DEVELOPING CHILDREN'S THINKING

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STATEMENT OF AUTHORSHIP

I hereby declare, that the work contained in this thesis is my own and has not been presented for any other degree.

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ABSTRACT

The goal of children becoming effective thinkers and learners has long been an educational ideal yet, despite extensive research literature showing the benefits of teaching thinking, there has been little systematic curriculum change embodying an awareness of this research. Further, although there are some very convincing findings which indicate the benefits of using programmes for teaching thinking, they are not widely used, largely because programme developers have failed to provide explicit links with functioning in the 'real' world for children or to consider effective implementation strategies for the complex realities of schools.

This thesis reports on the results of a study to produce, 'A Guide to Better Thinking', a resource designed to help children become more effective thinkers and learners, to bridge the gap between theory and classroom practice, and move teaching for thinking into the classroom. The study presents a broad overview of the literature on teaching thinking, and its implications for practice. It includes a review of relevant research on motivation and metacognition and an analysis of existing Thinking Skills Programmes, identifying their strengths, as well as the practical and theoretical weaknesses. This provides the theoretical foundation, highlights general issues concerning the design of effective programmes, and the need for a programme which:

- provides teachers with a manageable framework for teaching thinking, that synthesises the work of leaders in the field, but takes account of the constraints the classroom teacher faces;
- introduces a broad range of skills in Positive, Critical and Creative Thinking, considers how we can motivate children to want to use these skills, and emphasises the development of metacognition to help children monitor and direct their own thinking;
- provides 'child and teacher-friendly' material which is intellectually challenging, with issues of real concern, that provide explicit links with functioning in the real world for children;

- introduces 'fun' characters to model the thinking strategies and how to overcome obstacles to good thinking;
- is not restricted to the cognitive domain alone but embraces feelings attitudes beliefs and values.

The goals of the programme were: to develop Positive Thinking and improve children's concept of themselves as thinkers and learners; to develop Critical Thinking and improve children's ability to reason and reflect on their thinking; to develop Creative Thinking and flexibility of thought. Given the broad aims of the programme, evaluation had to be wide-ranging in nature and a major concern was to use evaluation instruments well focused on the goals of the programme. Careful consideration was given to selecting appropriate assessment procedures and to the tailoring of instruments to the capacities being developed. Issues concerning the evaluation of Thinking Skills Programmes were raised and recommendations for test improvement presented. The programme was trialled, with 10 -12 year old children, in a large inner-city school, requiring urban aid, and in a middle-class school with children of different ability and socio-economic background, with someone else administering the programme. Pre and post-tests were administered to control and experimental groups and results strongly suggest that children using the programme made large, and statistically 'highly significant', gains in, self-concept, cognitive ability and creative thinking. Scores on the Thorndike, Hagen & France, Cognitive Abilities Test, for example, represent, in real terms, gains of over two years in cognitive ability after only one term of using the programme. These gains were consistent across sites with children of different ability and social background. There was also some evidence of children transferring these skills to other areas of their learning. Children enjoyed the programme, teachers found it easy to use and manageable and reported shifts in attitude and increased motivation. The final chapter presents recommendations for the design, evaluation and successful implementation of Thinking Skills Programmes in schools.

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CHAPTER ONE

INTRODUCTION

This thesis reports on the results of a study to produce, 'A Guide to Better Thinking,' a resource designed to enhance children's thinking and learning and promote the teaching of good thinking in our schools.

My interest in teaching thinking stems from years of experience as a teacher and headteacher and my concern with providing education of the highest quality possible for the children in my care.

Increasingly I have found children, from across the ability spectrum, who were failing to fulfil their potential as learners – able children who were underperforming, less able children who considered themselves failures and had given up on learning. An even greater concern was children's concept of themselves as thinkers and learners. For many children, there was a passive acceptance of the status quo with no sense of having any control over their lives or their learning. Many were suffering from 'cognitive demoralisation', feeling alienated by the very system which is meant to serve them.

The purpose of this research, therefore, was to advance our understanding of, and make an original contribution to, the development of children's thinking; to find a way to help children become more effective thinkers and improve their concept of themselves as thinkers and learners.

The goal of children becoming effective thinkers has long been an educational ideal with traditions stretching back at least to Plato. Throughout the 20th century the need to develop the thinking ability of children in our

schools has been widely recognised. Dewey, for example, maintained, "There is not adequate recognition that all the school can or need do for pupils, so far as their minds are concerned, is to develop their ability to think" (Dewey, 1933, p.40). Extensive research literature, (Nickerson (1985), Siegel (1988), Swartz & Perkins (1990), Costa (1991), Edwards (1995), for example,) provides ample evidence that the teaching of thinking should be a major focus for education. Despite this evidence, many studies show that even the best products of our secondary schools are 'impoverished thinkers' and a recent study by Edwards (1995) suggests that mainstream education was mainly producing 'skilled regurgitators of knowledge', and not children who could think for themselves.

An analysis of national and international assessment data indicates that while performance in 'basic skills' shows a moderate improvement, there was a deterioration in higher-order thinking skills in Reading, Maths, Science and Writing (International Assessment of Educational Progress (IAEP) 1991, and The Nation's Report Cards, in Costa 1991). The Third International Maths & Science Study, (TIMSS) 1997, also concludes that our performance, relative to other TIMSS countries, was poor and had deteriorated since the 1991 study. To increase performance these reports recommend that teachers stress the development of thinking skills in all areas of the curriculum. "We are painfully becoming aware that challenges are not being met by the mere accumulation of data. We need a breakthrough in the quality of thinking employed at all levels of society and by each of us in our daily lives" (Costa 1991, p.3). 'Changing Schools,' a recent report by the Scottish Council Foundation, (2000), highlights the failure of the education system to furnish pupils with the thinking skills needed to thrive in the 21st century and suggests that countries across the world were now questioning the effectiveness and relevance of their traditional state systems.

