarative knowledge.

Increased learning occurs when children are actively engaged in manipulating the physical environment, for example, in sand and water or block play, because this kind of play allows the child to control the conditions in which objects can exist in space, creating relationships between objects that would not be possible in a normal environment where instability is minimised. Thus object play is a powerful medium for learning because: children are actively experimenting with their own understandings about how objects behave in space or in water; through learning through inquiry children are able to personalise their learning to their own particular interests and understandings; the laboratory of ‘play’ allows for conditions that do not pertain in everyday life, triggering the surprising outcomes that require the child to develop new ways of thinking. Thus the passive, or at least preconscious, learning that allows us to absorb the basic conditions of our lives becomes elaborated and deepened by the questions that are generated by playing with those conditions.

Psychologists understandings about the nature of these passive features of learning are also being elaborated. Recent studies of the developing brain suggest the mechanisms of associative learning can now be seen to be underpinned by a statistical monitoring of the number of occurrences of events, explaining how repetition strengthens associations and build notions of certainty / uncertainty and trust / distrust.

Speed of concept development

There is increasing evidence that the infant brain is very quick to develop certain key concepts, for example categorising objects as living or non-living or developing early understandings about communicative intention. This has caused researchers to wonder whether some of the rules children develop are innate or at least underpinned by some 'skeletal principles' from which further 'constructions' are generated. Neuro-scientists are beginning to suggest possible accounts for how some of these 'skeletal principles' might be represented in the brain. For example, the findings that 'mirror neurons' fire in response to the goal directed actions of other people provides a possible mechanism for the infant to gain an internal representation of other people's actions. Such mechanisms may be the basis for developing understandings of communicative intention.

Research has also shown that young children seem to be biased toward generating rules on small data sets and the rules thus generated are then quite resistant to change. This resistance to changing initial constructs presents a problem for a constructivist view of learning but may have evolved as the price paid for being able to learn quickly. A properly scientific approach to the generation of knowledge would delay the time taken to develop a working model of the world. In a dangerous environment it may not be in the interests of the sceptical infant to play longer with the tiger or the road traffic than is absolutely necessary.

This 'speedy' constructivism may also have utility in relation to children's engagement with testimony. If we are going to take advantage of other people's testimony, we have to be able to take on board the construction of events they are offering us without checking out every detail of the evidence base. Indeed, young children seem to have sophisticated ways of dealing with evidence, with four year olds showing emerging skills in weighing evidence and assessing the credibility of informants. The recent attention to young children's response to testimony demonstrates gaps in our understanding of this crucially important part of the learning process. Early years practitioners instinctively adopt the 'telling' mode but often feel ambivalent about the way in which this takes the learning agenda from the child. Similarly children can give sustained and engaged attention to some kinds of testimony and 'tune out' to others. More research is needed on the conditions for effective learning from testimony.

One aspect of testimony that can be directed by children are the 'why' questions so prevalent in young children's discourse. Their observations trigger puzzlement and invite explanations. But Tizard and Hughes note that the knowledge and understanding of the experiences and world view of the child make such discourse unusual outside the home context.

The imagination, learning and creativity

One aspect of testimony that has been subject to scrutiny is the extent to which other people's accounts engender an imaginative response from the listener. The 'pretend mode' that is a feature of imaginative play allows children to manipulate actions and events, much as in block play they can manipulate relations in the physical world. This allows them to understand that things can be other than they are, providing alternative possibilities and the notion of choice. This developing imaginative resource is essential to understanding the perspectives of others and for taking on board the experiences of others to which children have no direct access. Indeed, the strange and the exotic, seem to be particularly engaging to children despite the lack of any first hand experiential base.

The imaginative response that enables young children to understand the perspective of others can also be adopted to communicate their own representations of the world. Research on young children drawing and making music demonstrates how the conditions for sustained work and fluent expression are embedded in joint meaning making. As with children's invitations to hear adult explanations with 'why' questions, the various forms of

artistic expression seem to be at their most elaborated when children can direct their own search for meaning. However, this direction was crucially supported by adults who know them well and can help them make the connections they need to develop their understandings. At the same time these adults offered the children experiences that extended the themes with which they were engaged. As with the 'why' questions, this was found to be more likely to be happening at home.

An interesting feature of the music making was the dialogic nature of contexts in which it was taking place, usually between mother and child, and the importance of these musical dialogues for the development of pre-language communication skills. The research demonstrates the precocity of infants in terms of their musical understanding and the universal engagement of children in these impromptu musical events. This is perhaps surprising given the later tendency to see music as a specialist subject. Whilst the experienced infant teacher intuitively draws upon young children's facility and enjoyment of music making, lack of time often results in children performing the music of others rather than having the opportunity to develop and express their own musical ideas. It seems likely that the lack of rich and systematic musical experiences for all children in the early years means that some children may not be fully developing their musical potential.

Children observed drawing and music making moved in and out of particular sensory modalities as they developed and represented their ideas. Themes were repeated over extended periods of time and were developed in a variety of forms and a variety of contexts. Children worked individually on some stages of their work but often discussed what they were doing and asked for the help of others as the work proceeded. Many of the final products could only be understood in terms of the dialogues or monologues that accompanied them and the children themselves often seemed less interested in the final products than the adults.

Feedback and building confidence in learning

Research looking in detail at young children's problem solving over time demonstrated that giving children the opportunity to explain how they had solved the problem was more likely to lead to improved performance than giving them feedback about their performance. Indeed explaining why something was not correct was even more powerful than explaining why it was correct. Taken together with the findings that children were more interested in process than product in research on drawing and music making, it seems that responding to children's work effectively may be more about understanding the processes they have been through to achieve the work than about endorsing the final product.

Ages and stages

Although average ages have been used throughout this report to indicate some kind of time line for the achievement of developmental milestones, there is in reality tremendous variation both in the order and magnitude of young children's development. This variation seems to be a function of a number of factors.

Cultural contexts influence learning trajectories, children's brains are designed to adapt to the contexts in which they find themselves and domains of learning are prioritised accordingly. International comparisons of observations of adults responses to children's developing musicality illustrate such diverging contexts. For example, a child in a Kenyan village bangs on his metal mug and the rest of the family join in to create a musical event, whilst a child behaving similarly in a UK context is rebuked. Children's interests also determine the time and intensity of engagement in particular domains.

Detailed studies of learning processes show that learning occurs in 'overlapping waves' (Siegler 2005) that is not only is there significant differences between children but individual children do not operate a smoothly progressive learning trajectory. Children use less sophisticated learning strategies even after more sophisticated strategies have been understood. This variable performance is dependant on a range of variables, for example task difficulty, task support and levels of confidence on the day. The complexity of learning processes is being further illuminated by studies of the brain where it is increasingly clear that brain development is a function of a complex and interdependent system of relationships.

2.5 Creative Development

Children's creativity must be extended by the provision of support for their curiosity, exploration and play. They must be provided with opportunities to explore and share their thoughts, ideas and feelings, for example, through a variety of art, music, movement, dance, imaginative and role play activities, mathematics and design and technology. EYFS, p.104
http://www.standards.dfes.gov.uk/eyfs/resources/downloads/card4_10.pdf

The imagination and learning

Vygotsky has argued that play, and in particular 'pretend play' is a leading factor in development. His interest in the functions of play comes from his observations of the intensity of concentration young children display when involved in pretend play activities. He uses the example of play with a hobby horse to elaborate a model of the necessary mental activity involved. In the process of such play the child has to create an imaginary situation or context and whilst acting in this context, the context is elaborated and rules are defined. For example in the case of the hobby horse, the stick first suggests, and then becomes, a horse. The stick is not an abstract symbol, it shares features with a horse, for example, it can be ridden. Rather, it acts as a pivot for separating the thought 'horse' from the object. In playing with the stick 'as horse' the child abstracts horse like qualities and at the same time is constrained by the rules of horse like behaviour, the child's movements are those of a horse, the child feeds the horse a carrot on the flat of her hand. Vygotsky argued that in so doing the child is not acting out understandings they already have, but through the play, knowledge is being discovered, elaborated, and made known. In the terminology used by Mandler (Section 2.4) understandings are being transformed from implicit understandings, procedural knowledge, to declarative knowledge. The child is playing with, and elaborating, her concepts about the world. In separating the thought from the object the child is also experimenting with the early stages of symbolic representation.

Harris (2000) has taken on Vygotsky's thinking on the centrality of role play and linked it to later work on children's theories of mind. The work of Connolly and Doyle (1984) for example found that children who engaged in more role play were better able to view a situation from another person's point of view and the work of Youngblade and Dunn (1995) who found the level of pretence at 33 months was related to mental state understanding seven months later. For Harris, the power of pretend play is not just in the rich opportunities it provides for children to play with and develop concepts but also the possibilities it offers for understanding the perspectives of others.

> *Role play depends on an active process of simulation in which the role player projects him or herself into the make believe situation faced by a given protagonist. Having fed that make believe situation into their own knowledge base, the role player can arrive at judgements, plans and utterances that are appropriate for the adopted role*
> (Harris, 2000, p.36).

He proposes that *pretence* is a particular 'frame' or 'mode' for understanding within which rules apply that can be shared by all participants. Following the analysis of a number of experimental studies by himself and others, Harris argues that the features of pretence are understood by two year olds. These are:

- pretend stipulations (e.g. for the duration of this play episode, pretend that..)
- causal powers
- the suspension of objective truth
- an unfolding, causal, chain of events

This means that from the age of two young children begin to recognize the existence of episodes that are not to be constructed as events in the real world but as events occurring within a make believe framework, and in so doing, they understand some of the essential ingredients of drama and fiction. Further they seem able to do this with great accuracy and subtlety, they adopt the mood or tone of voice that is appropriate to the part and give expression to the emotions and needs that are appropriate to the role they are playing. Harris (2000) has also collected evidence that children who engage in a high proportion of this type of activity are perceived as more likable by their peers and as more sociable by their teachers.

