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Thinking Skills in the Early Years: A Guide for Practitioners

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EXECUTIVE SUMMARY

Thinking Skills and Personal Capabilities is an integral feature of the Foundation Stage Curriculum (CCEA, 2007), which is to become a requirement in all Year 1 classrooms from September 2007 and in all Year 2 classrooms in the subsequent school year. This report was commissioned by the CCEA to provide teachers and practitioners with some practical guidance about how thinking skills can be enhanced in an early years classroom and how to assess whether young children are thinking in a constructive way.

The report is based on two sources:

- a survey of key literature on the development of thinking skills in young children; and
- in-depth classroom observations (taken over a period of two consecutive days) conducted in four Year 1 classrooms identified as offering a high quality learning experience as part of the Enriched Curriculum Pilot Project (Sproule et al. 2005).

Using the evidence from the literature base as well as best examples from classroom practice, the findings were analysed according to:

- the adults' role;
- the physical environment; and
- the children's actions

in terms of how thinking skills can be effectively promoted in early years classrooms.

Key Findings

The key findings are outlined below:

Teaching strategies identified as promoting young children's thinking skills fall into four phases:

- **Tuning in phase***:* the adult observes, listens, encourages and shows sensitivity to the children before deciding to intervene in their play or practical activities;
- **Development phase:** the adult uses modelling, scaffolding or questioning strategies to extend the thinking experience;

- **Creative phase:** the adult provides open-ended and practical tasks for the children and encourages them to think beyond the routine, emphasising the importance of completing an activity with flair and imagination; and
- **Reflective phase**: the adult encourages the children to reflect on their experiences, introducing perhaps a degree of ambiguity into the children's thought processes to allow challenge to take place.

A high-quality thinking environment is considered to:

- **be physically attractive**
  - children's work attractively displayed
  - colourful and spacious
  - outdoor facilities used effectively
- **have a positive ethos in place**
  - friendly
  - home-like
  - encouraging
  - supportive
  - welcoming
- **involve a curriculum which is play-based, practical, challenging, flexible and open-ended.**

Assessing children's thinking is much more than assessing their cognitive ability. A summary of the literature, supported by the case studies, suggests that to fully support the development of children's thinking we need to pay attention to the following six key areas:

- **Social/emotional development**
  - Are children adequately confident to tackle ambiguity and express their point of view?
- **Motivation and dispositions to learn**
  - Do children show adequate persistence to stay with a problem and to think it through?

- **Cognitive development**
  - Have children developed the capacity to sequence and order, classify and sort at a concrete level?
- **Linguistic development**
  - Have children acquired the linguistic competence to explain and give reasons?
  - Can they explain why they have done things in a certain way, discuss their plan of action and answer open-ended questions?
- **Creative development**
  - Do children show a degree of imagination and flair in what they do?
- **Reflective responses**
  - Can children ask questions and express the need to find out more?
  - Can children be to some extent self-critical, accept suggestions from others, tackle ambiguity and be open to challenge?

CONTENTS

INTRODUCTION

The Curriculum, Examinations and Assessment Authority (CCEA) commissioned this literature review on thinking skills to inform the implementation of the revised Northern Ireland Curriculum in Foundation Stage classes. One of their key goals is to ensure that the early years of schooling in Northern Ireland should become less formal in nature, offering instead a more developmentally appropriate, child-led and skills-based approach to teaching and learning. As CCEA (2007) states, *'Young children learn best when learning is interactive, practical and enjoyable for both children and teachers' (p.15).*

A key aspect of the revised Northern Ireland Curriculum is the emphasis placed on the development of key skills, in particular thinking skills. As CCEA (2007) states, *'In order to develop children's skills and capabilities across the whole curriculum, teachers will need to provide frequent opportunities for pupils to think and do for themselves*' (pg. 10).

This move to encourage better thinking in our early years classrooms comes at a time when society, with its emphasis on the knowledge economy, demands individuals to be able to process effectively and organise and retrieve information. Problem solving capabilities are also particularly desirable. This shift means that the acquisition of thinking skills has become a major educational objective in recent years. According to Trickey and Topping (2004), curricular prescriptions in a number of countries have shown decreased emphasis on content knowledge and increased emphasis on transferable skills such as critical and creative thinking, as is the case in the revised Northern Ireland Curriculum.

According to McGuinness (1999), there are several general taxonomies of thinking available. Drawing on the work of Swartz and Parks (1994), McGuinness offers examples of an array of different kinds of thinking such as:

- sequencing and ordering information;
- sorting, classifying and grouping;
- analysing, identifying part/whole relationships and comparing and contrasting;
- making predictions and hypothesising;

- drawing conclusions and giving reasons for conclusions;
- distinguishing fact from opinion;
- determining bias and checking the reliability of evidence;
- generating new ideas and brainstorming;
- relating cause and effect and designing a fair test;
- defining and clarifying problems, thinking up different solutions and setting goals and sub-goals;
- testing solutions and evaluating outcomes;
- planning and monitoring progress towards a goal and revising plans; and
- making decisions, setting priorities and weighing up pros and cons.

McGuinness argues that what is included and excluded can be arbitrary and dependent on the age group, the degree of challenge and the context/subject matter being taught.

Much of the literature on thinking skills tends to focus on older children in upper primary and secondary schools (Higgins et al. 2004). The apparent gap has recently been filled with Taggart et al's (2005) literature review of thinking skills in the early years. Nevertheless, Venville (2002) points out that much of the existing literature addresses the need for thinking skills to be fostered but little attention is actually given as to how such an objective can actually be achieved. The need to provide early years teachers with practical advice on how a high quality thinking environment can be both activated and assessed formed the key aim of this study. The intention within this report therefore is not to undertake another review of how children think (see Taggart et al. 2005) and the different theoretical approaches to developing thinking (see McGuinness, 1999), but rather to provide teachers with a practical toolkit for enhancing and assessing thinking skills in an early years classroom, based on an infusion methodology in which thinking pervades all of the early years curriculum.

Objectives

Our remit for this review was two-fold:

(1) The first objective was to examine the existing literature on thinking skills in an attempt to identify what constitutes a high-quality thinking environment from an early years perspective. This involved a literature survey of good practice in the pedagogy of thinking skills in the early years, supported by in-depth observations in a small number of early years settings identified as offering a high quality learning environment as part of the Enriched Curriculum Project in Northern Ireland (see Sproule et al. 2001 - 2006). Through the joint endeavours of the literature review and classroom observations, we hoped to identify the key indicators of a high-quality thinking classroom in terms of the physical and social environment, teacher's strategies and the children's actions. The intention was for these key indicators to provide the basis for a code of good practice, which in turn would inform early years practitioners and enhance the development of thinking skills in early years settings.

(2) The second key objective was to use these key indicators of a good thinking classroom to refine the Higher Order Thinking Skills (HOTs) dimension in the assessment schedule, known as the Quality Learning Instrument (QLI) (Walsh, 2000; Walsh and Gardner, 2005). The QLI is a classroom observation schedule used as one of the principal assessment instruments in the evaluation of the early years Enriched Curriculum Project (Sproule et al. 2001 - 2006). The QLI is based on Katz's bottom-up perspective of quality, which attempts to capture the quality of the learning experience in terms of how it feels to be a child in this environment. According to the QLI, the quality of an early years setting is determined by the way in which the learning and developmental needs of the main stakeholders, the children themselves, are being met within the affective, cognitive, social and physical context. A number of key features of the experiential model of learning are intrinsic to the QLI and are incorporated within the nine quality indicators, against which children's learning experience in a classroom can be assessed.

These quality indicators are:

- motivation;
- concentration;
- confidence;
- independence;
- physical well-being;
- multiple skill acquisition;
- higher-order thinking skills;
- social interaction; and
- respect.

Results from the evaluation revealed that early years environments (both enriched and traditional) appeared to be performing less well on one of the key indicators of the QLI Higher Order Thinking Skills (Sproule et al. 2002). For this reason it was decided to undertake a study which would not only provide teachers with a practical toolkit to help them to create a high quality thinking environment in early years settings but also to refine the descriptors of the HOTs indicator in the QLI to ensure that researchers and practitioners are fully aware of what they are promoting and evaluating.

The objectives of this study are summarised as follows:

- to identify key indicators of a high quality thinking environment in the early years; and
- to enhance the Quality Learning Instrument to enable the quality of the thinking experience to be assessed in early years settings.

METHODS

The first part of the study entailed a comprehensive and up-to-date literature survey of thinking skills, focusing on exemplars of good practice. This review of the literature is supported by detailed classroom observations from four Year 1 classes (children aged 4 – 5 years) in four different primary schools in Northern Ireland. The schools included in the observations were purposely taken from a wider sample of schools involved in the Evaluation of the Enriched Curriculum Project (Sproule et al. 2004) and were identified as achieving high QLI scores in the latest review of this project, indicating good practice.

The observations took place over a period of two full days in each setting and focused on the whole learning triangle; the children's actions, the teaching strategies and the role of the environment. The teachers' views on how they were involved in the development of thinking skills in their classroom were recorded during a semi-structured interview and integrated into the study. Using the best examples of practice and evidence from the observations, the findings were illustrated in a case study format. Conclusions and recommendations drawn from this study serve as a guide for early years practitioners to promote the development of a high-quality thinking environment for young children.

LITERATURE REVIEW

Introduction

Walsh and Gardner (2005) argue that when considering the quality of a school learning experience, the whole learning triangle needs to be embraced – the children's actions, the teaching strategies and the learning environment. McGuinness (1999) confirms this position stating that, *'teaching thinking …. demands that teachers, pupils and technologies interact with one another in certain ways'* (pg. 27). Likewise, Taylor (2001) argues that the promotion of children's thinking in early years education involves the children, the context and the ways in which adults help children to learn.

It would appear therefore that the children, the adults and the physical environment all have a role to play in the development of thinking skills. For this reason, the literature review, pertaining to high quality practice, was structured in terms of:

- the role of the adults (how do the adults facilitate the development of thinking skills?);
- the physical environment (how does the physical attributes of the setting encourage thinking to take place?); and
- the children themselves (how do we know that the children are thinking well?).

The Adult's Role in a Powerful Thinking Environment

When the literature relating to the role of the adult in a powerful thinking environment was considered, the material obtained fell into three main categories:

- the role of the adult in promoting collaborative thinking;
- the role of the adult in ensuring creative thinking; and
- the role of the adult in developing reflective thinking.

The Role of the Adult in Promoting Collaborative Thinking

Adult-child interaction

Co-operative learning has been strongly associated with the development of thinking skills (Baumfield, 1995). The establishment of 'communities of learners' relies on effective partnerships between children and adults and is based firmly on the Vygotskian tradition (Fawett and Garton, 2005). Much of the existing literature tends to concentrate on the development of appropriate interactions between adults and children to facilitate the whole thinking process. Warm and friendly interaction on the part of the teacher is identified by Taylor (2001) as a key ingredient in the promotion of effective thinking in young children. Costello (2000) supports this view arguing that young children must have the skills and confidence to speak in a wide variety of situations and contexts to ensure effective thinking on their part.