Societal demands for higher-order thinking too are increasing and the need

for a workforce capable of more sophisticated thinking to meet the requirements of the 'information age' is paramount. The requirements of democracy and good citizenship also call for the ability to think critically about complex issues. The 5-14 Curriculum in Scotland and the National Curriculum in England and Wales, for example, emphasise the importance of critical thinking in preparing children for their future role as citizens. Glaser (1985) also believes critical thinking helps the citizen to form intelligent judgements on public issues and thus contribute democratically to the solution to social problems. Research by Berman (1991), however, highlights that many young people are finding it increasingly difficult to assume a sense of social responsibility or believe they can create a better world. They feel powerless and cynical about the future. They do not have the thinking skills necessary to understand the complexity of these issues or their solutions, with the result that they often withdraw from active participation in our society. Berman's research found however that when a particular methodology was used, with issues of real concern to children, they not only acquired the thinking skills, but developed a sense of their own power to influence change.

Children need therefore the 'thinking tools' to meet the needs of the 21st century but, perhaps more important, as Machado (1997) reminds us, all human beings have a basic right to the full development of their intellect.

While the need to teach thinking skills may be clear, and although the development of thinking skills is seen as the key to raising educational standards, little guidance is given as to how to implement thinking skills in the classroom. The teaching of thinking is rarely a component in teacher training programmes and teaching is seen as cramming ever increasing chunks of curricula into children's heads (Edwards, 1995). It is important to remember therefore, "The purpose of education is not to fill the minds of students with facts . . . it is to teach them to think and always to think for themselves" (Hutchins, 1991, p.20).

The major challenge facing education, therefore, is to help all children become better thinkers and my personal research, since 1990, has centred on investigating a wide variety of programmes and approaches that have been developed as a means of enhancing children's thinking and learning. While some of the programmes were effective and showed very promising results, many good programmes failed because of inadequate implementation procedures or were counter-productive in that they required a massive commitment in terms of time and teacher training. Many were narrow in focus and several programmes had to be used to cover the broad range of skills children need in their lives, making it expensive for schools and difficult to administer and teach. Many programme developers failed to provide explicit links with functioning in the real world for children or to consider the affective and motivational processes that play a vital role in cognitive development and functioning.

The thesis addresses issues concerning the design of effective Thinking Skills Programmes and proposes a new model for teaching thinking.

The two major approaches advocated to teach thinking are, to embed it in familiar academic disciplines (Glaser,1984), or teach it separately then infuse it throughout the curriculum (Edwards, 1991). Most authors and developers of major cognitive curriculum projects agree that direct instruction in thinking skills is imperative. Sternberg (1987), De Bono (1992), Lipman (1992) and Feuerstein (1997), all agree that children must be instructed in the processes of thinking but, often children cannot transfer these skills to real-life situations or to other areas of learning. If on the other hand, thinking skills are developed through specific content, Adams (1991) suggests they will be remembered, understood and, importantly, accessible only in relation to that content.

The main difficulty is that in many programmes exercises are remote or sterile and children cannot relate the programme to the world in which they live. My own research suggests that, for transfer to occur, experiences must be

meaningful for children, not artificial or trivial, but closely related to situations actually encountered. The thesis proposes to develop a programme which teaches children about thinking explicitly, in real-life contexts, then shows them how to apply the skills in different situations.

It is not surprising that despite continuing research showing the benefits of teaching thinking, some of it with very convincing findings, there has been little systematic curriculum change embodying an awareness of the research (Perkins,1992, Adey,1994). Further, despite exciting results which indicate the great potential and long-term benefits of using Programmes for Teaching Thinking (Perkins et al,1987), they probably influence less than 5% of schools across the U.K., U.S.A., and Australia (Edwards,1995). Perhaps the main reason why the teaching of thinking is not in widespread successful practice is that insufficient attention has been paid to the effective implementation strategies for the complex realities of school. The voice of the teacher and the child is missing from research in teaching thinking.

While there is much in the literature on why we should teach thinking and on what we should teach, few studies have considered how the teaching of thinking can be effectively implemented in our schools. Fullan (1991) believes that one of the main reasons for the lack of success in implementing new programmes is the neglect of the phenomenology of change, a lack of understanding of the meaning of the change for those involved. Shulman (in Brandt, 1992) suggests that more 'wisdom of practice' studies are needed to build case literature that is useful for practitioners.

There is a need to stand back from the details of the different methodologies and develop a broader perspective, which combines sound principles for teaching thinking with sound principles for teaching and learning; which takes account of how we can teach thinking skills effectively in the realities of to-day's classrooms and the features of the learning environment which

shape the disposition to engage in thinking; which considers how we can best motivate children to want to use these skills to become more effective thinkers and learners.

Bruner states that his thinking has been guided by the following motto from Francis Bacon that "Neither mind alone nor hand alone can accomplish much without the aids or tools that perfect them." (Bruner, 1986, p.122). If we are to develop children's thinking, we need to provide teachers with the 'aids and tools' to facilitate the development of thinking skills in the classroom.

The aim of the thesis, therefore, was to design a programme that would:

provide teachers with a manageable framework for teaching thinking, that takes account of the constraints the classroom teacher faces, but provides theoretical clarity and guidance as to how they might effectively develop children's thinking in the realities of today's schools;

equip children with a broad range of skills in positive, critical and creative thinking and do so in a manner relevant to their own personal lives;

consider how we can motivate children to want to use the skills and emphasize the development of metacognition to help children monitor and direct their own thinking;

provide a balance of the affective as well as the cognitive aspects of teaching thinking and recognize the importance of developing children's concept of themselves as thinkers;

help children fulfil their potential and move from their feelings of failure and lack of control over their lives to feelings that they too can be successful learners.