For Harris, this facility does not only allow children to adopt another person's perspective and to anticipate their future course of action, but it also allows them to identify with reported events of others and therefore learn from their experiences - they tell us a story and we feel their fear, excitement etc. He concludes that in evolutionary terms, the human capacity to use language combined with the ability to conjure up situations in the imagination

> *…. enabled us to pursue a new type of dialogue - to exchange and accumulate thoughts about a host of situations, none actually witnessed but all imaginable: the distant past and future, as well as the magical and the impossible (p.195).*

The imagination so constructed is not just a vehicle for the fanciful but a central medium for the transmission of human understanding for the sharing of hopes, fears and possibilities, or in the terms of this review, for coming to understand the experience of people in other times and other countries and cultures. Indeed, practitioners (for example Heathcote, 1984, Chappell et. al 2008) have made explicit use of certain types of dialogue with children when engaged in creative tasks and activities. Through the posing of certain types of questions they encourage the shift in children's thinking from 'what is', to what 'might be', what Chappell et al. have called 'possibility thinking'.

Children's Drawings

Anning and Ring (2004) in a study of 7 children reviewed annually over a three year period, demonstrated how the preoccupations of young children's lives are expressed in a range of different ways. Their study, focussing on a comparison of children's drawings made at home and in institutional settings, showed how the home was much more likely to provide opportunities for sustained and meaningful work. This was a function of a number of factors. Firstly, that in viewing children's art work over time, researchers were able to see that drawings were not bounded events but were an element in a continuous thread of meaning making. One three year old child's drawing of a huge strawberry devouring a small boy, taken from a TV pastille advert, led to a range of explorations of scary scenarios including mum singing the song 'never smile at a crocodile' that then led to him drawing a crocodile with very sharp teeth and later a play episode where he was sitting in the baby bath rowing with two coat hangers across the living room floor, trying to avoid a pursuing crocodile.

Secondly, the parents observed seemed more tuned into their child's needs than the setting practitioners. Parents often drew alongside their children and at other times provided a ready audience for the explanatory and elaborative monologues that accompanied the drawing. The same child who was exuberant in his drawings of action events and crocodiles at home meekly endured being shown how to draw 'mummy' at the family centre. Perhaps as a result the researchers observed that the child rarely chose to draw at the centre. However, with the right environment, other researchers have shown the same kind of free flowing activity Anning and Ring observe in the home, occurring in the care setting. Coates and Coates (2006) collected many examples of four year olds working in a range of modes on the same theme in a nursery class: games of pirates in the sand tray, leading to drawings of Captain Hook and his crew having a fight, accompanied by detailed verbal narratives and songs.

Anning and Ring conclude that drawing is part of a complex system of representation and expression that can not easily be separated from the multi-modal meaning making in which it is embedded. They also note that the way in which the child constructs themselves in the act of drawing is crucial. Where the context gave children a sense of mastery of their medium they were enthusiastic and energetic artists, where they were trying to aspire to others expectations they were nervous and tentative. This raises questions for the teaching and learning relationship and infers the kind of notion of the teacher that Malaguzzi aimed for in Reggio Emilia, *The aim of teaching is not to produce learning but to produce the conditions for learning, this is the focal point, the quality of learning',* (cited in Rinaldi, 2006, p.175).

So what are the conditions for learning? Anning and Ring noted the problems that came from practitioners' ambivalence about 'interfering' with children's drawings or alternatively seeing mark making as a stepping stone to the real business of writing. Cadwell (2003) and others have noted that children in the Reggio Emilia care settings seem to create representations with visual realism much earlier than their American counterparts. It is argued these advanced representational abilities are a function of the Reggio Emilia approach in which children's active constructive learning processes are facilitated through experience. Vlach and Carver (2006) endeavoured to illuminate the mechanism for their success. Adopting a small random control trial (11 children in each condition) they demonstrated that experience observing and interacting with objects are key factors in the development of representational ability. They tested the effects of brief but explicit observation coaching on five year old children's resulting graphic representations. They found that following the coaching, all the children in the experimental group, looked at objects more frequently during the drawing process and increased the detail and accuracy in their drawings than the children in the control group.

Hopperstad (2008) elaborating the work of Kress (1997) notes the amount of peer talk when a group of five and six year old children are drawing. Their talk focuses on the drawings, informing each other about their drawings, sharing and exploring technical issues and evaluating each others drawings. The children observed used drawings as props to develop stories relying on accompanying talk to present the narrative meaning. In other interactions the children solved difficulties of representation, sharing ideas and sometimes borrowing each others skills to fulfil the image they have in mind and exploring the way things might be represented. For example in drawing a sword, one boy asks his friends, 'does it get red when it is used to cut off heads? That's what I am wondering about.' This produced an extended discussion before a consensus was constructed as to how the sword might be represented. This echoed the findings of Anning and Ring (2004) as to the value of drawing together and sharing thoughts as equal partners in the drawing process.

Cox's (2005) observations make further reference to the importance of sharing contexts in order to understand children's drawings. She notes in particular how often children play with the drawing process, transforming drawings as new themes suggest themselves. Listening to children it becomes clear that what appears to be inaccuracies in the final product are a

function of this ongoing meaning making. Listening to children as they construct their drawings it becomes clear that what seem to be mistakes in the final output, are actually thoughtful resolutions of representational dilemmas: the one legged person is hopping and the pig with five legs is a joke. Similarly Rinaldi (2006) observes the drawing of a horse with two legs because the other two legs have been put on the other side of the paper as a solution to the child's wrestling with the representation of three dimensions in two dimensions. Cox argues that drawing thus becomes '*a constructive process of thinking in action, rather than a developing ability to make visual reference to objects in the world*' (p.123).

That children can be sophisticated readers of other children's drawings is shown in Misailidi and Bonoti's (2008) study of 80 children ranging from 3-6 years old. The study examined developmental changes in children's abilities to understand the emotions expressed in other children's drawings. Results showed that during the pre-school years children become increasingly able to recognize and differentiate emotions expressed in drawings and these understandings were emerging at age three. The children were most able to read the emotions of happiness, sadness and fear.

Musical Development

Reviewing research on the auditory competence of newborns, Papousek (1996) reports that two-day-old infants show a preference for their native language, probably due to auditory experiences prior to birth. Whilst newborn infants are more sensitive to high frequencies than low frequencies as compared to adults, their sensitivity to volume, pitch and timbre are similar to adults. Fassbender (1996) reports on evidence that infants are able to parse ongoing acoustical stimuli on the basis of information that marks syntactical units. This ability to segment the structure of speech and music is probably facilitated by the infants experience of motherese but is achieved so early and so easily that it seems likely to be innate. Reviewing research on infants musical competencies, Trehub (2003) concludes *babies are 'wired' for music from birth* (p.3).

Papousek (1996) also notes the early propensity for infants to play with sound and argues that this may be significant both in the integration of new information about sounds but also in the creative transformations necessary for musicality to develop. Vocal play characterises early interactions with care givers and becomes more complex at six months developing into nursery rhymes and songs. Trehub's (2003) findings lead her to argue that the infant's interest in the human voice makes it the most suitable instrument to develop infants' musicality. Papousek notes that the musical stimulation provided by care givers is also well suited to the infant's needs because it can be so easily modified to respond to the infant's signs of interest, levels of attention and emotional state. The use of the voice also makes it easy for the caregiver to respond to the child and engage in the playfulness already identified as critical to the development of musicality. Caregivers' sensitivity to infants' responses allows them to modify singing or musical elements in their speech on a moment-by-moment basis, for example to maintain alertness or support transitions into sleep.

Trehub and co-workers (2003) have demonstrated that adult listeners can identify the distinctive style of infant directed singing across cultures and are able to identify 'typical' lullabies from other songs when tested on four foreign cultures even with the lyrics and voice quality electronically removed from the songs. Trehub has also found that there is a normal distribution of musical abilities which counters a tendency to see music as a gift for the few, resulting in music being often treated as peripheral to the main stream curriculum.

Thus, musicality seems to develop early, be intuitively supported by caregivers from birth, in similar ways across cultures. Young (2005) argues that this means that musical ability is primarily dependent on environmental experience, which can be open to everybody, through the opportunity for structured, regular, quality input. Reporting on a project working with artists from a range of disciplines, Young found that the successful practice built on the informal playful interactions that care givers commonly adopt with children. She concludes *music for under three year olds … should move towards versions which allow them to engage creatively with generic time based, multi-modal improvisations that expand into game like or narrative-like forms* (2005, p.300). The value of such open ended use of music as a medium of interaction was also noted by Evangelou and Sylva (2003) in their evaluation of an early education intervention working with parents and their babies.

As their physical co-ordination develops, children of two and three can explore the sound potential of found objects in a more sustained way and enjoy clapping to music and joining in with action rhymes and are able to respond to different tempos of music (Duffy, 1998). At this age their interest in playing with known songs continues although Sundin (1997) notes that they tend to adopt the beginnings and ends of songs but not the middle. At the same time invented songs emerge, sometimes as a variation of adult songs and often compressed and developed into a chant form with other children, as a part of or accompanying other activities (Sundin, 1997).

Barrett (2006) exploring musical creativity in children aged 4-6, observes how the early musico-communicative interaction with others described by Young, evolves into independent invented song making. Barrett describes a case study analysis of the way four year olds spontaneously invent songs, showing how the songs become expressions of ideas developed in other modalities and are successive elaborations on a theme. Like Young, Barrett is concerned that a tightly framed musical curriculum, for example with an exclusive focus on group music making and performance, can give little opportunity for music generation and for viewing music as a creative rather than a re-creative practice.