Taylor's review (2001) of current literature on best practice emphasises the need for teachers to listen to the children and to get to know them well *before* effective interaction can be ensured. She also refers to the need to listen to and co-ordinate with parents to establish a common knowledge (an agreed subject/topic) between adults and children that will act as a tool for expanding children's thinking. The need to be sensitive to the children's needs and to gain an insight into when and/or when not to intervene is supported by an array of experts such as Pascal and Bertram (1997), Venville (2002), Nutbrown (1999) and Dowling (2005). As Segatti et al (2003) argue, *'Teachers must observe situations closely and be patient when children confront problems'* (p. 16).

Having identified the need for a sound relationship with the children, Taylor goes one step forward. She argues that successful teachers are those who are proactive participants in shaping learning experiences and extending knowledge rather than remaining on the periphery. To help shape these learning experiences she emphasises the importance of modelling effective thinking strategies to make thinking more explicit in the classroom. This may be as simple as using the word *think* more frequently and other *thinking* language, or as Craft (2003) indicates, the practitioner may ask the children to waggle their *'thinking thumbs'* to show physically they are thinking or ask them *'to put on their thinking caps'* (Venville, 2002).

Larkin (2002) stresses the importance of questioning as a means to encourage children to think, by asking, for example:

- What is my problem?
- What is my plan?
- How am I going to proceed?

He also emphasises the importance of asking children to predict and build theories by asking, *'What do you think and why?'* Devereux (2002) supports this analysis, providing examples of key questions such as:

- What will happen if you…?'
- Have you thought about…?
- What is your problem?
- How can you find out about…?
- What happens when you test…?
- Why do you think this will happen…?
- How can you fix this..?.

Taggart et al (2005) provide a synopsis of types of questions and thinking skills based on the Winnie the Pooh story. (See Table 1 overleaf for clarification).

Table 1: Taggart et al's synopsis of types of questions and thinking

FOCUS	QUESTION
Evidence	How do you know Winnie the Pooh got stuck in the rabbit hole?
Reasons/theory	Why did Winnie the Pooh get stuck in the rabbit hole?
Counterfactual suggestion	What would have happened if Winnie the Pooh had not eaten the honey?
False belief	What does Winnie the Pooh think has happened to stop him getting out?
Future hypothetical suggestion	What could Winnie the Pooh do next?

Venville's study (2002) of how to enhance the quality of thinking in Year 1 classes (children aged 5 - 6 years) provides further evidence on the importance of the role of the teacher in fostering good thinking through powerful interactions. Reference is made to the need for difficulty to be accepted as part of the classroom with children being encouraged to address challenging problems and being helped with strategies for solving problems at a level just beyond that which the children have already achieved. Talk that explores and explains the task at hand is also viewed as a critical aspect of good thinking in Year 1 and in Venville's opinion, teachers should encourage children to explain problems, ideas, action, misunderstandings, agreements, questions and possible solutions. Finally, Venville deduced from her findings that children should be given time to think. This echoes Feuerstein et al's logo (1980) *'Just a minute, let me think'*. Not only should teachers model their own thinking, but encourage children to do the same.

Sustaining and extending thinking during an interaction between teacher and child has also been given some consideration. This is particularly exemplified in the work of Siraj-Blatchford and Sylva (2004) in the Researching Effective Pedagogy in the Early Years (REPEY) project. They emphasised the importance of high quality adult-child interactions for ensuring positive episodes of *'sustained shared thinking'*. Sustained shared thinking is when two or more individuals work together in an intellectual way to solve a problem, clarify a concept, evaluate activities, or extend a

narrative. In the best settings these interactions tended to be child-initiated. During these child-initiated episodes staff members extended thinking through scaffolding, thematic conversation or instruction. Staff in excellent settings were:

- more likely to encourage children to engage in new experiences;
- more enthusiastic about the child's efforts; and
- more proactive in seeking out opportunities to scaffold children's thinking.

Dowling (2005) has produced a set of teaching resources to support this idea of *'sustained shared thinking'*. Her material suggests that the adult can use both verbal and non-verbal communications to develop positive interactions and in so doing assist in the development of children's thinking skills. She talks about the need for adults to:

- tune in;
- show genuine interest;
- respect children's own decisions and choices;
- invite children to elaborate;
- recap;
- offer personal experience;
- clarify ideas;
- remind;
- use specific praise;
- offer an alternative viewpoint;
- speculate;
- reciprocate;
- ask open questions; and
- use model thinking.

Child-child interactions

However, much of the aforementioned literature has concentrated on the role of the adult in securing effective adult-child interaction. Fawett and Garton (2005) stress the potential of peer collaboration for the development of problem-solving skills. Drawing on an array of research (Light et al. 1994; Samaha and De Lisi, 2000 and

Webb and Favier, 1999) they conclude that a key element of effective peer collaboration is the active exchange of ideas through verbal communication.

The need for children to talk and think together is particularly stressed by Littleton et al (2005). They argue that children cannot be expected to do this of their own accord but it is also the responsibility of the teacher to facilitate this. Their study focuses on an innovative approach known as *'Thinking Together'* using a *'Talk Box'*. They indicate that primary aged children are commonly asked to work with one another in small groups but in order to do so effectively they argue that young children require a shared set of ground rules. They require, in their opinion, an awareness of the use of talk as a tool for thinking together and an explicit knowledge of the speaking and listening skills which will help them to establish and sustain focused collaborative conversations. Drawing on the work of Dawes and Sams (2004), they indicate the value of the teacher's own use of talk to ensure this through modelling exploratory language, particularly open questioning and an emphasis on reasoning and being allowed to change one's mind if required.

Fisher's (2001) promotion of a *'community of enquiry'*, (similar to that of Lipman et al's (1980) 'Philosophy for Children' programme), is based on the same basic principles proposed by Littleton et al (2005) whereby children develop their thinking skills collaboratively around the stimulus of a story. Through engaging in a community of enquiry, children learn how:

- to ask their own questions and raise issues for discussion;
- explore and develop their own ideas, views and theories;
- give reasons for what they think and believe;
- explain and argue their point of view with others;
- listen to and consider the views of others; and
- change their ideas in the light of good reasons and evidence.

Fisher argues that children as young as four can benefit from the process of community of enquiry. In this model of teaching, pupils can raise and discuss questions after shared reading of a *'story for thinking'* and this aims to develop

critical reading skills in children, as well as increase their self-esteem as thinkers and learners.

The merits of this strategy have been further investigated by Baumfield and Mroz (2002) in their study investigating children's talk in the classroom. The teacher begins each session by explaining to the class that they are going to listen to a story. Children will be given time to write down any questions before discussing them with a partner and then in a group of four. Finally, they have to decide on one question to share in a whole-class discussion. Baumfield and Mroz (2002) found that young children are capable of asking a range of questions within this context, especially during the small group time. It is a very inclusive approach as younger pupils and those with literacy problems became more confident and were able to articulate questions by the end of the project. The process of questioning not only improves reading comprehension, speaking and listening skills but also extends thinking in the light of others' questions and accounts. In order to develop the type of questioning that goes beyond basic clarification, the choice of story needs to reflect the children's interests to ensure high levels of engagement and motivation which can be achieved by the teachers' in-depth knowledge of the children and level of ability.

Riley and Reedy (2005) extended the concept of promoting children's thinking through talk. They explored the use of *writing frames* with Year 1 and 2 children and found that young children were able to intellectually grasp the complexity of an issue and able to appreciate that there may be more than one way to perceive an argument. The writing frame serves as a temporary scaffold as it reduces the cognitive demands that the writing process makes on young children. During the shared writing, the adult models how to structure the ideas first into words and then into sentences and by doing so is making explicit to the novice writer how decisions are made in the construction of a written piece of work. The choice of topic needs to be something the children can fully relate to – the topic in this case related to an earlier class visit to the zoo. The purpose of the teachers' questioning was two fold – it facilitated the expansion of ideas and understanding, whilst moving children's thinking on to a more advanced state.

This approach has a lot in common with elements of a thinking skills programme Beaney and Kershaw (2003) developed for children with autism and communication skills, in that they introduced more visual ways for children to organise their writing, with the use of mind maps which were first pioneered by Tony Buzan (2003). The children can use a variety of words, colours and visual images to describe and illustrate their meaning on a single sheet of paper.

The importance of narrative in extending young children's thinking is reiterated by Taggart et al's (2005) review of thinking skills in the early years. They identify three main sites to help foster thinking skills in the young child within a classroom setting. These are through the context of *story, dialogue and play*. Stories provide the stimulus for children to reason counterfactually, adopt new thinking language such as '*think', 'guess'* and *'remember'*, as well as giving children the opportunity to think together with peers. Written narrative captures the child's interpretation and meaning of a learning moment. In keeping with previous findings, dialogue between adult-child and child-child is cited as a *'potentiating medium'* to deepen thinking in the young child. Open-ended, child-directed play is exemplified as providing favourable opportunities for the practitioner to intervene and help children adopt a deeper understanding of their subject matter. In this way it could be argued that the teacher's role not only extends beyond offering children collaborative and communicative experiences to extend their thinking skills, but also provides them with a range of creative experiences.

The Role of the Adult in Ensuring Creative Thinking

Prentice (2000) advises us that learners need to be '*actively involved'* in the process of their own learning to stimulate the correct conditions for creativity to flourish. This requires young children to be exposed to a range of rich opportunities that will help them engage with the world in different ways so that skills of enquiry, reflection and criticism can develop.

The fostering of young children's resourcefulness and encouraging them to develop *'possibility thinking'* in a wide range of contexts such as play, relationships and circle time, as well as mathematics and literacy, requires the adoption of *'little-c'* creativity,

so-called in order to distinguish it from its almost exclusive attachment to the arts (Craft, 2003). Positive strategies to encourage the development of *'little-c'* creativity include hearing and acknowledging the child and giving the child time to express an idea even in a busy moment. The practitioner must also be able to tune into the knowledge that enabled the child to complete an activity. If the child has produced an artefact, the practitioner must have a space to keep it and must celebrate the *'possibility thinking'* the child used by warmly acknowledging and praising the child's suggestions. The practitioner might then encourage the child to think further about alternative ways that the activity or task might have been completed. Play forms the basis of the creative environment with imaginative play and free choice of activities seen as highly important for the development of creativity in young children as this require imagination, insight, problem solving, divergent thinking and the ability to experience emotion and make choices (Craft, 2003).

Creative thinking can be encouraged in the early years setting by asking open-ended questions, tolerating ambiguity, modelling creative thinking and behaviour, encouraging experimentation and persistence as well as praising children who provide unexpected answers (Sharp, 2004). Sternberg (2003) believes that as well as the above, the practitioner must instil a sense of self-belief in the child so in the future when their ideas may not always be favourably received, they maintain a sense of self-efficacy. Sternberg suggests that mistakes need to be allowed because if children are afraid to make mistakes they will have difficulty being creative and will be less likely to take more risks in a restrictive environment. According to Sharp (2004), adults can act as supporters, coaches, facilitators and models of creativity for children. But, as she suggests, adults can also stifle children's creativity by being overly didactic and prescriptive or by having low expectations of what children can achieve.

The Role of the Adult in Developing Reflective Thinking

Reflective thinking involves an awareness of one's own thinking and reflection on the thinking of self and others. Metacognition is similarly defined as *'thinking about thinking'* (Georghiades, 2004). Although reflective thinking is often associated with more advanced stages of cognitive development, there is growing evidence that

young children can both evaluate and reflect on their thinking, given suitable support by teachers. According to Kuhn and Dean (2004), if teachers encourage children to reflect on and evaluate their own activities this heightens the child's awareness of and interest in the purpose of the activity. Reflection and evaluation can be achieved by simply asking questions such as, *'Why are we doing this?'* and *'How and what?'*. Pupils who are exposed to this type of questioning by the teacher are more likely to begin to ask themselves and others such questions and so this structure of argument will provide an internal framework and become part of their own individual thinking.