Beyond this, the greater aim was to help children achieve a new sense of identity as thinkers and learners and help them become more rational, more reflective human beings in the process.

To achieve these aims it was necessary to conduct a wide-ranging and detailed analytical review of the relevant literature, to develop the theoretical framework for the study; create a new model for a Thinking Skills Programme which can be successfully translated into classroom practice; design and conduct an appropriate evaluation of the programme; report and discuss the findings and present a detailed analysis of the result.

The programme produced was 'A Guide to Better Thinking' and the goals of the programme were:

- to develop positive thinking and improve children's concept of themselves as thinkers and learners;

- to develop critical thinking and improve children's ability to reason and reflect on their thinking;

- to develop creative thinking and flexibility of thought.

A summary of chapters follows to outline the manner in which the thesis is presented.

Organisation of the Thesis

The thesis is organised into six chapters.

Chapter One provided an introduction to the study. It included the study background and rationale for teaching thinking and identified the development of children's thinking as an educational priority. It highlighted the need for a programme, that can be effectively implemented in schools, to develop children's thinking.

Chapter Two presents a broad analytical review of the literature on teaching thinking to develop the theoretical framework for the study. It considers current developments in metacognition and motivation and reviews existing programmes and approaches to teaching thinking, highlighting their strengths as well as practical and theoretical weaknesses. It identifies teaching methods and learning strategies to help children become more effective thinkers and features of the learning environment which motivate children and promote their self-esteem.

Chapter Three provides a detailed description of the development of the programme. It explains the distinctive features of the programme and the rationale of the programme design. The main aims of individual worksheets, within each section of the programme, and the piloting of the materials in the formative development of the programme is described.

Chapter Four explains the methodology used in the evaluation of the programme and provides a rationale for key research decisions that were taken within the study. In particular it explains and justifies evaluation measures taken and issues concerning the evaluation of Thinking Skills Programmes are raised. This has not been well covered in previous studies. The chapter describes the research design, site and sample selection, data collection techniques and the trialling of the programme in two contrasting schools.

Chapter Five and Six, presents and analyses the 'findings of the study. Because of the wide range of measures used, a key concern was to ensure that a clearly focused and detailed account was provided.

Chapter Five presents the findings of the study. It includes a general overview of pre and post-test measures then reports findings for each of the programme goals. Group differences and findings from parents' and teachers' questionnaires are also presented.

Chapter Six provides the analysis of the findings. The chapter analyses to what extent each of the programme goals has been met and children's affective response to the programme. It also considers group differences and the effects of the programme from the parents' and teachers' perspective.

Chapter Seven presents a summary to highlight the main features of the study. In the conclusion, key features which should be included in Thinking Skills Programmes and the essential characteristics to help translate it into classroom practice are identified. A new model for teaching thinking is proposed.

The review of the relevant literature which is presented in the following chapter provides a historical framework, setting the study firmly in the context of previous research work on the topic.

CHAPTER TWO

LITERATURE REVIEW

As indicated in the introduction, this chapter provides a broad overview of the literature on 'Teaching Thinking,' building on the research and insights of others, to develop the theoretical framework for the study and guide the model for the programme. The aims of the review are to:

- illustrate and investigate the theoretical basis for teaching thinking;
- consider current developments and approaches to teaching thinking;
- present an analytical review of existing thinking skills programmes;
- identify teaching methods and learning strategies to help children become more effective thinkers and learners;
- analyse the relevant research on motivation and metacognition to identify features which will motivate children and promote self-esteem;
- present a set of proposals for developing thinking in the curriculum.

Theoretical Basis for Teaching Thinking

> An examination of the Theoretical Roots of Thinking, can assist educators in developing the broad conception of thinking needed to develop successful Thinking Skills Programmes.
>
> (Ferron, 1994, p .27)

The idea of teaching thinking is not new. Plato, Aristotle and philosophers through the ages have made attempts to improve the intellect. Socrates, one of the most important and influential teachers of ancient Greece, attempted to codify the rules of good thinking in terms of logic, and recognised the importance of dialogue as a way of structuring educational interactions. His view was that skilled reasoning is learned through the social interaction of argument and that teachers could not be educators in the fullest sense unless they were willing to nurture a climate of questioning among students. Through this 'Socratic dialogue' teachers encourage a critical attitude and help pupils self-correct their thinking.

The modern roots of teaching thinking can be traced to Dewey's (1933) Theory of Reflective Thinking. Dewey believed teachers should change their teaching practices to solve what he perceived to be the fundamental problem that affected schools. As Dewey states:

> In school, amassing information, 'covering the ground' is a primary necessity, the nurture of the mind a bad second. Thinking cannot go on in a vacuum but there is all the difference in the world whether the acquisition of information is treated as an end in itself or is made an integral portion of the training of thought.
>
> (Dewey, 1933, p. 63-64)

Dewey also believed schools should develop the habits of mind to think well and cultivate attitudes favourable to the best methods of enquiry. Unfortunately, neither Dewey's theory nor the many applications of that theory led to significant changes in schools (Rockler,1988, Brown,1991), and the theory of innate general intelligence dominated educational practice for many years.

Paul (1984) who was concerned about the shallowness of American political opinion during the Vietnam War, and Machado (1980), Minister of State for the development of human intelligence in Venezuela, both stressed the need for training in critical judgement as a defence against propaganda. This new surge of interest in the teaching of thinking led Nickerson to state: "We are witnessing a rebirth of Dewey's original ideas about the importance of thinking in our schools" (Nickerson, 1985, p.18).