Young (2005) also cautions against the over application of the argument that music brings general cognitive benefits and wishes instead, that more emphasis was put on children's musicality, the nurturing of which should be at the core of the limited time available for the music curriculum. She concludes that early childhood practitioners and parents *need assistance in constructing a rationale to recognize the value of improvised temporal arts activity and in constructing descriptions and language to share and develop such versions of practice* (p.301).

2.6 Physical Development

The physical development of babies and young children must be encouraged through the provision of opportunities for them to be active and interactive and to improve their skills of coordination, control, manipulation and movement. They must be supported using all of their senses to learn about the world around them and to make connections between new information and what they already know. They must be supported in developing an understanding of the importance of physical activity and making healthy choices in relation to food. EYFS, p.90
http://www.standards.dfes.gov.uk/eyfs/resources/downloads/card4_9.pdf

'Movement epitomizes childhood. From the first flutterings in the womb to the preschooler on the move, or the playful child and the adolescent who sleeps until noon, parents, grandparents, and teachers are variously charmed, amazed, and frustrated at the level of movement displayed by their children'.

(Eaton, McKeen & Campbell, 2001, p.205).

While the EYFS presents physical development in three distinct sections: *Movement and Space*; *Health and Bodily Awareness* and *Using Equipment and Materials*, this review is taking another approach. It begins with some processes of physical development, followed by a summative description of children's physical development between the ages of birth and five. Recognising that the current EYFS has already an excellent provision of physical development it ends by focusing on outdoor environments and the overall enabling environments of such development. Some studies carried out in early years are also outlined.

This section draws on the work of Maude (2006) as it links the children's physical development to the daily practice in early years settings. It also draws heavily on the work of Chambers and Sugden (2006) as it is a comprehensive review of the early years movement skills with reference to normal developmental trajectories as well as interventions that could enhance delayed development**.** Figure 2.3 clearly defines the interaction of the child (the mover), the environmental context and a movement task, as this is very much in line with the view that this review takes on child development: a complex system of interactions between the child, the surrounding environments, the available resources and the cultural context. Such a model allows for changes to occur in any part of the interaction which subsequently triggers modification; for example by placing higher or lower a rope (material) one can affect the required movement and skills the child needs to exhibit (mover) in order to achieve the target goal (i.e. to jump over the rope).

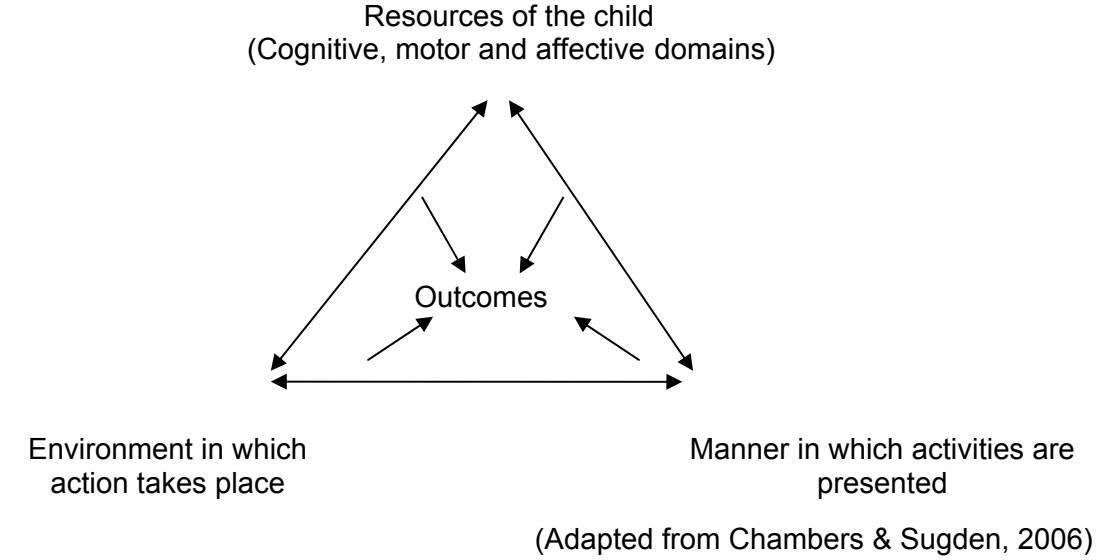


Figure 2.3 - Interaction of the child, the environment and activities

Some processes on physical development

Cephalo-caudal development

Maude (2006) discusses certain processes that are involved in physical development, beginning with 'cephalo-caudal development'. This type of development is used to describe the idea that development transpires from the head down to the feet. At birth, the head is much more developed than the limbs and the upper body more developed than the lower

and it therefore follows that development should occur from top to bottom. When related to 'cephalo-caudal' development, motor development is described as the child achieving motor capabilities in the upper part of the body before the lower part of the body. Head control is the first stage of motor development, which is followed by control of the shoulders (allowing the infant to raise his/ her head), then control of the trunk (allowing the infant to sit) and finally control of the hips, knees ankles and feet (allowing the infant to stand and then take his/ her first steps). Maude (2006) describes 'cephalo-caudal' development as being a significant contributor to the process of learning to walk.

Proximo-distal development

'Proximo-distal development', covers the idea that development occurs from the centre of the body, outwards (Maude, 2006). This principle follows the idea of the importance of the central nervous system and the relative insignificance of the limbs, and also the fact that the key bodily organs are found in the centre of the body. Maude (2006) describes this principle as being clear in infants' exploration of the immediate environment, whereby they gain control over the arms, beginning with the shoulders and moving outwards until finally gaining control of the hands. Movement proves a central element to the early exploration of environment. 'Proximo-distal' movement development can be applied to educators in terms of knowing when a child is physically ready to carry out certain actions, such as holding a pen between the thumb and the finger instead of by the palm (Maude, 2006).

Differentiation

This process covers the idea that, as a child gets older, their responses become more discriminatory. Here, this is attributed to the effects of neurological development. Differentiation is explained through arm movements, and the importance of the child being able to differentiate between object distances in order to fully develop the movement of picking an object up. Maude (2006) describes how infants initially use the whole arm to pick up objects, without differentiation between individual joint, but, after further development has occurred, the child begins to recognise the importance of distances and will use individual joints to alter the positioning of the arm in order to reach objects at different distances.

Motor development

Rafthus (1988) describes the typical sequence of motor development in young infants. Between birth and five months of age, young infants move from the foetal position to being able to sit on an adults lap. This sequence begins with infants being able to lift the chin at one month, followed by lifting the chest at two months. The next typical stage is for the infant to be able to reach for an object (but miss it) at three months, followed by being able to sit with support at four months and finally sitting on an adults lap at five months. At five months, the infant should typically be able to grasp objects also. From 6 to 10 months, the infant moves from being able to sit on a high chair whilst grasping a dangling object, to crawling. Between these stages the infant should typically be able to sit alone at 7 months, stand with help at 8 months and stand holding furniture at 9 months. At 11 months, the child should typically be able to walk when led; at 12 months be able to pull oneself up to stand by furniture; at 13 months, be able to climb steps; at 14 months be able to stand alone, and at 15 months be able to walk alone. Maude (2006) states that although all children follow the same sequence of movement development, this sequence occurs at different rates for different individuals.

Gallahue and Ozman (1995) have plotted three stages involved in the learning of skills. The first stage is labelled 'the initial or rudimentary stage', which is described as 'the emergent movement pattern, or early experimentation stage'. the second stage is named 'the elementary stage' and covers the improvement of co-ordination. In this stage movements are

still not performed entirely correctly and can be lacking in areas such as ‘strength, mobility, balance or speed’. The final stage is ‘the mature stage’, whereby all the actions involved in a pattern of movement are integrated. When infants reach this stage, movements will be prepared for appropriately, carried out accurately and recovered from effectively.

Physical development from birth to five

Gross motor skills

Chambers and Sugden (2009) describe the development of body control in terms of progression in the areas of walking, running, jumping, throwing, hopping and balancing, and again attribute the stages involved in each of these to the work of Keogh and Sugden (1985).

Reflexive movements

Movement of newborn babies is characterised by reflexive and random movements (Chambers & Sugden, 2009). These random movements are labelled as ‘spontaneous movements’, as they appear to occur without being prompted. Examples of such spontaneous movements include squirming, flailing limbs and stretching. Chambers and Sugden (2009) describe reflexes as being movements, involuntary by nature, which are elicited as a response to a given stimulus. Some of these reflexive movements are explained to be present from birth, such as the action of sucking. Some reflexes are explained to alter from being involuntary to voluntary as the child grows (using the example of the sucking motion, it becomes a voluntary response to the presentation of a bottle or a nipple). Other reflexes are explained to exist only whilst their purpose is being served, later to be replaced by others, when a larger and more useful array of movements is developed to achieve the same purpose. The authors discuss the debate about disappearing reflexes, and whether there is a relationship between a certain reflex that a child has at birth and a similar voluntary movement that appears later, after the disappearance of the reflex. The maturationist view is put forward, which states that the reflexive and the voluntary movements are not related and that the reflexive movement is inhibited, as it would, in fact impede the voluntary movement. Conversely, in the dynamical systems analysis view it is stated that reflexes may be lost due to the infant not using the reflex sufficiently.

Spontaneous movements

When looking into spontaneous movements, Chambers and Sugden (2009) describe how the common belief on such movements had been that they served no specific purpose and were not organised, serving no function in the development of future movements. The work of Thelen (1985; 1995) is cited to describe how these ideas are beginning to be dispelled and how there may be more intention behind such movements than was previously considered. One example provided of a seemingly spontaneous movement with definite intention behind it is that of kicking. It is described that the hip, knee and ankle work together succinctly in order to perform the movement and that therefore one could describe such a movement as coordinated. Such movements can be described as forerunners for movements conducted by children in later infancy.