An example of a metacognitive experience is provided by Larkin (2002), where a group of children are asked to dress a clown according to certain rules. The '*cognitive conflict'* arises from choosing and swapping items of clothing collaboratively. At the beginning of the task, the teacher invites the children to think about what is required and how they might achieve this. By becoming part of the group the teacher provides a metacognitive experience for the children. She refers to the thought processes in a naturalistic way, listens without judging and gives children time to think. The focus then is on children's own planning, generating of ideas, evaluation and explanation rather than on the mere completion of the task. The children are encouraged to reflect on their own and others' ideas and in so doing evaluate their judgments. Such thinking is synonymous with the plan-do-review sequence of the High/Scope approach.

Epstein (2003) offers some strategies that early years practitioners can use to encourage children to think about their intentions as they indicate choices and make plans throughout the day. They include:

- make child planning a regular part of the day;
- make sure children can see the areas and materials in the room when they are planning;
- ask children questions;
- listen attentively to children's plans;
- support, accept and extend all the ways children express their plans;
- encourage children to elaborate on their plans;
- write down children's plans; and

- use encouragement rather than praise.

She then goes on to provide strategies that will facilitate reflection. These include:

- make reflection an ongoing part of the day;
- ask open-ended questions;
- interpret and expand what children do and say;
- accept conflicting viewpoints and interpretations;
- comment on what you see children doing as they play;
- write down what children say;
- help children connect their plans and activities with their reflections; and
- encourage children to carry over their activities to the next day.

Wallace (2000) suggests that regular *'thinking about thinking'* is crucial for the transfer of thinking skills across the curriculum so that learners are able to reflect on what they have been taught. This maximises independent learning skills for example the process of making links with previous knowledge or *'bridging'* (Adey, Robertson and Venville, 2001). An essential question is how can we use what we have learned to inform future learning? This type of open questioning underpins thinking strategies such as De Bono's *'Six Thinking Hats'* technique (1999) which Horsfall and Bennett (2005) reveal has ensured positive outcomes such as improvement in speaking and listening skills, development of effective collaboration as well as increased motivation amongst pupils in a Year 4 class. The *'Six Thinking Hats'* represent six different modes of thinking and all of the hats are used during a thinking skills activity so that children are taught to use different styles of thinking in a controlled way. For example the first hat in the sequence is the white hat and it relates to information (think of paper), facts and figures. The children are encouraged to ask questions such as *'What do we know about.....?'* and *'What information do we need?'*. Once the children become familiar with the technique it is envisaged that the teacher will be able to apply the approach in different contexts. Drawing on the above literature, it can be seen how practitioners, when they use the appropriate teaching strategies, can play a major part in encouraging children not only to think collaboratively and creatively but also to be more reflective and evaluative.

Summary of the Adults' Role

According to the literature, the role of the early years practitioner in activating high quality thinking in young children can be summed up as follows:

Promoting positive interactions through:

- listening to the children;
- being sensitive to their needs;
- tuning in appropriately;
- modelling thinking;
- using open-ended questions;
- teaching children to think together;
- encouraging children to ask questions;
- giving children time to talk;
- using stories effectively; and
- scaffolding children's thinking effectively

Providing opportunities for creativity through:

- well-planned and challenging play;
- modelling creative thinking;
- offering alternatives and creating ambiguity;
- open-ended tasks;
- encouraging a degree of autonomy on the part of the children;
- accepting mistakes as part of life; and
- encouraging children appropriately.

Enabling reflective thinking through:

- encouraging and modelling reflection;
- welcoming commentary;
- accepting conflict;
- promoting discussion and questioning; and
- building on previous thinking to inform new thought.

The Role of the Environment

Although much is written about the need for a powerful thinking environment, there is little evidence as to what the key features of such an environment are. Claxton and Carr (2004) propose that there are four types of learning environment. They refer to a '*prohibiting environment'* as one where it is impossible or dangerous to express a particular kind of learning response and one that adheres to a tight scheduled programme. An '*affording environment'* provides opportunities for the development of an array of learning attributes but is insufficient for the needs of all children. Likewise, they refer to an '*inviting environment*' as one that not only affords the chance to ask questions, but clearly highlights this as a valuable activity. Finally, they refer to a *'potentiating environment'* as one that not only invites the expression of certain dispositions but actively stretches and develops them. A '*potentiating environment'* shares the power between the teacher and the learners. This classification is equally applicable to the thinking environment. De Corte (1990) and De Corte and Masui (2004) point to the need for an environment synonymous with Claxton and Carr's *'potentiating'* one to enable children's thinking to be fully activated.

Robson and Hargreaves' (2005) study into the perceptions and practices of early childhood practitioners (in relation to the development of thinking in children aged 3 – 5) not only places great emphasis on the role of the classroom environment in creating the correct conditions to foster thinking skills in young children, but also provides specific examples as to what these conditions are. Some of the most salient are presented below.

(1) They emphasise the need for thinking skills to be integrated into the whole learning experience for young children. This is synonymous with McGuinness' (1999) infusion approach. For this reason no set time should be attributed to the teaching of thinking but instead, in their opinion, it should infiltrate all that is taking place in the early years classroom.

(2) They recognise the value of outdoor activities for supporting children's thinking. Outdoor play provides children with the space to explore, investigate and engage in

spontaneous problem-solving.

(3) They highlight the importance of a play-based environment where children get the opportunity to engage in imaginative play.

(4) They place considerable emphasis on the importance of children's own choices. This is also a defining feature of Claxton and Carr's (2004) powerful learning environment where children are involved in frequent participation in a shared activity and take responsibility for directing those activities, which has the effect of sharing power between the teacher and the learners.

(5) The size of the group is also identified as a key feature of an appropriate thinking environment.

(6) Time for thinking was also emphasised. Children need sufficient time to complete activities and see through ideas. Time also is required to allow children to talk.

Claxton and Carr (2004) enrich and extend these conditions for a powerful learning environment (which are equally applicable to fostering thinking) by including the following:

- Children make posters and record all kinds of student-generated ideas about *'What to do when you don't know what to do'*, to act as a set of prompts to be referred to when *'stuck'*.
- Teacher takes photographs of children's learning achievements or alternatively gives the child a disposable camera to take photos at home or in the early childhood setting. The child can take photographs of things that have great meaning and significance to him/her and so the practitioner can piece together a picture of the child's priorities that can be built into a book or portfolio and can serve as a record of learning achievements (Mortimer, 2004).
- Capture learning moments as written learning stories.

- Children's drawings and illustrations can be used as a stimulus for further talking and thinking together between the child and the practitioner, as the child can provide commentary and interpretation on his/her own work (Mortimer, 2004).

Sharp's (2004) description of the creative environment helps to highlight physical attributes that are required to activate thinking. Like Robson and Hargreaves (2005), she too argues that fundamental to the creative environment is the encouragement of children's play. In addition to this she highlights the size and layout; the use of outdoor space; the quality of equipment and materials and access to new and varied environments. Segatti et al (2003) emphasise the need for a variety of everyday materials to foster appropriate problem-solving skills. They state, '*an environment rich in materials that foster cause-and-effect or trial and error explorations helps promote cognitive development'* (p.13). They provide some examples of what these materials might be:

- clear plastic tubes;
- potato chip canisters;
- clear plastic jugs;
- small clear lemonade bottles;
- thin plastic tubing;
- bubble blowing solution;
- tongs or ice-cream scoop;
- inclines or ramps;
- large cardboard blocks;
- cookie sheets; and/or
- large magnets and an alarm clock.

Possible supplementary materials include large marbles, paper plates and markers, food colouring, curtain rods, various size balls, metal lids, metal spoons, feathers and blocks.

Comments from one Hong Kong teacher in a study conducted by Lam Lam et al (2003) serve to illustrate the type of environment that is required to foster effective thinking, in other words the provision of *'independent and open-ended activities in*

the classroom, allowing children to investigate, coupled with the teacher's encouragement and peer interaction and stimulation from the environment will increase children's thinking' (p.153).

Summary of the Role of the Environment

A summary of the literature suggests that a powerful thinking environment can be described as:

- stimulating – containing an array of materials that encourage exploration and investigation;
- having spacious teaching space and being appropriately laid out;
- being flexible and not overly structured to allow children time to fully engage in the investigative process;
- play-based, allowing for freedom of choice;
- having access to outdoor facilities;
- having children's own work in evidence to provoke reflection through use of photographs and illustrations; and
- having a positive ethos reflected by pupils and staff.

The Role of the Children in the Thinking Experience

To ensure an effective thinking environment, it is necessary that the children actually getting the opportunity to think. However as Larkin (2002) points out, in her study of providing metacognitive experiences for 5 and 6 year old children, it is very difficult to detect thinking experiences in young children due to the highly internalised nature of the metacognitive process. According to Larkin (2000), evidence of thinking can only be assumed when children verbalise their thoughts aloud or display some other non-verbal behaviour such as facial expressions and/or the child physically completing a task. For the purposes of the study in question, it was necessary to discover what these verbal and non-verbal behaviours actually are in order to provide practitioners with some practical guidance.

Venville (2002) has identified a set of indicators related to the enhancement of the quality of thinking in Year 1 children. These attempt to demonstrate different modes of thinking in the young child.

Explains

A child explains:

- his/her idea/action;
- another child's idea/action;
- his/her idea for solving a problem; and
- his/her/another child's misunderstanding/difficulty.

Highlights discrepancy

A child:

- recognizes/points out his own/the group's/another child's difficulty;
- disagrees with another child/teacher; and
- accepts that another child/the teacher have different ideas.

Adopts a new idea

A child adopts a new idea to:

- a better /agreed one when his original idea was articulated/shown; and
- a better/agreed one when no clear original idea articulated/shown.

Demonstrates

A child demonstrates an appropriate action or his/her idea to other children or teacher.

Thinks/works collaboratively

Children:

- make various suggestions about solving a problem;
- build on each other's ideas or use several sources of information to solve a problem; and
- agree a problem is not soluble.

Asks questions

A child asks questions of the teacher or another child to clarify a task/activity/problem/ideas.

Other useful strategies

A child may use other thinking behaviours such as:

- creating analogies with ideas from a different context or example; and/or
- using a physical strategy to organise their thinking.

Drawing on the work of Russ (1996), Sharp (2004) argues that for young children to express creativity they require a number of attributes. These are defined as:

- personality traits such as self-confidence (being able to tolerate ambiguity, curiosity and motivation);
- emotional processes such as emotional fantasy in play, pleasure in challenge, involvement in tasks and tolerance of anxiety; and
- cognitive abilities such as divergent thinking, ability to 'transform' thinking (by being able to reorder information or shift 'sets'), sensitivity to problems, breadth of knowledge and judgement (pg. 7).

Although particular to creativity itself, these attributes could be considered as further integral indicators of thinking in its widest sense in young children.

Adey, Robertson and Venville (2001) provide further information on the relationship between cognitive abilities and young children's thinking, highlighting in particular the skills of:

- seriation (putting things in order to form a series);
- classification (sorting objects into sets);
- time sequencing (placing a set of events in order);
- spatial perception (viewing an image/scene from a different perception);
- causality (identifying the links between cause and effect); and
- identifying rules of a game (the ideas the rules are arbitrary) as integral, cognitive strands of young children's thinking.