For the first half of the twentieth century, the view that intelligence was a fixed entity and had little chance of being modified, somewhat distorted our understanding of thinking. The ability to reason was seen as a quality of mind which was largely inborn and unchanging. There was little hope of improving children's thinking if they did not have this innate ability.

Galton's view (in Vernon 1970), was that genius was hereditary and there was a general factor called intelligence. However, Binet (in Brown,1985), who devised the first I.Q. tests, disagreed with this view and argued that thinking does not derive from a single function called intelligence but is made up of many smaller functions and, by improving these, children could be trained to become more intelligent in their thinking.

While some psychologists, such as Eysenck (1986), still adhered to the general view of intelligence as a fixed entity, new developments in cognitive psychology have led to widespread acceptance of a different

interpretation of intelligence which emphasises the part played by the social environment.

Bruner and Vygotsky for example stress that the ability to think and reason is the outcome of a social process. Bruner (1986) links reasoning to the structuring of experience, the development of schemata and the formation of concepts, while Vygotsky (1978) sees intelligence as 'dynamic potential', that all children have a potential for development in collaboration with others, and it is through language that children take control of their thinking and make sense of the world. Vygotsky (1962) emphasises the role of teachers and 'others' in the learning environment in helping children through their 'Zone of Proximal Development' - the difference between a child's mental age and the level reached with assistance. "Children with a mental age of eight, for example, could, with assistance, solve problems for twelve year olds" (Vygotsky, 1962, p. 103).

Encouraging children to go beyond their levels of performance by supportive strategies or 'scaffolding' is also stressed by Bruner (1986), who believes it is this 'loan of consciousness' which gets the child through the 'Zone of Proximal Development.' The reality is, however, that our school system offers children problems they can handle without help and fails to utilise the Zone of Proximal Development and that the problem often is that there are no 'significant others' to provide the scaffolding necessary to lead children beyond their present level of competence. This study seeks to address this question by providing a supportive structure to guide and extend thinking for both children and teachers.

Feuerstein (1980), whose theory will be presented later in this chapter, also believes intelligence is not hereditary, that "the genes do not have the final word", and that intelligence is a much more fluid phenomenon. He has defined intelligence as a set of skills or thinking processes which enable us

to make sense of the world but, in the absence of these skills, which, are usually passed on through a 'mediated' learning experience, they can be 'instrumentally' remedied. Feuerstein also believes there is too little emphasis on the social context for learning, which mirrors the view of Vygotsky and Bruner.

Piaget's theory of intelligence on the other hand is more closely linked to neurophysical development. He regarded learning as an activity with different stages of development which are biologically programmed. While his theory helps teachers understand a child's capacity for learning, it failed to take account of the central role language played in developing a child's understanding or the essential role adults played in providing 'cognitive scaffolding' for the child.

Not everyone was persuaded by the limits to learning suggested by Piaget. Bruner (1960) believed that 'any subject can be taught effectively to any child at any stage of development', while Donaldson's (1978) re-interpretation of Piagetian theory suggests, that previous assumptions about children's limited capacity for reasoning and abstract thought are inaccurate.

Recent research has been concerned with identifying different 'levels' of thinking processes and separate 'modules' for thinking. Gardner (1993), for example, views the mind as a community of separate intelligences, which he calls 'Frames of Mind', and suggests that in teaching children to think our task is to develop each of these intelligences. Included in these 'frames' are Linguistic, Logical/Mathematical, Musical, Spatial, Bodily Kinesthetic, Interpersonal, (which includes knowledge of oneself to operate effectively) and Social Intelligence. More recently, Naturist and Existential Intelligence were added to the frames (Gardner, 1997).

Sternberg (1984), on the other hand, views the mind as an information

processing centre, and believes it is component processes that make up intelligent performance. He suggests that intelligence can be broken down into a set of underlying processes and strategies for combining these processes and that all of these processes can be trained and developed. In his 'triarchic theory', Sternberg identifies three types of processes:

Knowledge* - acquisition components:-** processes used in learning new materials - ***(Input).

Performance components*:-** processes for doing the task - strategies we use in solving problems, etc - ***(Output).

Metacomponents*:-** executive processes we use to plan what we're going to do, monitor what we're doing and evaluate what we've done - ***(Executive Control).

This view of separate intelligences and executive processes has important implications for the teaching of thinking in schools and highlights the need for a broad approach. The Thinking Skills Programmes that have been pioneered over recent years aim to improve one or more of these information processing abilities and Sternberg suggests, "The time has come for supplementing the standard curriculum with such programmes" (Sternberg, 1984, p. 48).

It is important therefore to consider current developments in teaching thinking and review some of the programmes and approaches with a view to identifying the specific features which enhance children's thinking and learning.

Current Developments in Teaching Thinking

Programmes and Approaches

In response to the considerable research on human thinking discussed previously, there has been a flood of programmes on the market which claim to improve thinking skills.

Sternberg suggests that the increasing interest in teaching thinking stems to a large extent from concerns about failings in the current system and the need for intervention programmes to halt the 'unprecedented decline in the intellectual skills of our schoolchildren'.

> Something in the system is not working and I view Thinking Skills Programmes as exciting new developments for reversing the decline in intellectual performance we have witnessed in recent years.
>
> (Sternberg, 1984, p. 47)

Sternberg believes that wide-ranging research is needed before selecting programmes for implementation in schools, and that the question of whether Thinking Skills training should be infused into or separated from the regular curriculum, must be considered.

It is important therefore, before considering specific programmes, to distinguish between a 'separate skills' and an 'infusion' approach to teaching thinking, which Resnick (1989) describes as probably the single most important theoretical issue in the field of learning research.

Thinking Skills Programmes v Infusion

The main distinction in the field of teaching thinking is between those who aim to teach Thinking Skills through specially designed programmes and those who favour the infusion of thinking throughout the established curriculum.