Postural development

Keogh and Sugden (1985) describe the stages of movement that infants go to in order to achieve such control. The first stage is described as head control, and this is developed from birth throughout the first five months of infancy. The initial stage in this development is holding the head erect for fifteen seconds, followed by holding the head steady whilst moving (for example whilst being carried by a carer). Once the child is able to hold its head steady, the next stage is to be able to hold the head at a ninety degree angle, and then to be able to

hold the chest up, using the arms as support. Following head control, the infant develops the ability to sit. Initially, the infant will be able to sit with slight support and this develops to the infant being able to sit without the head lagging until being able to sit without support. Following this, the infant will be able to sit alone for thirty seconds, until finally being able to sit alone with good coordination. The final stage in the development of postural control involves gaining the ability to stand. Initially, the infant can stand whilst holding on to an object and following this, will be able to pull his / herself up to the standing position, until becoming competent enough to stand by furniture. The final stage in this initial standing process is for the infant to stand alone. Following the ability of the child to stand alone, the child will next be able to recover from stooping. The next stage would be for the infant to be able to stand alone for thirty seconds, before being able to stand on one foot with help and finally being able to stand on one foot alone. According to these guidelines, the infant should reach the final stage at around nine months of age.

Locomotion

Keogh and Sugden (1985) have also put into place guidelines for the development of locomotion, which can be developed once infants have control over their posture: a lot of locomotive actions can only be achieved with the precursor of a specific postural ability. Infants go through the prewalking stage between birth and eleven months: between birth and five months, the infant is learning to turn from their side to their back and from their back to their side. Between four and ten months, the infant is developing the ability to roll from their back to their stomach, and, at around eleven months, the infant should reach the prewalking progression of being on his/ her hand and knees. The next stage, which occurs between the ages of five and twelve months, is the walking stage. This stage begins with stepping movements, followed by the ability to walk whilst holding onto furniture, followed by walking with help until he / she can walk alone. This ability should be gained by around seventeen months of age, and coincides with the development of the ability to walk well. The final stages that the infant should go through in order to achieve locomotive abilities are developing the ability to walk sideways and backwards, which should occur up to the age of twenty months, walking up and down stairs with some help, which should develop until around twenty three months of age, and finally the ability to walk with one foot on a walking board, which occurs up to around twenty four months of age.

Walking

In terms of walking, Chambers and Sugden (2009) point out that this action becomes more efficient in two ways after age two; firstly by the infant being able to vary their walking by including the tiptoe action and the walking backwards action and being able to walk in different situations (i.e. uphill or downhill or on uneven surfaces) and at different paces. Secondly, as walking becomes an increasing automatic function, infants learn to multitask and can carry out other actions whilst walking.

Running

Another key development that occurs in the preschool years is that of the ability to run. Chambers and Sugden (2009) state that children begin to run at around 18 months and that by 24 months most infants can run. Between the ages of four and six years, children begin to be able to run with ease and commence running games. The authors describe ‘limiters’ to the development of early running as being strength (as running requires both legs to be off the ground simultaneously, and this in turn requires strength) and balance (as the child must be able to regain control of their body after landing).

Jumping

It is described that, in the development of jumping, the age of achievement varies, but all infants follow the same stages; at 18 months, the ability to step down occurs, which is then followed by the ability for two foot take off. A key milestone for young infants is the two foot jump from the ground, which develops from around two years of age. Chambers and Sugden (2009) describe how one can measure jumping progression through looking at distances of jumps. They cite the average expectancies for jumping distances, which are as follows: 20 inches at age three; 27 inches at age four; and 38 inches at age five.

Hopping

In terms of the development of hopping, Chambers and Sugden (2009) describe the average expectancies. They describe how, by around 40 months children can hop once, and by around 60 months, can hop around ten times. They cite Keogh (1968) to explain gender differences in the attainment of these abilities: at 66 months, hopping five times on one foot is achieved by 90 percent of girls and only 67 percent of boys. It is described that hopping can lead to the development of other locomotor activities such as skipping and galloping. Skipping begins to develop at around 43 months (ability to skip on one foot) to 60 months (ability to skip on alternating feet). The authors again cite gender differences in this attainment: 55 percent of boys are able to enact five continuous skips at 66 months, compared to 91 percent of girls.

Throwing ability

Chambers and Sugden (2009) focus on the overhand throw. Babies begin to enact this action by around their second birthday and that at this age, throwing in characterised by a crude movement involving little control or sense of direction. The first stages of throwing after this involve use of only the arm, without movement of the feet or rotation of the trunk. The next stage involves movement of the trunk and putting the arm behind the head to enact the throw. The feet are still stationary at this stage. The final stage of the development of throwing involves much fuller rotation of the trunk and the child placing a leg forward in order to gain power and stability to the throw. Chambers and Sugden (2009) describe that this process is not fully complete until the child reaches eleven or twelve years of age. Gender differences are again highlighted, with the authors stating that more boys than girls reach the final stage.

Balancing

The last body control skill discussed is that of balancing. Balancing is not always seen as a development in its own right, but more as a means of attaining abilities such as running, hoping, skipping and climbing (Chambers and Sugden, 2009). However, after around 30 months of age it is beginning to be seen as a developmental ability in its own right. At around two years of age, a child can fleetingly stand on one foot and can walk along a line on the ground. By three years of age, children can generally stand on one foot for around five seconds and can walk around a circular line on the ground. Finally, by age five, most children can stand alone on one foot for around ten seconds.

Fine motor skills

Manual control

Another development, which occurs between birth and two years of age is that of manual control, which is described as the ability to use the hand and the arm to control objects. The first part of manual skills that young infants develop is hand control and the ability to grasp an object, hold it, and release it. Changes also occur in the arm linkage system, which allow

infants to reach higher levels of accuracy spatially. The final aspect of manual control, which is developed between birth and age two is the achievement of self help skills, for example the ability to dress oneself or help out with simple tasks in the house. The authors describe several landmark achievements that occur in an infant's manual control development, using the example of learning to pick up a cup. They also describe how this motion begins with the primitive action of using the palm to lift the cup and the fingers to hold it, progressing to using the thumb and finger conjunctively until learning to create a pincer grip between the finger and thumb at nine to ten months of age.

Manual skills

Chambers and Sugden (2009) describe how between the ages of two and five, children become able to use manual skills to dress themselves, writing, drawing, eating and a multitude of other skills. Between these years, motor skills are also subject to social constraints (the authors use the example of it becoming more important *how* children use cutlery, not just that they have the ability to do so). Dressing is a key manual skill described here, with the authors stating that, at around 32 months children can dress with adult help and without such help by 42 months. Linked to dressing is the ability to put shoes on at 36 months and to tie laces at 48 months. Feeding is another manual skill: children have some control of objects such as spoons and cups by 24 months; by 36 months, can utilise a variety of utensils and can pour into a cup; when the child gets a little older they develop the ability to minimise unnecessary movements whilst feeding. Construction skills form another aspect of the development of manual skills. In addition, children can draw circular, vertical and horizontal lines with varying quality by the age of 24 months; children can draw a circle by 36 months; children can draw a cross by 48 months; a square can be drawn at 54 months and a triangle at 60 months. Chambers and Sugden (2009) raise an important point about children's varying abilities. They describe how, even though not all children will be ready to write by school age, it can be damaging to wait for too long to teach them and let them experiment with this skill themselves. They state that it is vital to give children constant and accurate instruction in this field.

With regards to spatial and temporal accuracy, Chambers and Sugden (2009) describe how much spatial and temporal development occurs in later childhood (for example, the ability to predict spatially a moving object occurs between the ages of eight and twelve) but state that, although these age groups do not overlap with the early years, educators and carers should still be preparing young infants for this type of activity.

Some studies on physical development

A study by Sigmund, Sigmundova and Ansari (2008) aimed at identifying the changes that occur in children's physical activity at reaching the first year of school and to reveal the days of the school week in which infants display low levels of physical activity. The authors investigated 176 children and the physical activity levels of these participants were examined at two time points: once in the nursery school and once during class in the first year of school. The methods used for identifying physical activity levels involved calculating the daily number of steps taken using a pedometer and calculating energy expenditure from the Caltrac accelerometer. The findings indicated that children in the first grade had significantly lower physical activity levels than children in the nursery school, on both week days and weekends. The reduction of physical activity is shown during school hours, not during after school leisure time. From these results, Sigmund et al. (2008) have concluded that interventions need to be implemented to promote physical activity and that these interventions should take place during after school nursery programmes and at the weekends.

In a study investigating the social and environmental events that surround preschoolers' physical activity as well as the conditions that can predict moderate to vigorous physical activity in the outdoor environment, Brown et al. (2009) found that the majority of preschoolers' activity is sedentary throughout the preschool day.

The authors' findings showed that 89% of activity was sedentary, 8% was light and 3% moderate to vigorous. In terms of preschool social contexts, activities were vastly adult-initiated (81%). Teachers were rarely observed to prompt children to increase or decrease their physical activity. A further observation was that the social circumstances were typically group ones (85%) and that these groupings were either with or without adults. Brown et al. (2009) suggest that, in order to promote healthy activity in schools, analyses should be carried out of the contextual and behavioural factors that influence activity. They also suggest that more research needs to be conducted into day to day preschool policies to see which settings incorporate physical activity into these policies.

Heinonen et al. (2008) looked into whether weight, length, BMI, head circumference at birth and postnatal growth are related to cognitive abilities at 56 months of age. The sample comprised 1056 Finnish infants who were born at term, without any definable impairments. Measurements of weight, length and head circumference were collected at birth and 5, 20 and 56 months old and BMI was calculated at these time points. The researchers tested cognitive abilities using measures of general reasoning, visual / motor integration, verbal competence and language comprehension at 56 months of age. The study revealed that sometimes, large body size and faster growth were also associated with poorer scores on cognitive tests. The authors concluded that prenatal and postnatal growth in body size is associated with individual differences in cognitive abilities.