In addition to these skills, Fisher (2001) emphasises that to make them effective, the dispositions to use the skills must be in evidence. She talks about the dispositions of *'caring'*, *'collaborative'* or *'connected'* thinking. By *'caring'* she means that children need to take responsibility for their thinking and by *'collaborative'* the sense of being open and considerate to what others think. She continues that *'co-operative dispositions'* include learning to co-operate with others in a *'community of enquiry'* (pg. 68) and highlights the importance of self-esteem, empathy and respect for others.

Claxton and Carr (2004) also emphasise the importance of a number of dispositions such as persistence, questioning and collaboration for learning in general, all of which carry significance for the overall development of thinking skills. They argue that persistence is associated with *'sticking with it; voicing doubts and digging below the surface'* (pg. 88). They also refer to the importance of *'robustness'*, in other words the tendency to respond in a learning, positive way, irrespective of the situation and to *'stick with it'* until a satisfactory conclusion is reached. Breadth is also highlighted as a positive learning response in the sense that the learner realises that previous learning can inform new learning or in fact previous thinking can inform new thinking. They conclude with *'richness',* which in their opinion is the result of persistence and in-depth questioning. They argue that richness is when children become *'skilful in marshalling and building … the scaffolding... needed in order to*

persevere in difficult enterprises' (pg. 91). It is about displaying more sophisticated and creative approaches to problem-posing and problem-solving and developing and sustaining interests over time in the company of others.

Based on an in-depth review of young children's thinking, Taggart et al (2005) conclude that by the age of six, given the right assistance, young children are generally able to:

- use *'thinking language'* involving words such as *'think'*, *'know'*, *'guess'* and *'remember'*;
- construct informal rules for the purpose of solving problems;
- sort objects according to one or more criteria;
- understand that the beliefs of others may be different from their own;
- understand that because someone has partial knowledge of something, they will not necessarily have all of it;
- hypothesise about what might happen in the future;
- suggest alternative actions that could have been taken in the past; and
- reason logically from given precepts (pg. 35).

Summary of the Children's Role

A summary of the literature would suggest that for young children to engage in thinking they need to acquire the following attributes:

- **adequate self-confidence**
  – to tackle ambiguity and express their own point of view;
- **persistence**
  – staying with a problem until a satisfactory solution is reached;
- **planning**
  – they know what they are doing and why;
- **signs of reasoning**
  – explaining why they done a certain thing in a certain way and making informed judgements based on what they have learned;
- **cognitive abilities**
  – such as the capability to order, sequence and classify at a concrete level

- **creativity in what they do**

  – not being satisfied with the routine but showing flair;
- **reflecting**

  – thinking back to former learning to inform new learning; and. asking questions, wanting to find out more; and
- **being self-critical**

  – always trying to improve; being open to suggestions from others and learning from them but not always accepting them as their own.

EVIDENCE FROM THE OBSERVATIONS

Introduction

The main purpose of the observations was to support the literature survey by attempting to identify exemplars of a high-quality thinking experience in terms of:

- the teaching strategies used;
- the role of the physical environment; and
- the children's actions or skills.

Four settings were chosen based on the Quality Learning Instrument's ratings, taken as part of the evaluation of the early years Enriched Curriculum (see Sproule et al. 2000-2006). They were all Year 1 classes (children aged 4-5 years) and were considered to be offering high-quality practice. The in-depth observations were conducted over a period of two days in each setting and were supported by informal interviews with the Year 1 teacher.

Background to the Settings

Three of the schools included in this study were located in the Greater Belfast area and one in County Armagh. School A's catchment area included children from a varied socio-economic background ranging from low to high. School B's pupil population was largely comprised of children from a highly disadvantaged background and this contrasted with schools C and D, which attract children from more favourable socio-economic backgrounds, ranging from mid to high. The schools ranged in size from school B which had 134 pupils enrolled to school D which had 417 children enrolled. All of the schools were similar in terms of average class sizes with approximately 20 children in each Year 1 class. All of the schools had the same level of staffing per pupil and similar teaching and special needs support. Parental participation was evident across all of the schools with parents involved in various school councils and parent-teacher associations. Parents were proactive in fundraising for school equipment and trips. Parents were also invited to the school up to four times per year for progress reports regarding children in Year 1 classes.

Table 2 helps to clarify this more fully.

Table 2: Comparability between the four settings

SAMPLE	AVERAGE % OF FREE SCHOOL MEALS	SCHOOL SIZE	AVERAGE CLASS SIZE	LOCALITY	BOARD AREA
Setting A	20	273	21	Large town	SELB
Setting B	11	417	22	Leafy Suburb	BELB
Setting C	5	168	19	Suburban	SEELB
Setting D	75	134	18	Inner city	BELB

Evidence from the Case Studies: The Teaching Strategies

In all four of the settings, the practitioners displayed a range of effective teaching strategies that helped to foster a high-quality thinking environment for their young children. These teaching strategies could be summarised as follows:

- demonstrating sensitivity;
- using thinking language;
- modelling thinking;
- providing a variety of creative learning experiences; and
- encouraging critical reflection.

Each of these is discussed below.

Sensitivity

The adults' sensitivity was displayed in a range of ways in the early years classrooms. Frequently they were observed down at the children's level when speaking to them, making good eye contact and often touching the individual child's shoulder when listening to him/her speak. The staff appeared to take a genuine interest in all of the activities the children engaged in and had a great rapport with them, conveying a sense of warmth and of nurturing especially with younger, less confident children.

Time was spent observing the children in an attempt to know when and when not to intervene and on all occasions a positive self-image of children was emphasised. The main messages appeared to be, 'I can do' and 'I will support you to do'. Encouragement of children's efforts was at all times in evidence and much emphasis was placed on the children's own participation and valuing all the contributions that were made. Children's ideas and thoughts mattered and were taken into consideration in all of the classrooms.

The following example helps to illustrate the sensitivity of the teachers more fully.

Example 1

The teacher in setting C noticed that Jessica was very busy in the junk area but decided to leave her to her own devices as she might interrupt her flow of thought. Jessica was making an aeroplane out of cereal boxes and bun cases. Aware that the activity had come to an end, the teacher commented, "That is a wonderful aeroplane. Could you tell me how you made it so I can make one too?" The child explained how she designed it. "Where do you want to hang it/put it up?" the teacher asked. Jessica pointed to the line overhead and the teacher asked her what she wanted to put on the aeroplane to describe it or say what it is. The child dictated her name and also the following narrative, "An aeroplane and it can fly like a kite." The teacher wrote this out for the child, fixed it to the plane and hung it up where Jessica wanted it to be displayed. At the end of the play session, during the plenary, the teacher asked Jessica to show her aeroplane to the rest of the class and to tell them about it. The children clapped Jessica's efforts. Jessica was very chuffed indeed.

The Use of Thinking Language

Another teaching strategy that was explicit in each of the settings was the emphasis placed on using thinking language. The teachers kept referring to what they did the day or the week before, constantly keeping children aware of what they had learned to date and linking this together, ensuring a sense of continuity in children's thinking. Furthermore, an array of language was used to draw the children's attention to the importance of thinking, for example, "Let's Think"; "That is very good thinking"; "I am

going to give you some thinking time"; "I am looking out for the best thinkers today"; and "I want you to think carefully and think back or reflect, do we all know what that big words means, yes think back to what we did yesterday". Advanced language was also used by the teachers to familiarise the children with the correct terminology for the skills they were using, for example sequence, order, classify, sort, predict, imagine and reason.

On several occasions a commentary was supplied by the teachers to explain linguistically the skills and processes they were using, for example, "Well done Johnnie. You are very clever you have sorted the animals for two criteria big and small." or "I see what you are doing Helen. You are ordering the teddies from biggest to smallest." Example 2 clarifies this more fully.

Example 2

Teacher: "Now boys and girls, a big hard challenge. Who can think of a way to sort these hoops before we put them away in the store?"
Jack: "Colours."
Teacher: "That is a super idea. Could you do that for us Jack?"

Jack, with the help of some peers, proceeds to sort the hoops into red and blue sets.

Teacher: "Well done children. That is excellent. Can anyone think of another good way to sort the hoops?"
Alice: "Small and big."
Teacher: "Can you think of any other size?"
Alice: "Middle size."
Teacher: "Excellent. Now boys and girls you are going to have to decide whether your hoop is small, middle or large. What is the word we are looking for?"
Louise: "Sorting."
Teacher: "That's right, we are sorting our hoops."

To complement the language used, a range of gestures were employed to make thinking more explicit in the classroom. For example teachers pointed to their head

whilst referring to thinking, telling children to put on their thinking caps and to tie them tightly or, they held up a question mark to denote that really good thinking was taking place. This is clearly illustrated in Example 3.

Example 3

In the gym in setting A, the children were listening to a CD and had to carry out a set of moves and instructions accordingly. After children completed the first dancing task the music changed denoting a new dance. The teacher said, "I want you to have a really good think. I want you to put your hands on your head (teacher has both hands on her head and children copy) and think is this a loud song or a soft song?" Children listened to the quiet music and said, "Soft."

The Use of Questioning

In each of the settings there was much emphasis placed on the use of open-ended questioning on the part of the teacher, such as:

- Who do you think...?
- Why would he be...?
- How do you know...?
- What do you think?

The children were encouraged to talk and ask each other questions instead of being expected to remain silent and to listen to the teacher. The following examples illustrate the teacher using open-ended questions or tasks to encourage children to think more fully.

Example 4

Two children in setting C were at the art station during playtime.

Teacher: "That is a wonderful machine you are making. Can you tell me more about it?"

Bill: "It's an aeroplane and you see these wings they make it go really fast, woom woom. I was in an aeroplane once and it was great."

Amy: "So was I. I went to Spain and it was really sunny there and you got to go on the beach. I loved it."

Teacher: "What can you do at the beach?"
Amy: "Oh you can do lots. You can swim, you can paddle and you can even build big sandcastles."
Bill: "I can build sandcastles too. My dad says I am the best. I made lots of sand castles but they are disappeared and I was sad."
Teacher: "What do you think made them disappear?"
Bill: "It's the water, teacher. My dad said that it is magic. The sea goes in at night time and makes all the sand wet."
Teacher: "The sea is very interesting indeed Bill but let's get back to this fantastic aeroplane. I wonder does anyone know this big, hard question? What do you call the man or woman who flies the aeroplane?"
Amy shouting: "I know teacher, it's a peelot."
Teacher: "Well done Amy. It is a pilot. You are such a brainy girl. Great thinking. I will let you and Bill get on with your aeroplane. I have kept you back enough."

Example 5

After reading the story, 'The Three Billy Goats' Gruff', the children in setting D were put into small groups and they had to think up some alternative endings to the story. One group came up with the idea of letting the troll eat the goats while another group decided that the troll became a friendly troll who played with the goats and was never nasty again. As the children could not write their ideas they had to draw them but each group had to agree on one idea, thus encouraging reasoning and discussion.

Modelling strategies

The teachers modelled high-quality thinking in action in an attempt to encourage the children to adopt some of these strategies for themselves. The following example helps to clarify this.