Most programmes designed to teach thinking are based on the assumption that there are general aspects of thinking which can be taught separately and applied, through transfer, to specific situations. In this approach, core skills are identified and practised through exercises which are usually content free and not linked with any one discipline.

Resnick (1987) agrees that there are general Thinking Skills, applicable across a wide domain of areas, which can be taught and that considerable leverage can be obtained from programmes which aim to teach them explicitly. Examples are Feuerstein's 'instruments' where each instrument is designed to foster particular mental skills, or De Bono's Six Thinking Hats or C.O.R.T. Programme, which he maintains can quickly transform the learner's capacity to think.

While the 'separate skills' approach is often criticised for implying that thinking is an add-on element in the curriculum, the programmes are designed to focus attention on the processes of thinking and, as Nisbet suggests:

> To rescue thinking from the neglect it suffers in much of our educational practice and to empower learners in the wider application of Thinking Skills to other aspects of learning and to the world beyond the classroom.
>
> (Nisbet, 1989, p. 2)

In most programmes such as that of de Bono, skills are taught as content-free procedures and the transfer problem is their application in context. To facilitate transfer of learning, however, Perkins (1987) and Nisbet (1989) suggest that these skills must be practised in a variety of contexts until they become an integral, routine part of the learner's procedure.

While this approach addresses thinking explicitly, it does not contribute directly to improving content area instruction. A contrasting view is held by those who argue for 'infusion', embedding the teaching of thinking within the traditional curriculum. This 'domain-specific' approach is based on the assumption that the forms of thinking involved in different domains have relatively little in common and are best taught by an infusion of thinking into the teaching of each school subject. In this approach, transfer involves a decontextualisation by the learner after mastery of the skill.

In this approach, pupils are given experience of better thinking practices to promote a deeper understanding of the content. The teacher, for example, might try to present Socratic questions which require higher-order thinking, rather than just recall, but instruction time is spent mainly on the content with little reflection on the thinking itself.

Schoenfeld (1985) and Glaser (1989) argue that higher-order thinking is best learned through the study of 'knowledge-rich' domains of subjects in the traditional curriculum, while McPeck (1981) takes the view that all thinking is domain specific and that there is not one single skill that can be applied generally across subject area domains.

Many teachers would agree with this view and maintain that in teaching their subject they **are** teaching children to think in that subject. But, while many

good teachers encourage their pupils to think, it is not the same as teaching them **how** to think.

Siegel (1988) believes that teaching thinking means not just providing encouragement and opportunity but a knowledge of principles and techniques, and regular guided practice in applying these techniques. They argue that McPeck fails to consider obvious examples of general thinking skills and abilities and point out that thinking **in** a subject is not the same as thinking **about** a subject.

Coles and Robinson (1990) also suggest that the discipline-specific approach does not enable children to forge links between different areas of knowledge, thus offering the opportunity to make sense of the disparate school curriculum, nor does it offer the chance to examine the nature of their own thinking as some of the Thinking Skills Programmes do.

Adams also considers that transfer effects tend to be weak when thinking skills are taught in conjunction with some particular content area and suggests:

> If the Thinking Skills are introduced and developed through specific content, they will perforce, be remembered, understood and – importantly - accessible only in relation to that content.
>
> (Adams, 1991, p. 1)

Perkins (1992) agrees that in this approach, the treatment of thinking remains tacit and tends not to carry over to other settings. Thus, the 'specific skills' approach addresses thinking explicitly, while the 'infusion' approach treats content more deeply, but without the direct cultivation of thinking.

Perhaps, as Edwards (1995) suggests, the argument between those who advocate that Thinking Skills are domain specific such as Glaser (1984) and those who argue they are generalisable such as de Bono (1985) is to some

extent a non-argument. They are not mutually exclusive approaches, surely both are important.

We know that pupils often do not think very effectively and do not necessarily become good thinkers as a consequence of completing subject courses. Studies such as those of Gunstone and White (1980) and Nickerson (1984) show that the learning of thinking skills as a by-product of academic disciplines is relatively inefficient and ineffective.

However, without the continued and varied experience of using thinking skills, children will not attain mastery, therefore, 'bridging' to other areas of learning is essential.

> Teaching children solely through programmes minimises its effectiveness. Children receive a 'mixed message' when on Friday mornings they are taught from a Thinking Skills Programme and during the rest of their school experience these forms of thinking are not used.
>
> (Swartz & Perkins, 1990, p. 126)

The infusion of thinking skills, once learned, therefore is crucial to the effective and widespread use of the skills.

In an attempt to address this question, Swartz and Parks (1994), suggest an infusion approach which involves explicit attention to thinking during content instruction using 'Thinking Maps' and 'Graphic Organisers'. Pupils apply these 'Thinking Organisers' to the content but also reflect on their thinking. Both improvement in thinking and enhanced content learning are the goals.

A core of thinking skills and processes that cut across the various content areas are identified and Thinking Maps and Graphic Organisers are provided

for each of the thinking skills identified. Sample lessons are provided and a breadth of contexts for designing infusion lessons are illustrated. The aim is however that teachers will plan their own infusion lessons by selecting contexts in which the thinking process relates naturally to the content being taught. "Any teacher can design well-crafted infusion lessons which dramatically enhance student content learning" (Swartz, 1994, p. 4).

While this is an improvement on earlier ideas of the infusion approach, reservations must remain about, for example, the teacher's ability and willingness to design infusion lessons for every subject area and to identify the specific thinking skills to promote in each lesson. The 'Thinking Organisers' are difficult to use and the time taken to complete them unrealistic in the realities of today's classrooms. Perhaps the Swartz view therefore is somewhat naive. Learning to name our thinking will not necessarily help modify it. Also, while there may be a novelty element to begin with, continually motivating children to use the 'Thinking Organisers' for every lesson will be difficult and no guidance is given as to how teachers assess children's responses.