Adding to these results, Cheong et al. (2008) investigated the relationship between head circumference and brain MRI at term-equivalent age as well as the relationship between head circumference and neurodevelopmental outcomes at two years. The study involved 227 preterm infants whose head circumferences were measured at birth, term and age two. MRI scans at term were graded for white and grey matter abnormalities and segmented volumes were calculated for different tissue types. Outcomes at two years were measured using Bayley Scales of Infant Development II. Results showed that there was no significant relationship between head circumference and white or grey matter abnormalities on MRI. There was, however, a strong relationship between head circumference and brain volume at term. Microcephalic infants had strongly decreased volumes for total brain tissue at term, and also the most segmented volumes compared with infants with normal head circumference. At two years of age, microcephaly was linked to worse cognitive and motor development and an increased occurrence of cerebral palsy. The authors therefore concluded that brain volume plays a role in determining head size at term. The findings also suggest that microcephaly is linked to a reduction of brain tissue volumes, notably deep nuclear grey matter (which suggests selective vulnerability) and that unsubstantial head growth in preterm infants becomes more apparent by age two and is linked to poor neurodevelopmental outcomes and cerebral palsy.

Outdoor play

The importance of outdoor play

There has been considerable research documenting the vital role of play in fostering optimal growth, learning and development across all domains - physical, cognitive, social, emotional - throughout childhood (Isenberg & Quisenberry, 2002). Play provides a vehicle for children to both develop and demonstrate knowledge, skills, concepts and dispositions (Isenberg & Quisenberry, 2002). It provides a non-threatening context for children to learn about their world and develop the skills necessary for adult life. (Bruner, 1972). Through their

interactions with the environment during play, children develop and refine a range of locomotor skills (such as throwing, climbing, kicking, striking, sliding), manipulative skills (such as throwing, catching, kicking, bouncing), and stability skills (such as banding, stretching, swinging) thereby gaining control and mastery over their bodies. Play also facilitates language development, creative thinking and problem-solving and helps children to manage complex emotions (Wyver & Spence, 1999).

Furthermore, children are growing up in an era of increasing emphasis on academic achievement and the significance of the early years for learning. Recent contributions from brain research have provided much support for the early years as a period for optimising learning across all areas. Children's early experiences and interactions, including those during play, affect the way the brain develops and helps shape its structures (Bee & Boyd, 2007). Within this research there is an acknowledgement of the importance of play as a *'scaffold for development, a vehicle for increasing neural structures, and a means by which all children practice skills they will need in later life'* (Isenberg & Quisenberry, 2002, p.33). Play has traditionally been the foundation of good practice in early childhood education. While current practice makes no distinction between play and other experiences that foster children's learning, open-ended child-directed play opportunities in a rich environment are still seen as a very important and integral part of early childhood education practice (Stonehouse, 2001). Pellegrini and Bjorklund (2004) argue that, while the lifestyle of most Western middle-class children offers safety, it also involves large amounts of time in formal schooling, structured play activities and television viewing, all of which lead to changes in the amount and quality of play children engage in. Although Pellegrini and Bjorklund (2004) argue that these changes may have subtle impacts on children's development, it is equally plausible that the changes are profound and negative for some children.

The outdoors (whether it be children's playgrounds or the natural environment) provides the ideal context to encourage children to explore, experiment, move and be active. Research indicates that low skill level and low movement competence are associated with reduced physical activity and represent a major barrier to children's participation in sport (Hands & Martin, 2003). In addition, Bouffard et al. (1996) found that children with low motor competence were active less often, played less on playground equipment and spent less time interacting with their peers. Hence, not only is the acquisition of movement skills essential for children's learning, but lack of confidence and competence in performing these skills can have detrimental effects on children's social and emotional wellbeing. It is evident, therefore, that in the preschool years, children benefit from and indeed seek out opportunities for physical and outdoor play.

In an attempt to raise standards of physical development, forest schools were introduced to Britain in 1995. The forest school initiative was developed in Scandinavia in 1950's and has been rapidly developing in England and Wales over the last 4 years. The idea is to use a woodland setting as an 'outdoor classroom' as a way of helping young people learn about the natural world. A qualified forest school leader devises a programme of learning that is based on the children's interests and which allows them to build on skills from week to week, at their own pace. The programmes are designed to give children a varied experience of the woodland through experimental and hand on tasks and activities. Forest schools provide a safe woodland environment for the children to explore, embedded in routine that is established early within the programme.

What makes forest school unique is its emphasis on learning outside of the traditional classroom and having the freedom to explore the ever changing environment; to take risks and *'assess risk for themselves'* (Lindon 1999:11). Weaver adds that *'The children learn informally about nature through being out in the woods'* (1988:14). Smart (2001) argues that all aspects of the curriculum can be taught outside, stimulating the imagination and bringing subjects to life in a real context; indeed in such a way as to stimulate all their senses and building firm foundations for further learning.

Risk-taking in physical outdoor play

Greenfield (2003) believes that early childhood centres are well-placed to provide children with positive risk-taking opportunities that are not available to them in other contexts. An environment free from hazard is necessary to ensure that children can satisfy their natural curiosity and desire for challenge and take risks without compromising their safety. This does not mean removing all the risks, but rather finding a balance between those that promote learning and those that can be hazardous and can therefore result in serious injury. It also means that it is critical to ensure appropriate supervision as well as monitoring of the impact of the outdoor environment on play. According to Little (2006), current safety requirements operating within the children's services regulations rely on passive strategies aimed at making the environment safer, independent of the behaviour of those using it. The notion of finding the balance is central if children are to have the opportunity to experience some risk in their lives.

Close attention to the quality and quantity of physical play provides a way of determining whether an appropriate balance has been achieved. Such monitoring requires a high level of practitioner skill; the National Quality Improvement and Accreditation System (QIAS) (National Childcare Accreditation Council, 2005) asserts that staff *'should have the skills to assess risk potential, based on their knowledge of each child'* (2005, p.84), allowing them to intervene to prevent harm when necessary while also nurturing *'each child's developing independence and competence by supporting the child in some activities that the child perceives as risk taking'* (2005, p.84).

This balance can be achieved when adults respond sensitively to individual patterns of behaviour that involve accepting and fostering children's ability to appraise and manage risks, as well as their desire for challenge and excitement in their play (DCMS, 2004; NCAC, 2005).

Nutrition and Obesity

According to Bee and Boyd (2007), due to the fact that children grow more slowly during the early childhood years than in infancy, they may seem to eat less than when they were babies. In addition, food aversions often develop during the preschool years. Consequently, conflicts between parents and young children often focus on the child’s eating behaviour (Overby, 2002).

Despite the fact that young children are rarely overweight in infancy, they acquire eating habits during these years that lead to later weight problems. Nutritionists recommend keeping a variety of nutritious foods on hand and allowing children’s appetite to guide how much food they should eat (Wong, 1993).

Because children and parents often fail to adhere to dietary interventions and due to the fact that lack of activity is just as important to obesity as over-eating, physicians emphasise the need to include exercise in weight-management programmes for children (Overby, 2002). Researchers have also found that obese children begin an inactive lifestyle as early as age 3 (Reilly, Jackson, Montgomery, Kelly, Slater, Grant & Paton, 2004). The defining characteristic of this lifestyle is preference for sedentary activities such as television-watching over those that require physical activity, such as sports or cycling. Parents’ role in preventing obesity is critical - it is important that they recognise this lifestyle pattern when it appears and regulate their child’s activities by encouraging them to be more physically active.

Enabling environments

Maude (2006) discusses the importance of physical play, describing its importance in promoting discovery of movement abilities; allowing for exploration of the movement environment; offering practice time to enhance fundamental motor skills and strengthen the cardio-vascular system and the muscles. She discusses how play involving gross and fine motor skills is highly important in infants' movement development and states that the planning of physical development and physical education curriculum should be centred round this idea. Infants arrive at school bringing with them both gross and fine motor skills that can aid in learning the ability to act independently in the school environment. Examples of these skills include the ability to feed, toilet, and dress oneself. She explains that children who bring with them a wider array of gross and fine motor skills into the educational environment will be more able to participate in educational activities and hold much advantage over those who are less experienced in these skills.

Maude (2006) describes what the aims of the physical development and education curriculum should be for early years education as follows:

Physical development:

- to stimulate growth
- to enhance physical development
- to provide healthy exercise

Movement development:

- to build on existing movement vocabulary
- to develop coordination and body tension
- to extend movement vocabulary

Movement skill acquisition:

- to develop fundamental motor skills to the mature stage
- to introduce new motor skills
- to increase knowledge of dynamics and movement
- to develop coordination
- to teach accuracy and efficiency in movement

Movement confidence development:

- to teach movement observation skills
- to develop movement experimentation and expression
- to enhance self-expression, self-confidence, self-image and self-esteem

According to Maude, *'In England, the curriculum guidance for the foundation stage provides an excellent section on physical development'* (2006: 222). In addition to children's physical and movement development, it is important that have the knowledge and techniques of the basic skills to be developed in physical education. Children can achieve the mature stage in fundamental movement patterns through broad-based and varied play, dance, games, and gymnastics in addition to the challenge, enjoyment and confidence. According to Maude (2006), activities such as these can also offer children extensive movement vocabularies, opportunities to develop creative and functional movement, and the stimulus for physical development and growth.

Chapter 3 - The enabling contexts of development

The first part of this report explored the 'Developing child' linking recent research findings (principally post 2000) to the six developmental domains of the EYFS. Building on these synopses Chapter 3 describes the supportive processes that shape development within the four contexts: family, setting, neighbourhood and culture.