Example 6

In setting A, the teacher effectively modelled checking strategies during an activity so that children knew how to ensure their answer is correct. The children carried out a numeracy task where they have to place the correct number of elephants on the

number displayed. James required help as he said he was "in a muddle" and so the teacher prompted him and he got the correct number of elephants. Then the teacher asked him, "How do you know that you are right?" and he replied, "You have to check it." The teacher reflected back to the child, "Let's count and check." and they both re-count the elephants.

Also during number fun, the group played a computer game projected onto the overhead white board. The children had to identify the number and click on the right machine with the corresponding number of dots on it. When a child clicked on the correct machine with five dots for the number five the teacher asked her, "How did you know that the machine had five?" The child replied, "I counted." The teacher then said, "Yes, you counted and checked. Well done."

Scaffolding

In the settings it was frequently observed that the teachers had to move beyond modelling thinking to actually probe and prompt the children to extend the thinking experience. In this way it could be argued that the teachers were engaging in a process of scaffolding, either through the use of language or action. The following examples help to illustrate this.

Example 7

In setting A, the teacher encouraged the children to recite the days of the week. Whilst pointing to a chart she has up on the wall she asked, "Who can tell me what the weather was like on Mah, Mah Monday? How could we find out?" A child goes over to the weather chart on the window and points to Tuesday's weather.
Teacher: "Today is not Monday, can anyone else tell me?"

The children looked puzzled so teacher offered support.

Teacher: "Monday was the first day that we came back to school after the weekend. Have you any idea? What would help us to find out?"
Child: "Sunday."

Teacher: "No, look at all our elephants and they have the days of the week on them and so let's say them again. How could I find out what the weather was like?"
(The weather is usually placed under each day/elephant)

Child: "Look at the first elephant on Monday."
Teacher: "Why?"
Child: "Because that is Monday."
Teacher: "So remembering, what was the weather like on Monday?"

Child pointed to weather symbol underneath Monday.

Teacher: "So looking at what Holly has done, how could we find out what Tuesday's weather was like?"
Child: "The purple one." (Tuesday is a purple elephant).

The child then said what the weather was like.

Teacher: "What was the weather like today? Think, what you were wearing when you went out to play today."
Child: "A coat, it was raining"

Teacher invited the child over to select the correct raining symbol and child placed it under the Friday elephant (today).

Example 8

During playtime, the teacher in setting C noticed that the play in the hairdresser's was very boring. She decided to phone the hairdressers and booked herself in for a perm. Soon she arrived and asked for some magazines to help her choose the hairstyle she wanted. Immediately the play was enhanced. A purposeful dialogue soon developed between the teacher and the hairdresser and in next to no time other children were waiting to get their hair done.

In settings C and D the teacher encouraged the children to participate in a set of exercises known as 'Brain Gym' where children undertake a set of short physical exercises modelled by the teacher immediately before a lesson or activity. These co-ordinated exercises are thought to improve concentration and cognitive development with one study reporting improvement in behaviour as well (Harris, 2003 cited in Taggart et al. 2005). These classes had primary movement timetabled as part of the daily schedule and this was a combination of movement (gross and fine motor skills) and singing along to nursery rhymes.

Creative Learning Experiences

Creativity was integral to the learning experience in all four settings, with play greatly in evidence. A dedicated period of time was set aside for structured play each day and during this time the children were allowed to choose from the variety of play-based activities available. The following examples help to illustrate the emphasis that was placed on encouraging children to think for themselves in an imaginative way.

Example 9

In setting C, a group of children were involved in painting a crazy face using hairdresser's utensils. These included brushes, combs, curlers, clips, and scissors. The children involved thoroughly enjoyed the experience and showed persistence, individuality and originality. Each picture was totally unique and highly imaginative.

Example 10

In setting A the children were involved in structured play. One of the play stations was an igloo. A group of four children were playing there. They were dressed in fur like Eskimos and the boys were trying to shoot polar bears. Skis were available for the children as well as a sleigh. Inside the igloo there was no electricity. The children were encouraged to think about what they could do without it; how they would cook and what they would do instead of watching TV.

Reflection

The teachers practised a *'plan, do, review'* approach to some extent during playtime. The children were encouraged to informally plan what they wanted to do and then at the end of the play session, a plenary took place, generally in the form of a discussion but sometimes through completing a record sheet. Overall, the children were encouraged (through a number of teaching strategies) to think back to what they had done before to inform new learning and to engage to some extent in a process of self-reflection. Example 11 outlines this approach.

Example 11

During circle time, the teacher opened a class discussion (using lots of open questioning) about what to expect during a planned fire drill later on in the week. After raising all the necessary questions and getting the children to respond and participate as fully as possible, the teacher passed around a stone and asked the children to take it in turns and say what they could remember from the discussion. When half of the class had done this, the teacher stopped and reflected on all of the suggestions by saying, **"**That's great, we are thinking of some great things to do when we are having a fire practice."

One of the children's contributions was, "If there's a fire don't worry because the teacher is there to look after us." The teacher acknowledged the child and gave positive feedback by replying, "That's a very good idea!" Another child suggested that she, "would go to her childminder" if there was a fire at school. The teacher reframed the question by firstly saying, "No, we never leave the school during the day." and proceeded by asking, "What do we do when there is a fire at school?" The same child was stuck and so the teacher intervened with a thinking strategy. "Have a think. What did I tell you you would have to do?" The child responded with the correct answer, "I would line up and not run to the playground."

The above examples all provide first-hand evidence of the role the adults play in the development of thinking skills in young children. By the same token, as the literature suggests, the physical environment also is integral to the overall thinking experience. The next section concentrates on exemplars of good thinking environments, as observed in the four Year 1 settings.

Evidence From The Case Studies: The Learning Environment

As with the teaching strategies, the environment in each of the four settings:

- was colourful and stimulating;
- children's own work and thinking aids were on display;
- outdoor facilities were available;
- a positive ethos was in evidence; and
- the learning experience tended to be flexible and play-based.

Each of these will be discussed in turn.

Colourful and Stimulating Classrooms

In three of the settings, the early years classrooms were very bright and colourful with coloured desks, chairs and storage furniture. The other setting made up for the lack of colour through the use of bright and colourful displays. All the activity areas were clearly defined and well resourced. Materials were stored in clearly marked trays in open cabinets and some had photographs of what was inside fixed to the label to make it easy for the children to see where a particular item was located and to help them make choices more readily in planning an activity. The work-tops and cabinets were all low-level for the children and displays and learning aids at eye-level for the small children. There was a comfortable carpet area for tasks shared with the teacher such as planning, circle time and shared reading. On other occasions this carpet acted as a private area where children could go and relax and read a book quietly. Attractive displays were not only mounted on the walls, but attractive resources relating to the topic for that month were displayed around the room which children could consult at their own leisure using their senses.

Children's Own Work in Evidence

There were lots of examples of the children's own work on display on the wall and all around the classroom.

In school A, there was a dedicated space called the 'Learning Wall.' This had all the children's messages; the topic, letter and theme of the week as well as rules relating to respecting each other. This was in addition to other displays of the children's work.

In school B, the children had made their own drawings of pumpkins and had the letter 'P' displayed too, a letter they had learned a few weeks previously.

School C had displays made by the children recording their favourite foods. These were accompanied by photographs of the children as babies, concealed by a card with the question: 'Can you guess the baby?'

In setting D, the children's learning achievements were accompanied with the narrative, 'We have learnt to say the days of the week', making explicit what the children had learned. In school D, the children all helped to make a large display, charting everyone's eye colour. This was linked to a visit by an optician, made the week before.

In two of the settings the children's learning moments were captured in photographs placed all around the room. These showed the children participating in different activities and had some narrative attached such as 'We had great fun dressing up as book characters – Who can you see?'

Learning/Thinking Aids on Display

Word banks were displayed on the walls of the classrooms identifying:

- key words the children had learned to date and others they would need;
- days of the week;
- months of the year; and
- the week's weather.

On the children's desks a number line (1-10) was fixed, alongside their name. In setting C, this was accompanied by the child's photo. A system of self-registration

was also in operation with all the children's names on display as well as birthdays (for example, 'Who is four years old and who is five?').

Colourful and eye-catching alphabet and number charts were hanging at eye level for children to see from any position in the room. In setting D, the number chart was accompanied by some questions to aid stimulation, such as 'Where is today's number?' In all of the settings there was a poster on the wall that referred to what parts of their body could be used to develop skills the children need for example ears for listening and eyes for watching. A visual timetable was in evidence so that children could follow the routine of the day.

Outdoor Facilities

Outdoor activity was a planned part of all of the children's timetables. In two of the settings a variety of equipment was available for the children such as bicycles, scooters, balls and hoops. In one setting there was a garden where the children had the opportunity to dig and there are plans to develop this area so that the children can grow plants and vegetables.

The teachers also highlighted how the outdoors is simply used as an extension of the classroom in the summer term and the emphasis is placed as much as possible on exploratory play. Excursions also take place throughout the year to extend the children's knowledge of their environment, such as visits to the local supermarket, the garden centre, and the farm.

The Ethos

In all classrooms there was a very inviting and welcoming atmosphere. The children appeared relaxed and at ease and there was a hum of activity, coupled with smiling faces and sounds of laughter. The physical setting complemented this relaxed atmosphere. The children sat in small groups and appropriate talk was encouraged. Collaborative learning was prioritised and emphasis was placed on ensuring that the voices of the children were being heard and taken into consideration. Positive

relationships were encouraged and at all time bickering, fighting and tale-telling were discouraged. The adults had a warm, caring rapport with the children and strict discipline was not in evidence. In this way, the environment in each of the settings was conducive to positive personal, social and emotional development.

Practical and Play-Based Activities

The emphasis on practical and play-based activities was apparent in each of the settings. Formal written exercises were kept to a minimum. At least an hour each morning was dedicated to structured play where children were encouraged to engage in a variety of exploratory, creative and problem-solving tasks. Likewise, most mathematical activities tended to be practical and problem-based and the literacy activities tended to be shared learning experiences using a big book, whereby discussion, questioning and reflection were stressed. Some of the activities observed which appeared to be particularly advantageous for the development of thinking skills included:

- **Planning time**
  - children can make choices
- **Show and tell**
  - child's narrative
- Shared writing and reading as well as individual work
  - stories were excellent for this
- **Open play**
  - art and craft, imaginative play, dough, water and sand
- **P.E. and physical activity and gym equipment**
  - nursery rhymes are recited (questioning by teacher)
- **Primary movement**
- **Music lesson/music time**
  - children thoroughly enjoyed this
- **Having visits from people with different occupations**
  - for example an optician, policeman and actors
- **Cookery**

- **Planned visits outside the school with the teacher**
  – this provides a great resource for shared ideas and thinking and stimulating recall and recap and can then provide a stimulus for the literacy task
- **Numeracy work to include sorting and sequencing, patterns, matching and counting**
  – this can be supported with other media such as videos and computer work
- **Circle time**
  – allows time for reflection.

All of the above examples help to provide practical evidence to support the findings from the literature on the need for a stimulating, physical environment to support the development of thinking skills in young children.

Evidence From The Case Studies: The Children's Actions

The observations suggested that the most explicit indicator of children's thinking were their facial expressions, as shown in Example 12.

Example 12

Ben was writing a story about a class trip to a local park. Whilst he was writing out the sentences, he was talking aloud to himself, sounding out the letters and had his finger in his mouth. He was completely engaged in the task and progressed well as he managed to complete the task.