A further concern however is that teaching thinking must involve more than just getting children to think well within the walls of a classroom. Children must be able to assimilate good thinking practices and use them in their lives outside of school.

What is required therefore is a resource which will address this gap – which will provide the explicit teaching of thinking skills but model for children, in a realistic way, how these skills can be infused into other areas of their lives and their learning.

Sternberg (1987) believes that the burden of teaching thinking entirely within an existing curriculum is just too great and that if schools are serious about

teaching thinking they must devote special time to it. He suggests that Thinking Skills Programmes could act as a catalyst to influence the pedagogy and curriculum of the whole school. Edwards agrees and sees great benefit in teachers beginning with Thinking Skills Programmes that already embody many of the powerful techniques for teaching thinking.

> It allows teachers to get into the water quickly and relatively easily and get a feel for what it's like to teach thinking directly.
>
> (Edwards, 1995, p. 29)

Edwards believes that many of the programmes available do an 'excellent job', but, how do educators choose from the vast array of programmes available, which is best and what should one look for in such a programme?

Thinking Skills Programmes

Programmes differ widely in many respects, having different theories, serving different purposes producing different outcomes. They differ in scope, skills addressed, intended audience, and evaluation instruments used. Some require a massive commitment in time and money for staff development, others rely on the material itself and need only minimal in-service.

Sternberg (1984) suggests wide-ranging research is needed before selecting a programme for implementation and Edwards (1995) warns that school staffs could spend years exploring the range of programmes available.

Realistically however, most schools do not have time to review or investigate programmes, and decisions for adoption are often based on ease of installation, minimum staff development and financial economy.

To make classification easier, Nickerson, Perkins and Smith (1984) group Thinking Skills Programmes into separate categories and, while this classification is far from perfect, as many of the programmes could fit equally well into more than one category, it does help make some useful distinctions. These categories are:

The Cognitive - process approach
The Heuristics - oriented approach
The Thinking About Thinking approach
Learning Strategies

The **Cognitive-process approaches** assume that Thinking ability depends on certain fundamental processes such as comparing, ordering, classifying, inferring and predicting. Such processes are assumed to be essential to the performance of many intellectually demanding tasks. Children practise these processes in a variety of contexts, the assumption being that extensive practice will strengthen the underlying processes and make them more

accessible for application to other contexts. The basic cognitive processes are considered to be 'muscles of the mind' which can be strengthened through use. Examples of this approach are:

Structure of the Intellect Programme (S.O.I.)	Meeker, Harvard University	1979
Instrumental Enrichment Programme	Feuerstein	1980
Project Intelligence	Perkins, Nickerson et al	1981
Odyssey - A Curriculum for Thinking	Nickerson et al	1982
Tournament of Minds - Adapted in Australia from Harvard Project		1986
Somerset Thinking Skills Course	Blagg & Ballinger	1986

Heuristic-oriented approaches promote the idea that there are certain heuristics worth learning because they are applicable to problem-solving more or less independently of the nature of the problem. Research for this approach involved investigating how 'experts' differed from 'novices' in solving problems. Larkin et al (1980) and Schoenfeld (1985) found that 'experts' spent more time than 'novices' on preliminary activities i.e. conceptualising a problem, finding alternative ways of representing it and planning an approach. Programmes that focus on heuristics therefore typically put considerable emphasis on these activities. Examples of this approach include:

The Productive Thinking Programme	Covington	1974
Problem Solving	Schoenfeld	1980
C.O.R.T. Thinking Programme	De Bono	1983

Thinking About Thinking approaches focus on thinking as subject matter, the assumption being that learning about thinking can improve thinking. Research by Nisbett and Ross (1980), Flavell (1981) and Donaldson (1983) highlight that 'experts' have a greater repertoire of metacognitive skills than 'novices'. They plan more effectively and monitor performance more

carefully. While many of the Thinking Skills Programmes have metacognitive components, there is as yet no formal programme which focuses exclusively on teaching metacognitive skills. Programmes that explicitly encourage children to think about thinking, however are:

Philosophy for Children Programme	Lipman	1980
Complete Problem Solver	Hayes	1981

Learning Strategies approach investigates the effectiveness of specific strategies aimed at improving learning. While they are not in widespread use, these programmes contain a number of important learning strategies teachers can use to develop thinking in the classroom. The aim is to help children become more effective thinkers and learners. Strategies such as brainstorming, questioning, diagramming waiting time, and mnemonic techniques are explored (Nickerson et al, 1984) and metacognitive strategies for monitoring performance etc. are also considered. Examples of programmes that emphasise learning strategies are:

Learning Strategies	Weinstein	1983
Chicago Mastery Learning Programme	Jones	1983
Tactics for Thinking	Marzano	1986
Learning to Learn	Heiman & Slomianko	1986

Even after careful consideration therefore it is rarely possible to find just one programme to cover the range of thinking skills required. Often several programmes need to be included even though some will not be used in entirety, making it expensive and difficult to administer and teach.

Many teachers, already suffering from 'cognitive overload', see it as just another course in an already overcrowded curriculum and make only a token investment in the programmes. Further, the fact that many of the Thinking

Skills Programmes are designed by curriculum developers rather than teachers has important implications for how easily individual teachers can use the programmes in the complex realities of schools.

The question therefore of which of the existing programmes is 'best' is to some extent unanswerable. Such is the range and diversity of Thinking Skills Programmes, there is a need to develop a programme which provides a more balanced approach to teaching thinking, which provides a broader perspective. A programme which provides teachers with a realistic framework for the explicit teaching of thinking skills, which will equip children with a broad range of 'Thinking Tools' to use throughout their lives.