The literature review is situated within the conceptual framework, which has emerged from the review (Section 1.1): an "interactionist" tradition that conceives of learning as located within nested social contexts (Bronfenbrenner, 1979) and constrained by the developing architecture of the brain. Overlaying the social contexts of child's development, relationships, culture, resources and environment were initially highlighted as important enablers of development. In the light of the evidence emerging from the reviews' developmental domains two further factors have been identified as significant in their own right: pedagogical processes and enhancing partnerships with mothers, fathers and carers. Therefore the renewed conceptual framework is as follows in figure 3.1.

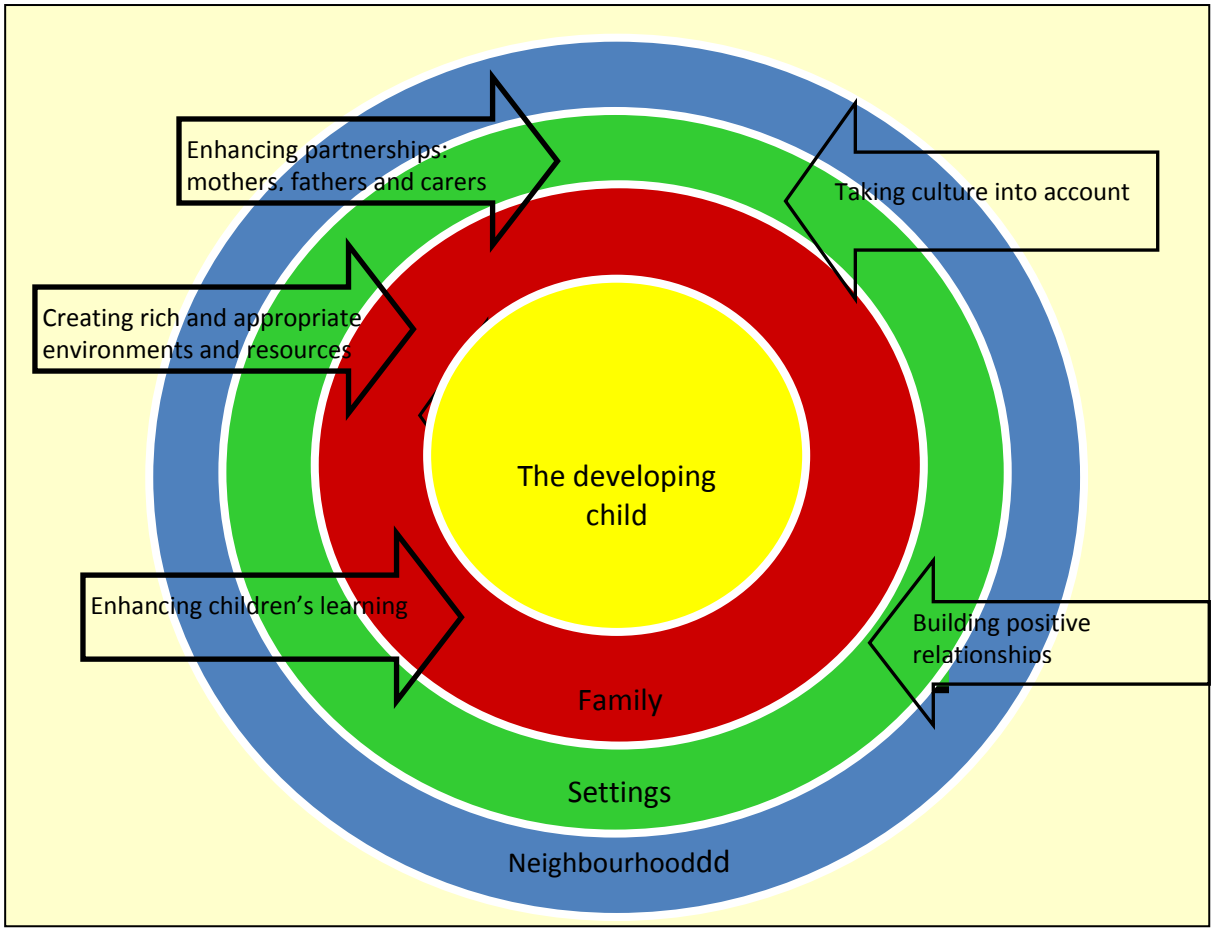


Figure 3.1 - The enabling contexts of development

Each of these enabling processes encompasses a number of key factors that have emerged from the literature review. Many of these factors are well established principles within early years literature and practice, for example the importance of relationships and play. Nonetheless, it is important to draw attention to the most recent understandings of these in order to reinforce prior research evidence and practice. Other trends within the literature for example the distinctive benefits of developing children's thinking skills and understandings through narrative and enquiry have been particularly significant in the literature since 2000 and thus warrant special consideration.

Finally, a specific section on parents is included in this chapter because although the current EYFS document recognises the important role that mothers, fathers and carers play in children's development, it does not elaborate beyond this as a principle. The EYFS states the importance of successful partnership with parents (p.10) but many of the references to partnership are around assessment of children's development and the reporting of progress or statutory responsibility. In light of this, this section examines the role of parents as an enabler of learning in its own right across all six developmental domains. Given that the research related to the developmental domains has already been surveyed in detail in Chapter 2, it is inevitable that a comparatively longer section on the enabling role of parents is required in Chapter 3.

In the following summary sections children's development is seen to be enabled by:

- Building positive relationships
- Enhancing children's learning
- Creating rich and appropriate environments and resources
- Enhancing partnerships: mothers, fathers and carers
- Taking culture into account

3.1 Enabling children's development by building positive relationships

Children's development is influenced by rich relational experiences that take place both at home and at settings with parents and the staff around them. The research evidence in this report identifies six key facets of relationships: the warmth of relationships; the contingency of relationships; the use of talk in building and maintaining such relationships; the recognition of the uniqueness and agency of the child; the importance of mutually responsive relationships in facilitating pro-social thinking and behaviour.

Warm relationships

Children's socio-emotional development is enhanced by secure attachment through development of nurturing relationships with at least one key person who identifies with them strongly. Characteristics of these relationships include the presence of responsive parent-child interactions; supportive caregiver feedback and the establishment of routines. The familiarity with and the presence of a caring adult early in life thus provides children with a safe and secure environment. In the absence of such early "balancing supports" the research suggests it is possible to alleviate the negative effects by providing the supporting environment later on in the child's life. However, although it is possible to redress this later on, it is optimum that every child should experience such 'balancing supports' from the outset. Opportunities for children to affirm their feelings through positive conversations with caring adults are critical in the development of children's self-esteem and of their understanding of societal expectations.

The importance of strong attachment between mother and child is highlighted as affecting not only early conscience development but also emotional understanding, pro-social understandings and self–regulation. Given the important role that attachment plays, the allocation of "key persons" to each child within early years settings has been perceived as crucial. This allows for the building of strong dyadic relationships, which in turn support children's socialisation. It also develops children ability to respond socially and emotionally within the contexts of their cultural environment.

In addition to adult-child relationships it is important to remember the key role of others e.g. siblings and extended family in a child's social world. Similarly children's friendships become increasingly important to children through the early years.

Contingency of relationships

High levels of contingent response by the adults help infants' gain a sense of self during the first year of life. Contingent responses can also reinforce the child's understanding of the social world around them, serving to reinforce social expectations and the socialisation of the child within particular contexts. It is important for the development of a child's understanding of themselves and others that the responses of parents and other adults is underpinned by warmth and positivity but also that responses to the child are contingent to the child's desires and specific behaviours in particular contexts. Some degree of non-compliance may also be important in development, particularly around the second year of life when the children are learning to assert their own autonomy and independence. Adults can assume different roles in different situations, for example, negotiating group conflicts or protecting individual children's needs may require different responses to the child.

Use of talk and narrative in building and maintaining relationships

A further factor that supports children's building of relationships and the development of social understandings is the opportunity for rich communication, both between adults and children as well as between children. Rich conversations about children's feelings with important adults in their lives enhance their self-esteem. Such conversations can stem from stories and fictional scenarios, as well as real-life contexts and can promote trusting relationships that further build children's emotional awareness and self-regulation. These conversations can also transmit culturally appropriate ways of expressing emotional displays and behaviours. The research literature suggests that an "elaborative narrative style" is likely to be most effective. Narrative can be simply descriptive but an elaborative narrative style implies a deeper structuring of events and relational contexts as they are recounted with opportunities for children to reflect on the experiences, both real and fictional, and to hypothesise about alternative outcomes and consequences.

Recognising the uniqueness and agency of the child

The recent literature indicates that children's development is an active rather than a passive process; it is a dynamic process within which the pattern of relationships can vary as the unique characteristics of each child interacts with the unique characteristics of those around them. The child's individual temperament affects their social behaviours and interactions in both their home and the setting. The choice of a key worker within settings thus becomes very important since the personal dynamics of individuals is constantly shaping their interactions.

Facilitating pro-social thinking and behaviour

The role of relationships in children's social and emotional understanding is already known to be important. Research has suggested that children's socialisation is best supported within a 'social relational model'.

Children's pro-social thinking and behaviour is facilitated by internalising rules through mutually responsive relationships between themselves and their mother. This mutual responsiveness combined with explicit focus on behaviours through the kind of narrative described earlier helps to shape the development of conscience. It is important to promote both aspects of compliance with social norms to become 'committed compliance' as opposed to the more superficial 'situational compliance'.

Children's pro-social behaviours are also facilitated by play with their peers in which children are engaged in mutual exchanges and learn how to interact with each other and others.

3.2 Enhancing children's learning

Play

In this review both imaginative or pretend play, and physical and exploratory play have been identified as important for children's development. Vygotsky viewed the former as a leading factor in children's development.