Ella had her hand on the side of her head as she was completing a jigsaw of a dog. Tom had his tongue protruding whilst completing a jigsaw of the park. Katie gently tapped on the table whilst she read out the sentences she had written about the park.

Similarly, when a group of children were engaged in listening to the story about the ginger bread man a number of thinking gestures were observed. These included pursed lips, faces fixed to the teacher, running fingers through hair and chewing their fingers. When asked a question, Ethan tapped his nose.

Other indicators were also in evidence. These included:

- the children's confidence to speak out and take risks;
- their high level of persistence when meeting difficulty;
- their competence at explaining what they had done and why;
- their use of thinking language;
- their ability to sort and classify;
- their ability to reflect and reason;
- their competence at asking questions and making suggestions; and
- their creative flair when completing tasks.

Examples 13, 14 and 15 help to illustrate this more fully.

Example 13

Tina was participating in free play first thing in the morning and had chosen to play with magnetic construction shapes. Whilst some children at her table were constructing their own individual designs, Tina was committed to constructing a design illustrated on a card within the set. She worked really hard and intently and was close to completing the design when she said to her friend, "I need this piece." She pointed to the top of the van depicted on the card and then selected the correct shape, identical to that on the card. When she completed the van she jumped up and down and said, "I've done it!" Tina was very pleased with her achievement but then looked at it again. "I don't think that back is much use. It doesn't stay on. Yes that's the piece I need (adding her own piece to the design). Yes, that's better. That will work better."

Thinking skills in evidence include:

- persistence in face of difficulty;
- ability to follow instructions;
- possessing a plan of action;
- ability to make a decision; and
- being capable of reflecting and reasoning.

At the end of a sorting activity the teacher asked some children, "What have you done with your elephants this morning?" Jessica replied, "I made a set of elephants." The teacher then prompted Jessica to explain what a set means.

Jessica: "Sets are a collection."

Teacher: (*holding up a set of uniblocks*) "Ryan what do we call this."

Ryan: "A pattern."

Teacher: "What is special about your cubes?"

Ryan: "It's a tower."

Teacher: "Is it a tall or short tower?"

Ryan: "It's a long tower."

Teacher: (asks Paul) "What did you do with your dogs?"

Paul: "I put them in yellow, pink and white. (*Child points to the groupings in front.)* Can you sort them a different way teacher?"
Teacher: "Well Paul, let me see. Can you give me some help?"
Paul: "I have a good idea. Let's make a set of big dogs and small dogs."
Teacher: "Well done Paul. What a good idea!"

Thinking skills in evidence include:

- ability to sort and classify;
- use of appropriate language;
- competence at speaking out and asking questions;
- making suggestions; and
- capable of explaining and reasoning.

Example 14

Amy had spent much of playtime making a birthday cake with play-dough. She put some intricate patterns on it and placed five candles on the top. After playtime, the teacher asked Amy if she would like to show her beautiful cake to the rest of the class. Amy explained how she made it and whom it was for. The teacher then asked Amy the complicated question, "If you were to make another cake what might you do differently?" Amy replied, "Well I would make it bigger of course, and I would like those sparkly things to go over it to make it look pretty."

Thinking skills in evidence:

- ability to be creative;
- capable of providing an explanation;
- ability to reflect and reason; and
- confidence in speaking out.

Example 15

In setting C, the children were completing a group painting activity. They were making a collage. Some excellent discussion was overheard. John thought the sky

should be dark blue but Emily thought that it would look like night-time. Robert then suggested that light blue might look better as it might look like it was going to rain if the sky was dark. John thought this was a good idea and decided to add some white paint to the blue.

Thinking skills in evidence:

- working collaboratively;
- making suggestions;
- offering alternatives;
- accepting the opinion of others;
- confidence in giving an opinion; and
- creative problem-solving

PART B: THE OBSERVATION INSTRUMENT

The remit of this study was two fold. The first key objective was to undertake a literature survey, supported by evidence from the classroom, to identify key indicators of a high-quality learning experience for young children. The second objective was to use these indicators to refine the Higher Order Thinking Skills (HOTs) indicator in the already existing observation instrument known as the Quality Learning Instrument (QLI) (Walsh, 2000; Walsh and Gardner, 2005). In this way a more accurate assessment of the quality of the thinking experience can be made. Furthermore, with more explicit descriptors, teachers could perhaps use the Quality Learning Instrument as a self-assessment tool.

A summary of the literature and the evidence from the observation have been combined to inform the revised HOTs indicator from the QLI. As the literature reviewed and the case studies undertaken all concentrated on a high quality-thinking experience, they informed the examples of high quality for the purposes of the QLI.

Table 3, see overleaf, illustrates this more fully.

Table 4: Higher Order Thinking Skills Indicator

CHILDREN'S ACTIONS	TEACHING STRATEGIES	THE ROLE OF THE ENVIRONMENT
The children: • display self-confidence in the classroom; • show persistence in what they do; • use thinking language and gestures; • can engage in planning for example they appear to know what they are doing and can give an explanation; • can complete tasks competently; • can categorise and sequence successfully; • are capable of reflecting on previous work; • can make a comment on their own work and in this way are beginning to evaluate their own work; • ask informative questions frequently; • can explain why they have done things in a certain way; • are open to suggestions from others; • make an attempt at solving problems for themselves; and • show signs of creativity in what they do.	**The adults:** • are sensitive to the children's needs for example they tune in easily to when and when not to intervene; • display warmth and encouragement through making eye contact, being down at children's level and gently touch children's head or shoulders; • encourage a sense of self-belief through encouragement and appropriate praise; • allow children a sense of ownership/autonomy of their own learning; • make reference to previous learning to inform new learning; • use thinking language including reflection, remembering, paying attention and listening; • make use of physical gestures to encourage thinking to take place; • use an array of open-questions; • give children time to talk and to ask each other questions; • model thinking strategies; • scaffold the children's learning through making suggestions about what to do next, asking probing questions, amplifying children's utterances and participating with the children during play; • use primary movement where and when appropriate; • provide an array of creative, practical learning and play-based experiences to promote decision-making, problem-solving, use of imagination, critical enquiry; and • encourage children to plan, do and review in an informal manner especially during structured play.	**The environment:** • is spacious and colourful with brightly painted walls, colourful furniture and well-presented displays of children's own work; • is flexible, well-organised and not overly structured with clearly marked areas, appropriate labels, child-sized furniture and items that stay in a fixed place; • is owned by the children - children's paintings, drawings, graphs, messages, photographs are on display; • is child-led; • thinking aids such as word banks, alphabet charts, days of the week, number lists, captions, questions, key-skill charts and self-registration are on display; • outdoor facilities are available and are seen as an extension of the classroom (bikes, scooters, balls, hoops and garden patch available); • The outside community is taken advantage of through trips to the farm, zoo, florists, supermarket, garden centre, local park and so on; • play-based and practical activities are carried out (show and tell, child's narrative, shared writing and reading, individual work, stories, free play, arts and craft, pretend, play-dough, water and sand, P.E. and physical activity, primary movement where nursery rhymes are recited (questioning by teacher), music time, visits from people such as the optician, policeman and actors, cookery, planned visits outside the school, numeracy work that includes sorting and sequencing, patterns, matching and counting (this can be aided with other media such as videos and computer work) and circle time with time for reflection; and • has a positive ethos.

CONCLUDING COMMENTS

Both the literature and the case studies confirm that practitioners can play a salient part in the development of young children's thinking, if the appropriate teaching strategies are used.

These strategies tend to fall into four main phases. The first phase could be described as a 'tuning in' process whereby the teachers take time to familiarise themselves with what a child or group of children are doing and then make a decision as to whether they need to intervene or not. If they do decide to intervene, the need to act sensitively is clearly emphasised.

The next phase could be referred to as a developmental process whereby the teacher uses modelling, scaffolding or questioning strategies (amongst others) to extend the thinking experience.

The creative phase may run alongside the development phase whereby the teacher simply provides open-ended and play-based tasks for the children to engage in or it may be envisaged as an extension to the development phase. Here the teacher will encourage the child/ren to think beyond the routine, emphasising the importance of completing an activity with flair and coming up with creative solutions to a problem/question.

The final phase could be defined as the reflection phase. The emphasis during this phase is to encourage young children to reflect on what they have done and engage in a process of self-assessment. This phase introduces a degree of 'cognitive conflict' on the part of the child, where the teacher/significant other, through his/her tactful use of language/questioning, might introduce a degree of challenge/ambiguity to the child/ren's thought (see Appendix 1).

A combination of the literature and the case studies would suggest that the physical environment also has a role to play in the development of children's thinking. The physical environment comprises three main elements:

- the physical appearance;

- the ethos; and
- the curriculum.

Appendix 2 details these elements further.

Although some literature, such as that of Adey, Shayer and Venville (2001), focuses solely on the cognitive aspect of children's thinking, a summary of the literature reviewed in this report, complemented by the case studies, would suggest that children's thinking is more complex, comprising six main categories:

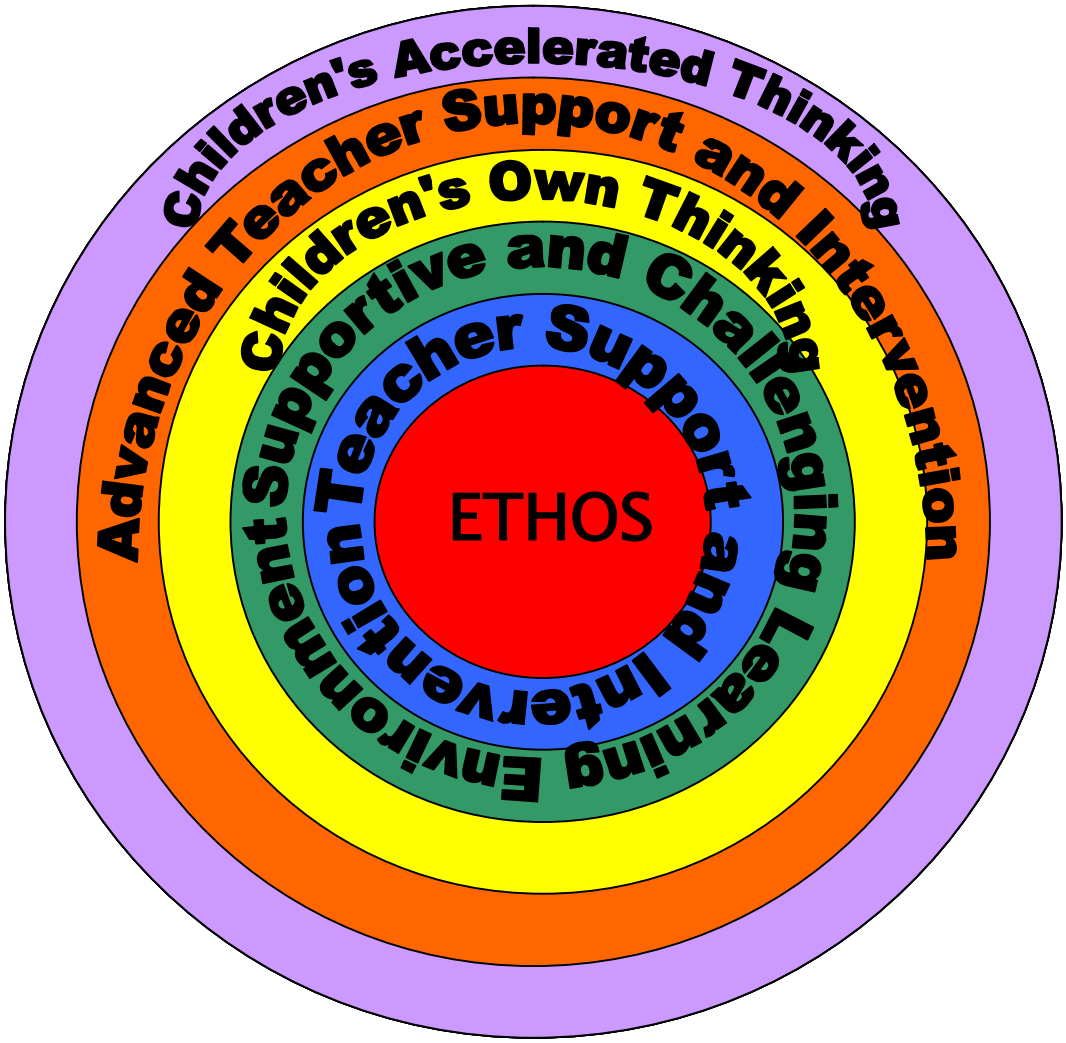
- social/emotional;
- dispositional;
- cognitive;
- linguistic;
- creative;
- and reflective thinking.