With a view to developing such a programme therefore, it is important to consider which features across a number of contrasting programmes would lead to the optimal approach to teaching thinking. While it would be impractical to give a detailed review of all of the programmes listed, three contrasting programmes have been selected – one from each category – which illustrate the range and diversity of Thinking Skills Programmes available.

Instrumental Enrichment

Reuven Feuerstein's Instrumental Enrichment Programme was originally proposed for use with children showing 'retarded performance', but has since been recognised to be valuable for children at all levels of the intellectual spectrum.

One of the founder members of the State of Israel, after the Second World War, Feuerstein was responsible for the education of young people traumatised by the holocaust, who poured in to Israel from all over the world. He became aware, not only of their culturally different backgrounds, but that many, categorised as mentally retarded because of cultural deprivation, were potentially far more capable than revealed by conventional assessment techniques. He believed that traditional tests were misleading and counter-productive, that they become self-fulfilling prophecies, that they reflect cultural differences, **not** the ability to learn.

In Feuerstein's terms, culture should be seen as the active process by which knowledge, values and beliefs are transmitted from one generation to the next and cultural deprivation as a failure on the part of parents and educators to transmit or mediate the culture to the new generation. Unless parents and educators make the culture available to children, they will be deprived of the vital structuring needed for full cognitive development and will fail educationally.

To gain a greater understanding of how children learn, he moved to Geneva to study under Piaget, but rejected the idea of child development as a 'biological unfolding'. He believed that too little emphasis was placed on the social context of learning and disagreed with the current psychological views on the fixed and inherited nature of intelligence. Indeed, his views so conflicted with the psychology of the time that he was regularly dismissed as a crank. Eventually, with the help of like-minded colleagues, a Research Institute was

established outside Jerusalem where Feuerstein set out to 'shatter some of these established myths'. In 1979 he published 'The Dynamic Assessment of Retarded Performers' and in 1980, 'Instrumental Enrichment' and the 'Learning Potential Assessment Device'.

He begins with the belief that all humans, of any age, however severely disabled, for whatever cause, can become fully effective learners. He views all humans as potentially dynamic with a potential for change and disagrees totally with the idea of a static cognitive structure which precludes the mastery of higher learning skills.

Central to his theory is the idea of 'structural cognitive modifiability' and the essential feature of his approach is that it is directed, not merely at the remediation of specific behaviours and skills, but at changes of a structural nature that alter the course and direction of cognitive development. Feuerstein states:

> When we use the term 'cognitive modifiability', we refer to structural changes or to the changes in the state of the organism, brought about by a deliberate program of intervention that will facilitate the generation of continuous growth by rendering the organism receptive and sensitive to internal and external sources of stimulation. Thus, a structural change once set in motion, will determine the future course of an individual's development.
>
> (Feuerstein, 1980, p.9)

Feuerstein distinguishes two forms of interaction between an individual and his environment that contribute to the development of cognitive structure;

direct exposure to stimuli from the environment, and learning experiences mediated by an agent, often a parent or teacher. While both are considered essential, differences in levels of cognitive development are attributed largely to differences in mediated learning experiences.

> The more an organism has been subjected to adequate levels of mediation, the greater is its capacity to learn, i.e. to become modified through direct exposure to stimuli.
>
> (Feuerstein et al, 1979, p. 356)

Mediated learning experiences are of two types:

(a) experiences that involve the transmission of information, values and attitudes.

(b) experiences aimed at helping the child learn from direct exposure to stimuli that will transcend the immediate needs and generalise to other contexts.

The absence of these interactions can result in grave cognitive deficiencies, but they are reversible, and The Instrumental Enrichment Programme is Feuerstein's attempt to define procedures that will remediate the detrimental effects of the lack of mediated learning experiences. He contends that the use of such procedures can change cognitive structure and increase an individual's capacity to learn.

> The goal is to change the cognitive structure of the retarded performer and transform him into an autonomous independent thinker.
>
> (Feuerstein, 1980, p. 1)

After extensive research, Feuerstein and colleagues drew up a list of fifty or so interactions in real life which offer children Mediated Learning

Experiences and these have played a crucial role in the construction of the Programme.

Mediated Focusing is one example: crucial to a child's cognitive development is the transfer of the ability to focus perception and attention and, the absence of an adult to help the child learn to focus attention and see single objects in great detail, can have profound effects. It leads to an inadequate perception of reality - blurred and sweeping perception - which excludes a child from acquiring a whole range of cognitive functions. Perception skills are required for comparison between objects, comparison is required for categorisation which in turn is necessary for logical thinking.

Even minor impairments could have a significant impact on children's thinking processes because of the knock-on effects onto other parts of the cognitive structure. For example, a child who cannot be precise cannot compare effectively and this affects the ability to classify, categorise, draw analogies and make conclusions. A child with poor spatial and temporal orientation would find it hard to order his/her work, or analyse cause and effect, understand logical progression or construct abstract representations of situations. In fact, the ability to develop abstract thought at all would, according to Feuerstein, be greatly impeded.

Feuerstein believes that cognitive deficiencies resulting from inadequate mediated learning, can interact with each other and with emotional and motivational factors, to make children fail in school, in I.Q. tests and in life. He suggests however that these deficiencies are often misinterpreted by teachers and psychologists as severe learning difficulties.

To identify the precise nature of a child's deficiencies resulting from inadequate mediated learning, he produced the 'Cognitive Map' which separates the act of thinking into three stages:

(1) **The Input Phase** - Impairments concerning the quantity and quality of data gathered by the individual.
(Blurred and sweeping perception, unplanned, impulsive behaviour, etc.)