Play contexts are introduced to infants from an early stage that allows dealing with unpredicted outcomes and therefore facilitates learning. In late infancy and as children grow and initiate their own play they acquire invaluable lessons about both their physical and social world. They are doing so by negotiating rules, relationships and roles between them and with key adults. Pretend play can enhance language development as it allows children to interact with adults, siblings and peers. It also creates a bridge to de-contextualised thinking; those thoughts that go beyond the here and now.

In addition, pretend play allows children to develop concepts and to understand the perspectives of others as well their self. Within a make believe framework they come to acquire the subtle differences between real life, drama and fiction. Moreover, by anticipating the future course of action in their make believe, children exchange and develop a wealth of thoughts about different situations, none of which are witnessed but which are imaginable. Play also enhances understanding of social conventions for example when turn taking or sharing of resources. Finally, it enhances moral development as it allows the exploration of social/cultural expectations and norms. Through "shared intentionality" children's understanding of others is enhanced; these can be experienced and fostered in social encounters especially through discussions and play.

Last but not least, the importance of physical play has been identified as very important in young children's development. Movement is natural to children and they all come to early years settings with varied physical abilities and skills. As gross and fine motor skills have a direct effect on their overall development, settings need to attend to this variation and enhance those skills by offering opportunities and a safe environment for children to practice and develop.

Much play is self-initiated, or free. There is an important role, however, for guided play, which begins with peek-a-boo and extends to adults explaining the linguistic rule in the "I spy" game.

Narrative

The role of talk and narrative in building and maintaining relationships has been acknowledged in section 3.1. This section emphasises the role of narrative in language, literacy, cognitive and mathematical development.

Use of narrative in building and maintaining communication language and literacy development

It is well established that language is embedded in the social and emotional interactions of babies' lives and that children require relaxed, playful and loving conversations right from birth. Parents also need to be aware that communicating with their babies is of vital importance in terms of their later language development as through it they will learn the social norms of communication for example taking turns in conversations. Through practice children enhance their speaking and listening skills as well as their later reading and writing skills. In addition to discussion with important adults, children learn through communicating with peers, for example exchanging ideas about their drawings. There is potential to use such discussions as prompts to expand children's oral communication into plays or stories. It is through experiencing linguistic interaction as opposed to mere linguistic exposure that children build language skills.

Use of narrative in building and maintaining cognitive development

Narrative has a prime place in children's cognitive development. Narrative understanding is one way to understand world, according to Bruner, the other being scientific enquiry. Through children's narrative understanding, actions, goals and intentions are maintained and meaning is achieved through navigating the complexity of the world around them with a coherent storyline that makes sense and feels 'authentic'.

Recent research findings suggest that a child's natural openness to communication, both as an initiator and receiver, assists their overall understanding. Through modified gestures maternal communication in young children supports their speech and scaffolds their communication.

Use of narrative in building and maintaining mathematical development

Language also has an important role to play in children's mathematical development. Through play or through story books, children in early years settings use a range of mathematical metalanguage. It is very important that early years practitioners are aware of the opportunities for mathematical development through play so they can support it whenever it happens and expand it further. Again children's understanding of cardinality is emphasised through gestures; even for counting when things are not present.

Feedback and building confidence in learning

When children are asked to explain how they solve a problem they learn more than when they are given only positive feedback. In addition, it is a more powerful learning experience for children to explain why something is not correct than to explain why something is correct. This suggests that understanding the processes of how problems are solved is more important than the final outcome (right answer).

Use of enquiry and experimentation

Play is an important avenue once more for children's development of scientific thinking as it affords the opportunities for children to experiment their first understandings of a topic by starting with their own interests and gradually developing new ways of thinking followed by test of their thinking.

Children usually ask 'why' questions when faced with an unexpected event or object. Indeed, these 'why' questions can be persistent and result in sustained dialogue often with adults whom they trust. This trust in adult testimony is mediated by the context of the

discourse in which the testimony occurs. Children are sensitive to the degree of consensus that occurs between different conversational partners as to the reliability of particular entities or ideas.

Recent research findings support the importance of inquiry based approaches in children's learning and specifically in scientific inquiry. Children generate theory through asking questions, and then problem solving approaches as they test them. Clearly, the more complex the task the more necessary it becomes to use evidence to support their theory. The development of children's scientific thinking is based on a discourse around not only 'how do you know' but also 'what is the support for your statement'. By initially engaging children in such discussions they learn how to question in similar ways in the future. Therefore, asking the appropriate types of questions through an inquiry based approach of teaching is paramount for children's development of scientific thinking. This requires knowledgeable teachers who can explain not only the 'what' or 'how' but also the 'why' something happens.

Adult guided learning

Some learning is guided by adults although children's active participation is always vital. Adults begin by initiating peek-a-boo games and body play. Gradually children become full partners and finally the leaders in these early games. With older children adults lead word number games such as 'lotto' and these too are taken over by children. The most recent literature on adult led phonics firmly supports adults taking the lead in literacy learning. The balance between play and instruction related to phonics is still being debated but there is no doubt that adults should guide play with the sounds in words.

Many literacy activities, such as shared reading, are commonly led by adults who note the participation of every child in order to ensure their interest and understanding. Discussions about health and safety are also led by adults when it is important to convey information and routine.

Introducing children to phonics often begins with the adults pointing out the links between the sounds and the letters of words they know well such as their name. Later on, when children are playing in the 'restaurant' it is the adult who can propose they write menus on cards using invented writing. The supportive adult may praise the younger ones for their scribbled list, or for the older children they may suggest writing prices next to the well-formed letters of each separate food.

3.3 Enabling children's development by creating rich and appropriate environments and resources

Facilities, equipment and materials

Although the availability of facilities, specialist equipment and materials are without a doubt important for children's learning, a distinction needs to be drawn between quantity and quality of use of such materials. Children learn with the same effect by using everyday material (for example the treasure basket for babies). However, it is the guided interaction on the part of the parents and practitioners that enhances this learning. Children's learning benefits more when experiencing environments rich in oral language and high quality books.

Computer use in settings is such an example, where children sometimes need direct active interaction including careful monitoring and scaffolding of their work. Since technological artefacts - real and pretend and encompassing a range of information and communication technologies - are part of the child's everyday experience, children should be offered many opportunities to use them.

Similarly, the home can provide an equally supportive environment for children's learning with a lot of opportunities for sustained and meaningful work. Use of everyday material in children's settings provides a bridge between what is available at home and what is available in settings; children are acquiring emergent literacy and other skills e.g. numeracy by being exposed to the same material both at home and at settings. Recent research suggests specific ways to strengthen links between home and setting, especially through the creation of shared books, DVDs and photo albums.

Outdoor environments

Children come to preschool settings with a broad span of gross and fine motor skills. The settings provide opportunities for physical development, movement development, movement skill acquisition and movement confidence development. Children in the preschool years benefit from opportunities for physical and outdoor play which is highly important in their movement development. The outdoor environment (whether it be children's playgrounds or the natural environment) also provides the ideal context to encourage children to cognitively explore and experiment as well as to move and be active.

The forest school initiative where a woodland setting is used as an 'outdoor classroom' is a way of offering opportunities to young children to learn about the natural world by physically being there. Forest school's emphasis on learning outside of the traditional classroom offers a unique forum for children's learning and development. More importantly, it allows children the freedom to take risks and *'assess risk for themselves'.*

Use of time

Availability of time is crucial to children's development. The research evidence from this review across the different domains makes reference to time implicitly and explicitly. The notion is that children need to take time to engage fully in activities depending on their personal interests rather than on adults' preconceived expectations as to how long children should be engaged in an activity. In reading stories, for example, children need time to appreciate books closely and to respond to them accordingly. Time is also needed to allow children to make the necessary connections between their own world and that of the stories. In children's attempts to read an unknown text, time should also be offered with sensitivity to allow the children to make sense of the unknown word without taking too long and thus losing interest and confidence on the task in hand.

There is, of course, controversy around the use of time children spend using new technologies especially when they are very young. The potential impact on physical development, the social isolation, as well as the fact that young children learn through physical and autonomous exploration of the world, are factors that cannot be ignored. Equally, however, it is vital to accept the advancement of technology and attempt to incorporate it into children's daily lives. Settings can maximise the benefits for children by following the suggestions recommended by the DATEC project, for example, ensuring that developmentally appropriate resources are used and allowing the child to take the lead in ICT activities but to make use of adult support when necessary.

3.4 Enabling children's development by taking culture into account

The cultural context

The importance of the cultural context was well-evidenced in the current review across a number of domains of children's development. The first evidence comes from the children's development of cognition and of their understanding of social realities. Cognition is 'encultured' and babies are learning how to behave by being placed in social settings

surrounded by important adults, siblings and peers. Through these shared interactions children understand their own social realities. One of the most important 'lessons' through these cultural interactions and the use of shared language is the appropriate forms of emotional displays and behaviours. These shared languages are offering enriched discourse and narratives of their social experiences through the individual family's cultural repertoire. It is important for settings to recognise and nurture these different repertoires.

Another source of evidence on the importance of the cultural context comes from the research literature on children's communication, language and literacy development. It is through daily social activities that children predominantly develop their language and literacy skills. While adults support the initial stages of such development, children enhance these skills further by collaborating with peers. It is through play that they explore the use of language and the characteristics of print in the pre-school years. While these take place in settings, they are also nurtured in the cultural environment of each child's home; there parents offer valuable opportunities for linguistic development. Additionally, the cultural environment enables the development of musicality from an early stage and this is happening in slightly different ways across different cultures.

In terms of children's early mathematical development there is a cultural necessity to teach them key principles of counting. This is manifested through the use of problem solving in social contexts rather than more formal mathematical tasks. The social context of mathematical learning is additionally supported by a proposed pedagogy by Gifford, which considers that this learning takes place within a cognitive, physical, and emotional framework. As with literacy and language development, there is an important role for the family in supporting mathematical development through diverse home experiences.