These are explained more fully in Appendix 3.

The literature and the case studies would suggest that the level of children's thinking can be detected by:

- tuning in to their facial expressions and gestures to reveal their overall level of confidence and persistence;
- observing their competence at cognitive tasks such as sorting, sequencing, ordering and classifying;
- assessing their ability to plan, do and review;
- noting their creative flair and their powers of questioning;
- listening for the degree of thinking language used; and
- observing their capacity to engage in a process of critical reasoning, reflecting, considering, taking on board the views of others, tackling ambiguity and being open to challenge.

The whole thinking experience can be consolidated and summed up by way of conclusion in the following thinking wheel.



Key:

- Emotional and social pre-requisite
- Modelling, questioning, encouraging, adding commentary
- Stimulating, flexible, play-based and welcoming
- Use thinking language, ask simple questions, explain and clarify, generate ideas, sort, sequence, classify, justify
- Promote critical discussion and debate, encourage critical reflection and evaluation, introduce challenge and ambiguity
- Creativity, criticality, reasoning, accepting cognitive conflict, tackling ambiguity

RECOMMENDATIONS

These recommendations build on those proposed throughout the report and focus particularly on how a high quality thinking experience can be promoted in a Foundation Stage classroom.

To ensure effective thinking on the part of children aged 4 -5 years:

- An appropriate ethos must be in place in any Foundation Stage classroom. The classroom ethos must be friendly, welcoming, caring, encouraging, supportive and as home-like as possible.

- The physical indoor and outdoor environment should be bright, stimulating, colourful and cheerful and most importantly owned by the children.

- The best way to stimulate thinking in children at this age is through a play-based curriculum with a practical perspective, based on children's own needs and interests. It should be as open-ended as possible, allowing for a degree of flexibility and choice. The activities offered to children should provide an appropriate level of challenge and encourage the children to think more in-depth, without curbing their enthusiasm.

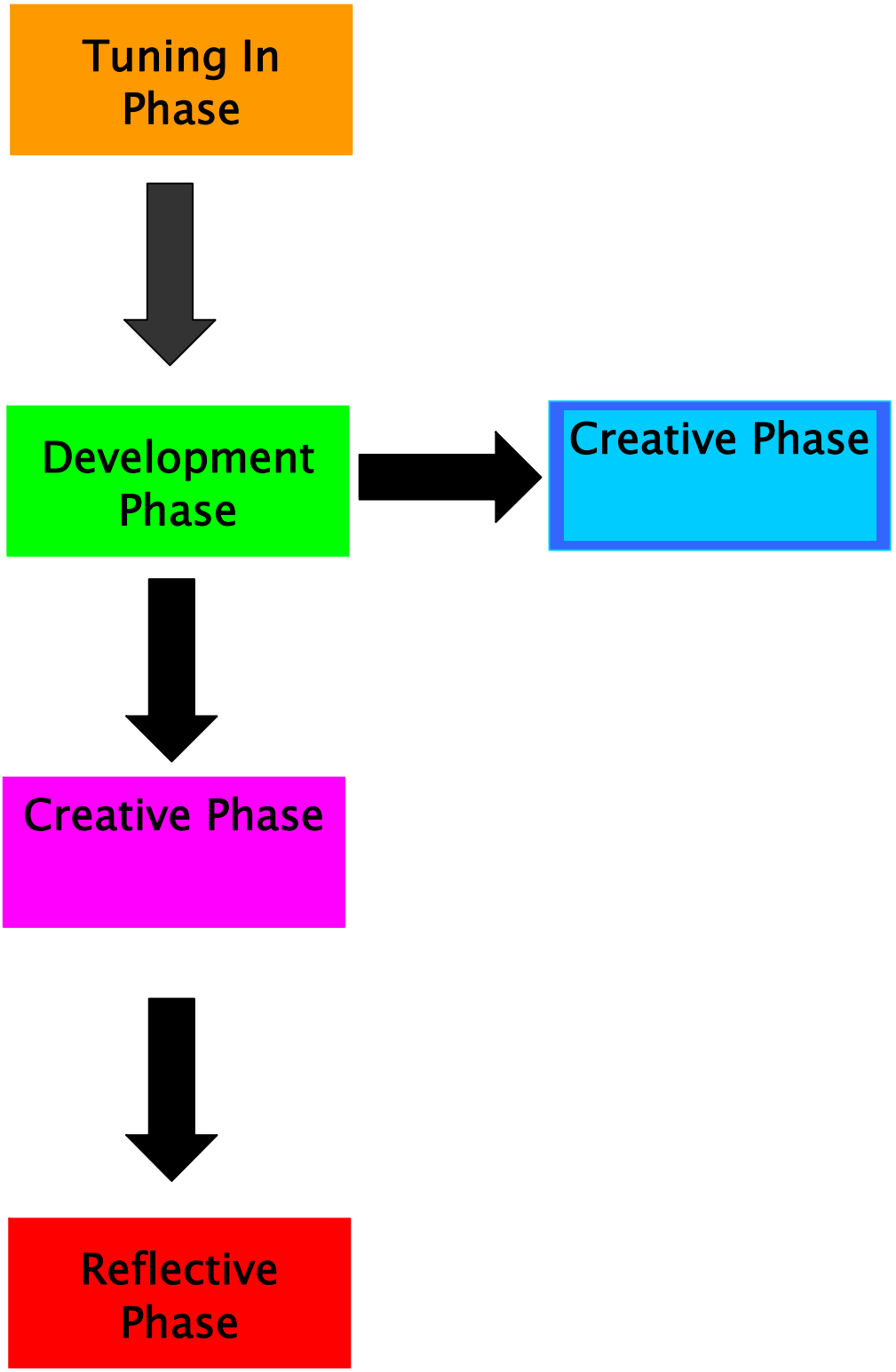
- There should be an appropriate balance between child-initiated activities and adult-initiated activities to ensure that challenge and extension to children's thinking.

- An authoritative teacher is not the answer but rather a supportive, enthusiastic practitioner who is willing to:
  - take the time to tune into the children's learning by observing them and listening to what they have to say; and
  - follow their lead and build upon this experience through effective modelling, scaffolding, questioning and encouraging strategies.

- Children should feel valued at all times, not feel pressured. Mistakes should be accepted as part of learning and adequate time should be given to children to allow them to think effectively.

- To ensure effective development in children's thinking, the next step for the early years practitioner is to:
  - foster creativity;
  - offer alternatives;
  - make links with previous learning;
  - promote reflection;
  - provide challenge; and
  - introduce a degree of ambiguity and reflective thinking on the part of the children.

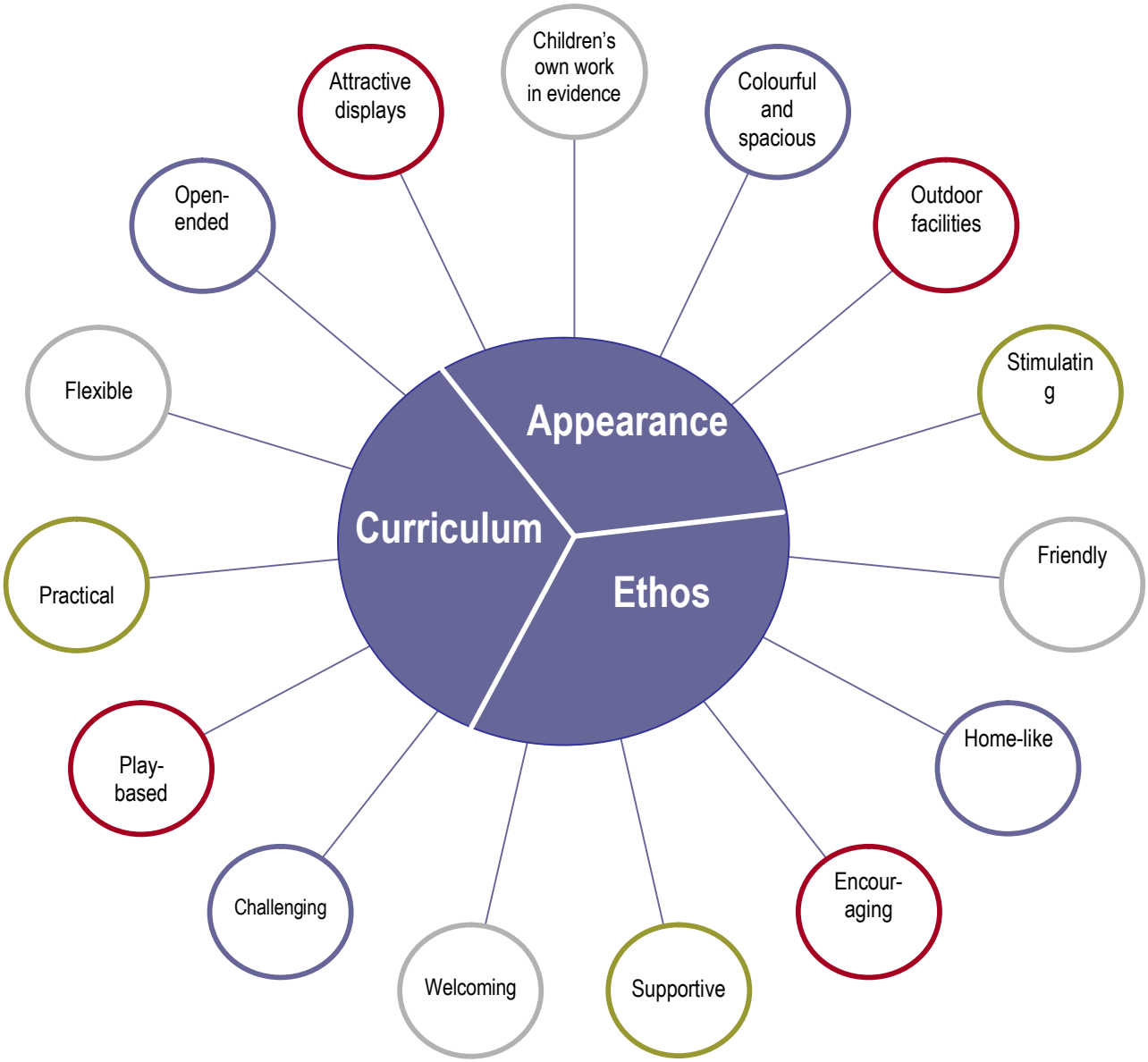
Appendix 1: A Stage-Based Approach to Support the Teaching in an Early Years Classroom



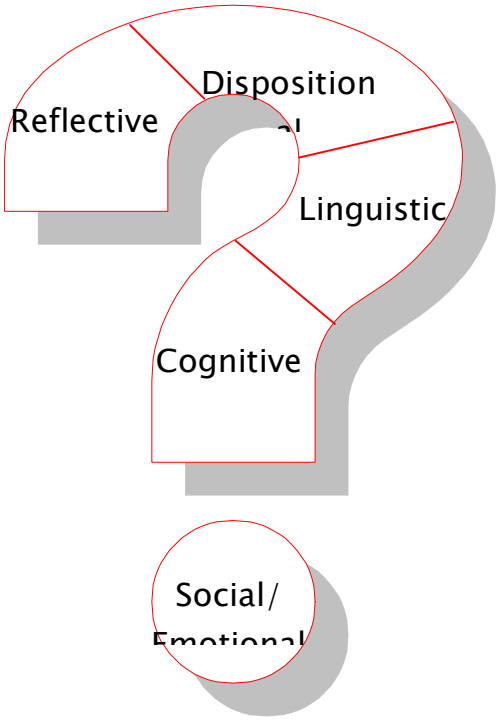
Key: Teaching Strategies Used in Each Phase

	Tuning-in	• Observing • Listening • Encouraging • Showing sensitivity
	Development •	• Questioning • Modelling • Scaffolding • Giving time to children • Encouragement • Adding a commentary • Bridging (making links with previous thinking)
	Creative	• Offering open-ended, play-based tasks • Modelling creativity • Encouraging autonomy
	Creative	• Encouraging flair and originality • Accepting mistakes as part of life • Offering alternatives and introducing a degree of ambiguity • Encouraging prediction and use of imagination
	Reflective	• Encouraging reflection and self-assessment • Promoting critical discussion and questioning • Introducing challenge • Welcoming critical commentary • Promoting critical conflict

Appendix 2: The Integral Features of a Supportive Thinking Environment



Appendix 3: Key Dimensions of Children's Thinking


Disposition
Reflective
Linguistic
Cognitive
Social/

REFERENCES

Adey, P.; Robertson, A. and Venville, G. (2001) Let's Think!. Windsor: NFER-Nelson.

Baumfield, V.M. (Ed) (1995) Improving students' performance: a guide to thinking skills programmes in education and training. Tyneside Training and Enterprise Council, Gateshead.

Beaney, J. and Kershaw, P. (2003) Positive Thinking Skills. Special, Summer, 11-15

Baumfield, V and Mroz, m (2002) 'Investigating pupils' questions in the primary classroom', Educational Research.44, 2,129-140.

Buzan, T. (2003) Mind Maps for Kids. London: Thorsons Publishing

CCEA (2007) The Northern Ireland Curriculum: Primary. Belfast: CCEA.

Claxton, G and Carr, M (2004) 'A Framework for teaching learning: the dynamics of disposition', Early Years. 24, 1, 87-97.

Costello, P.J.M. (2000) 'Thinking Skills and Early Childhood Education'. London: David Fulton Publishers Ltd.

Craft, A (2003) 'Creative Thinking in the Early Years of Education', Early Years. 23, 2, 143-154.

Dawes, L. and Sams, C. (2004) 'The capacity to collaborate' in Littleton, K.; Miell, D. and Faulkner, D. (Eds) Learning to collaborate: collaborating to learn. New York: Nova Press.

DeCorte, E (1990) 'Towards powerful learning environments for the acquisition of problem-solving skills', European Journal of Psychology of Education.5, 1, 5-19.
.
DeCorte, E and Masui, C (2004) 'The CLIA – model: A framework for designing powerful learning environments for thinking and problem solving', European Journal of Psychology of Education.19, 4, 365-384.

De Bono, E. (2000) (2nd Revised Edition) Six Thinking Hats. London: Penguin books.

Devereux, J. (2002) "Developing thinking skills through scientific and mathematical experiences in the early years", in Miller, L; Drury, R. and Campbell, R., Exploring Early Years education and care. London: Fulton.

Dowling, M. (2006) Supporting young children's sustained shared thinking. Early education. Spring, 48, 5-6.

Epstein, A.S (2003) 'How Planning and Reflection Develop Young Children's Thinking Skills', Young Children. Sept 2003, 28-36.

Fawcett, L.M. and Garton, A.F. (2005) 'The Effect of peer collaboration on children's problem-solving ability', British Journal of Educational Psychology. 75, 157-169.

Fisher, R (2001) 'Philosophy in primary schools: fostering thinking skills and literacy', Reading. July 2001, 67-73.

Georghiades, P. (2004) From the general to the situated: three decades of Metacognition. International Journal of Scientific Research, 26, 3, 365-383.

Harris, J. (2003) 'That's What Your Brains Are For': An account of the Norfolk 'Thinking Schools, Thinking Children Project'. Norfolk: National Primary Trust.

Higgins, S., Baumfield, V., Lin, M., Moseley, D., Butterworth, M., Downey, G., Gregson, G., Oberski, I., Rockett, M and Thacker, D (2004) Thinking skills approaches to effective teaching and learning: what is the evidence for impact on learners?. London: EPPI Centre, Social Science Research Unit, Institute of Education.

Horsfall, P and Bennet, L (2005) 'Thinking hats in the primary school: from thinking skills to thinking curriculum', Education Today. 55, 1, 20-29.

Kuhn, D and Dean, D (2004) 'Metacognition: A bridge between cognitive psychology and educational practice', Theory into Practice. 43, 4, 268-273.

Lam Lam, M., Lim, S.E., Ma, J.C and Adams, L.D (2003) 'What Hong Kong teachers and parents think about thinking', Early Child Development and Care. 173, 1, 147-158.

Larkin, Shirley (2002) 'Creating metacognitive experiences for 5 and 6 year old children' In Michael Shayer and Philip Adey (eds) 'Learning Intelligence: cognitive acceleration across the curriculum from 5-15 years. Buckingham: Open University (chapter 5 pps. 65-79 and 196-203.

Light, P.; Littleton, K.; Messer, D. and Joiner, R. (1994) Social and communicative processes in computer-based problem-solving. European Journal of Psychology of Education. 9, 1, 93-109.

Lipman, M. et al. (1980) Philosophy in the Classroom. Philadelphia: Temple University Press.

Littleton, K., Mercer, N., Dawes, L., Wegerif, R., Rowe, D and Sams, C (2005) 'Talking and thinking together at Key Stage 1', Early Years. 25, 2,167-182.

McGuinness, C (1999) From Thinking Skills To Thinking Classrooms: a review and evaluation of approaches for developing pupils' thinking, DfEE Research Brief no. 115.

Mortimer, H. (2004) Hearing children's voices in the early years, Support for learning, 19, 4, 169-174.

Nutbrown, C (1999) (2nd Edition) Threads of Thinking: young children learning and the role of early education. London: Sage.

Pascal, C. and Bertram, T. (1997) Effective early learning: Case studies in improvements. London: Hodder and Stoughton.

Prentice, R (2000) 'Creativity: a reaffirmation of its place in early childhood education', The Curriculum Journal. 11, 2, 145-158.

Riley, J and Reedy, D (2005) 'Developing young children's thinking through learning to write argument', Journal of Early Childhood Literacy. 5, 1, 29-51.
Robinson, W (1991) 'Rich seams of mind' Support for Learning'.6, 3, 119-123.

Robson, S and Hargreaves, D.J. (2005) 'What do Early Childhood Practitioners Think About Young Children's Thinking?', European Early Childhood Educational Research Journal. 13, 1, 81-96.

Russ, S.W. (1996) 'Development of creative processes in children' in Runco, M.A. (Ed.) Creativity from childhood through adulthood: The development issues. (New Directions for Child Development, No 72). San Francisco, CA: Jossey-Bass.

Samaha, N. V. and De Lisi, R. (2000) Peer collaboration on a nonverbal reasoning tasks by urban minority students, Journal of Experimental Education, 69, 1, 5-14.

Segatti, L.; Brown-DuPaul, J. and Keyes, T. (2003) Use everyday materials to promote problem-solving in toddlers, Young Children, Sept, 12-18.

Siraj-Blatchford and Sylva, K (2004) 'Researching pedagogy in English pre-schools', British Educational Research Journal.30, 5, 713-730.

Sharp, C (2004) 'Developing young children's creativity: what can we learn from research?', Topic. Autumn, 32, 5-12.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2001) The Early Years Enriched Curriculum Evaluation Project: First Year Report. Belfast:CCEA.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2002) The Early Years Enriched Curriculum Evaluation Project: Second Year Report. Belfast:CCEA.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2003) The Early Years Enriched Curriculum Evaluation Project: Third Year Report. Belfast:CCEA.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2004) The Early Years Enriched Curriculum Evaluation Project: Special Fourth Year Interim Report. Belfast:CCEA.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2004) The Early Years Enriched Curriculum Evaluation Project: Fourth Year Report. Belfast:CCEA.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2005) The Early Years Enriched Curriculum Evaluation Project: Final Key Stage 1 Report.. Belfast:CCEA.

Sproule, L.; Rafferty, H.; Trew, K.; Walsh, G.; Sheehy, N. and McGuinness, C. (2006) The Early Years Enriched Curriculum Evaluation Project: Fifth Year Report. Belfast:CCEA.

Sternberg, R.J. (2003) 'Creative thinking in the classroom', Scandinavian Journal of Educational Research.47, 3, 325 -338

Swartz, R. and Parks, S. (1994) Infusing critical and creative thinking into content instruction for elementary teachers. California: Critical Thinking Press.

Taggart, G., Ridley, K., Rudd, P and Benefield, P. (2005) Thinking skills in the Early Years: a literature review. National Foundation for Educational Research.

Tayler, C (2001) 'Australian early childhood milieu: teacher challenges in promoting children's language and thinking', European Early Childhood Education Research Journal. 9, 1, 41-56.

Trickey, S. and Topping, K.J. (2004) 'Philosophy for children: a systematic review', Research Papers in Education, 19, 3, 364-380.

Venville, Grady, J (2002) 'Enhancing the quality of thinking in Year 1 Classes' in M. Shayer and P. Adey (eds) Learning intelligence: cognitive acceleration across the curriculum from 5 to 15 years. Buckingham: Open University.

Wallace, B (2000) 'Teaching thinking and problem-solving skills', Education Today. 50, 4, 3-6.

Walsh, G. (2000) The play versus formal debate: A Study of Early Years Provision in Northern Ireland and Denmark. Unpublished PhD Thesis.

Walsh, G. and Gardner, J. (2005) Assessing the Quality of Early Years Learning Environments, Early Childhood Research and Practice, Vol. 7, No. 1.

Webb, N.M. and Favier, S. (1999) 'Developing productive group interaction in middle school mathematics', in O'Donnell, A.M. and King, A. (Eds) Cognitive perspectives on peer learning (117-149). New Jersey: Erlbaum.