3.5 Enabling children's development by enhancing partnerships: mothers, fathers and carers

The role of parents in their children's development

Desforges with Abouchaar (2003) discuss the notion of '**at home good parenting'** as one where a secure and stable environment, intellectual stimulation, parent-child discussion, and high aspirations are present. Three distinct factors are emphasised: 1) levels of involvement are associated with social class, poverty, health, as well as with parents' perceptions of their role, their levels of confidence in that role and professionals' respect for their role. 2) the parent-child relationship in the parent involvement process is reciprocal - the higher the child's attainment, the more parents get involved. 3) 'at home good parenting' has a more significant positive effect on children's achievement than other factors.

> *Research shows that a form of parental involvement… has a major impact on school outcomes even after all other forces (e.g. the effect of poor attainment or of social class) have been factored out… the effect is shown to be indirect and to operate in the main through the promotion of attitudes, values and aspirations which are pro-learning.* Desforges with Abouchaar (2003, p.10)

These authors further demonstrate strong and positive links between parents' involvement and interest in a child's learning, and children's subsequent adjustment and achievement. Furthermore, Feinstein, (2003, 2004) demonstrated that parental involvement can be particularly significant in breaking the cycle of disadvantage and children's underachievement.

The Early Learning Partnership Programme considers how partnerships between parents and practitioners can enhance children's learning. The study's evaluation report (Evangelou et al, 2008) recognised the following principles as particularly important.

- Strong relationships with parents, family members and other significant adults;
- Parental interest and involvement in education with clear and high expectations;
- Positive role models (both between parents and children and early years professionals and parents);
- Active involvement in family, school and community life;
- Recognition, praise and feeling valued.

Some of the key findings from the ELPP evaluation on parenting were:

- Parents' interviews indicated specific benefits from participating in ELPP included: support through interaction with other parents and members of the ELPP team; social engagement in regaining emotional health; practical help in coping with everyday activities; increased awareness and empathy towards their child; knowledge exchange leading to new skills, techniques and creative ideas.
- ELPP showed that it is possible to reach and engage some vulnerable families in disadvantaged areas in an educationally oriented initiative.
- Statements made by parents when they were first visited indicated that they were largely aware of their role in their children's learning. They recognised the importance of their involvement as well as providing a stimulating environment. Services for parents therefore need to aim at more than 'awareness' to bring about positive change in parenting behaviours.
- Although ELPP was targeting the more excluded families with children at risk of learning delay, observational data showed that most of the ELPP parents had satisfactory or even good parenting skills. Most showed emotional warmth and support for their child's learning but more than a fifth did not engage with their children in activities that were intellectually stretching. The challenge for future work is to respond to a range of parental needs: including intellectual challenge for children; improved family relationships; and greater participation in mainstream services.
- Families had many and varied needs, ranging from poor parenting skills, to mental health problems, to severe social isolation. Efficient use of resources requires careful targeting of services to the discrete needs of vulnerable families and the orchestration of inter-agency responses. (Evangelou, et al, 2008, p.v)

Concurrent with the ELPP project The Parents, Early Years and Learning Project (PEAL) was commissioned by the DfES 2005-07 'with the task of gathering and assessing existing knowledge and best practice in working with parents to involve them in their young children's learning'. PEAL's remit was to design as a training programme to maximise parental involvement, drawing on a range of models, theoretical bases, strategies and techniques.

The PEAL review stresses the need for respectful relationships (Chapter 3) and highlights the following key principles:

- *Practitioners need to acknowledge, value and support the role that parents play in their children's learning*

- *Time needs to be given to enable practitioners to develop meaningful relationships with parents and children, so that they know families and the wider community well*

- *Parenting is complex and families have to cope with a wide range of pressures. Practitioners need to ensure that they are creating opportunities for all parents to be involved and to acknowledge that if parents don't respond to invitations this does not mean they are not interested in their children's education.*

- *Practitioners should show interest in and respect for family background culture and language. Stereotypes and assumptions must be avoided.*

- *To work effectively with parents' practitioners need to reflect on their own practice - setting time aside for genuine evaluation, openly acknowledging any possible experiences of discrimination, involving parents in this process.*

- *Practitioners and parents should share knowledge about a child regularly in order to promote learning and development.*

(Wheeler and Connor, 2006, p. 11)

The importance of the HLE in children's overall development

Engaging parents in their children's learning can lead to a richer home learning environment, which has a positive and enduring impact on children's achievement. Melhuish *et al* (2008) and Sammons *et al* (2007) define and measure the 'home learning environment' in the EPPE study, as a seven question interview suitable for large-scale surveys. A key finding from the EPPE Study is that a stimulating home learning environment at age 3-4 years is linked to long-term gains in children's development. The influence of the home-learning environment on children's development is similar in strength to their mother's qualification level. 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.

However, as Melhuish *et al* (2008) note *responsibility should not be placed solely on parents*. *The provision of good quality preschool education from 3 years of age is likely to produce further benefits, particularly when the preschool center works closely with parents. Studies of successful preschools by Siraj-Blatchford et al. (2003) indicate that preschools that promote activities for parents and children to engage in together are likely to be most beneficial for young children, and this has implications for strategies to help disadvantaged children start school with more academic skills and maintain their educational achievement.*

Elsewhere, in the current report, the importance of relationships and parental involvement in children's learning has been highlighted. This is a point echoed by Wheeler, Connor and Goodwin (2009) who note *the powerful effect of home and family for children's social and intellectual development*; and therefore state that *it is not surprising that the most effective early years and schools have been found to work closely with parents (ibid, p.15).*

The current review highlights the importance of the HLE once more by supporting the notion that children's language and literacy development as well as the development of mathematical language is enhanced by parental involvement.

Involvement, of course comes as a result of mothers' and fathers' awareness of the role they can play in their children's development. When such awareness is evident, parents are introducing and sharing in their family lives rich and varied experiences around books and other printed materials thus providing opportunities for sustained and meaningful work. One of the most successful ways of such involvement is where play is integrated in parent child interactions; as such interactions are more meaningful to children when they stem from their daily lives. Many schools are welcoming parents in to enhance such activities.

Implications for the support and development of the above processes

Some implications for the further support and development of the processes that enhance children's learning have been highlighted across the domains in the current review and are summarised here:

1. A skilled workforce through professional training

- The importance of effective practitioner staff development in recognising and responding to situations where the six domains of development (including the use of ICT) can be enhanced 'on the spot'

- The use of formative assessment and the practitioners' role in guiding play and conversation in early years settings.

2. Sustained shared thinking

- Enhancing children's learning through sustained shared thinking; for example, asking why something did not work instead of 'merely' commiserating with the lack of success.

- Knowing when to extend a child's thinking requires continuing and informal formative assessment e.g. by using colour stickies to make observational notes

3. Quality of environment in early years settings

- Getting the balance right between guided learning and free play requires professional competence and confidence.

- Working in partnerships across the disciplines with key adults in children's lives

4. Need for more research into children's development within settings

- There is need for research opportunities within the early years settings, for example in the areas of measurement and phonics.

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Appendices

Appendix A - Questionnaire for expert consultation

For each of the following categories (A-F) please nominate 2-3 key texts (peer-reviewed papers/ books/ reports) for consideration within the EYFS literature review. Please note that we are particularly interested in any texts / articles published since 2000. For each area please also highlight any key theme concepts that you think are particularly relevant to early care and education (0-5 years).

A. Cognitive Development of Children aged 0-5

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

B. Language and Literacy Development of Children aged 0-5

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

C. Social Development of Children aged 0-5

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

D. Emotional Development of Children aged 0-5

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

E. Brain Development of Children aged 0-5 (as it relates to education and care)

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

F. i. Enabling Environments for Learning of Children aged 0-5 (Parents & Family)

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

ii. Enabling Environments for Learning of Children aged 0-5 (Child Care/ Early Education)

Key papers / Books / Reports 1
2
3

Aspects / Themes requiring further exploration

Appendix B

EYFS
PROFORMA FOR THE LITERATURE REVIEW

Reviewer id & number of review: Data base source / link: Reference (Please reference using APA): ISBN / ISSN: Funding Body / Umbrella:
Details Discipline / Area: Country/ies involved: Type of literature (e.g. meta-analysis; 'issues' book; text for practitioners; popular journal/periodical; academic journal; professional journal etc.) Type of research (e.g. quantitative, qualitative, …paradigm espoused/ philosophy of authors if given or identifiable) Focus of study (e.g. brain development)
Rationale *What was the study trying to do?* The Review aimed at answering the following research questions:
Scope *Who were the targets?* *Particular group focused on*: *Geographical scale?* *Timing: How long was the programme?* *How long was the study?*

Sample:
Participants:

Size:
Other details (age, socio-econ info): Children from middle class and upper-middle class families

Design / Methodology:

Instruments:

Summary of Relevant Key Findings:

Criteria *(tick or make notes)***:**

- Minimises possible bias
- Has external validity / authenticity
- Conclusions fit data, sufficient evidence
- Has been assessed by others (e.g. refereed for journal, peer review, public domain)
- Generalisations have been made only where/when appropriate

Relevance:

High */ Medium / Low Relevance?*
To
Outcomes (Brain Development/ Cognitive Development etc.):

Relevant Studies / Lit. Review / Key Words (to look up):
Mentioned in literature review or references

Key Ideas (e.g. mastery of learning, scaffolding, play, relationships, social constructivism, empathy, children's voice, school readiness, developmentally appropriate practice etc.):

Overall Gaps:
Implications for Good Practice:

Useful Quote and Page Number:

Ref: DCSF-RR176

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