(2) **Elaboration Phase** - Impairments concerning the efficient use of data available.
(Inability to see or define an actual problem, select relevant cues, etc.)

(3) **Output Phase** - Impairments concerning the communication of elaborative processes.
(Trial and error responses, impaired verbal tools, lack of precision, etc.)

Feuerstein himself suggests this is an over mechanical analysis of the way children think and agrees that these three stages rarely, if ever, occur separately in real life. It has, however, allowed a system of diagnosis which can be used by teachers and other professionals.

Once the cognitive deficiencies are identified, what children need are activities or 'instruments' that will provide the intellectual enrichments they have been lacking. The six specific sub-goals of the programme are:

(1) Correction of the deficient functions that characterise the cognitive structure of a particular individual.

(2) Acquisition of certain basic concepts (labels, vocabulary, etc), that are necessary to perform the cognitive tasks in the programme.

(3) Production of intrinsic motivation through habit formation (to ensure transfer to non-school situations).

(4) Production of reflective insightful thinking by the student regarding success or failure with tasks.

(5) Creation of task-intrinsic motivation (enjoyment of the task for its own sake).

(6) Installation in the learner of a perception of him/herself as an active generator of knowledge and information, rather than a passive recipient.

Feuerstein suggests the last sub-goal to be one of the most vital aspects of the programme.

> The passivity of the culturally deprived, retarded performer towards incoming stimuli and himself is also responsible for a host of other attitudinal, motivational and emotional determinants of his behaviour.
>
> (Feuerstein et al, 1979, p.118)

Considerable importance is attached to the relatively content-free nature of the exercises so that even the most backward children can attempt the task and attention is focused on correcting the specific deficient functions rather than on content.

Feuerstein maintains that children with cognitive deficiencies do not have the mental apparatus to sort, store or re-use information so any attempt at remediation must involve, as far as possible, abstract content-free tasks. He suggests that one of the great errors of conventional special education is to rely on 'concrete' educational techniques and devices. Feuerstein believes this has failure written in because the children do not have, and are not given, the thinking behaviours to organise materials and generalise.

Emphasis is placed throughout the programme on learning how to learn and, while the instruments can be used individually for specific needs, the programme provides enough material for two to three one-hour weekly lessons over a two year period.

The Instrumental Enrichment Programme is divided into fifteen 'instruments' organised in three clusters:

Those requiring little or no reading ability:- Organisation of Dots, Analytical Perception, Illustrations.

Those requiring some reading ability or assistance in reading directions:-
Orientation in Space I, II & III, Comparisons, Family Relations, Numerical Progressions, Syllogisms.

Those requiring independent reading and comprehension skills:- Categorisation, Instructions, Temporal Relations, Transitive Relations, Representational Stencil Design.

Simply doing the exercises does not produce the structural changes the programme intends, the instruments are viewed as a tool to facilitate the role of the teacher as a mediator. A detailed description is given in the programme of how this should be done but throughout, children are required to think about their own thinking and the cognitive processes they are using.

The programme has been applied to many different age and ability groups and subjected to rigorous evaluation. These studies show that performance in I.Q. tests is significantly enhanced by exposure to Instrumental Enrichment and this has been found for children at all levels of the intellectual spectrum including mentally retarded, culturally deprived and 'gifted' children (Burden, 1987; Shayer & Beasley, 1987; Blagg, Ballinger & Gardner, 1989).

A Venezuelan study by De Sanches (1983) found that not only did Instrumental Enrichment improve Thinking Skills, the programme

developed self-esteem and positive attitudes towards learning. In his analytical review of Thinking Skills Programmes, Sternberg found it to be, "An exemplary programme for improving intellectual functioning" (Sternberg, 1984, p.42).

Instrumental Enrichment has been translated into seventeen languages, and twenty eight countries have programmes in varying degrees of development. Training centres are being established throughout the United States and Canada. Many 'Third World' countries have adopted the programme, and new versions oriented to early childhood and high-functioning adults are being produced.

In Britain, however, there has been less enthusiasm for the programme. While many stress the need for the development of cognitive skills there has been little financial commitment, and attempts to adapt the instruments, i.e. The Somerset Thinking Skills Programme, which reduces the level of units to the assumed level of backward and inattentive children, is opposed to everything Feuerstein stands for.

With universities and industries constantly complaining that our education system is not producing the 'thinkers' needed to keep abreast of rapidly changing technology, and with the cultural fragmentation resulting from unemployment and changing social values, Howard Sharon suggests,

> The tragedy of Britain's approach to cognitive education in the state system is that perhaps no other country in the Western World probably needs it more.
>
> (Sharon, 1987, p. 321)

The strengths of the Instrumental Enrichment Programme are, therefore, that it can be used across a wide age range, across a wide range of ability levels

and across socio-economic groups. Children enjoy the exercises and all studies suggest it is effective in raising intrinsic motivation and self-esteem.

On the negative side however the programme requires extensive teacher training which must be administered by a designated training authority for the duration of the programme. It requires therefore considerable commitment in terms of time, training, costs, etc. Further, the isolation of problems from any discipline base raises questions regarding transfer of skills to academic and real world tasks. Studies by Shayer & Beasley (1987) and Blagg, Balinger and Gardner (1989), while optimistic about the programme in general, question claims made regarding 'transfer'.

While Sternberg (1984) believes it to be among the best of the available programmes for thinking skills training, it falls short in the affective domain and, despite Feuerstein's aversion to I.Q. Tests, the programme trains those abilities that I.Q. Tests tap, rather than a broader spectrum of abilities.

Despite the limitations with regard to costs, breadth of skills taught and potential power for generalisation, nevertheless, the programme has much to commend it. Feuerstein's belief in the potential of children, in the concept of cognitive modifiability; in the idea that all children can be changed by education; in the importance of the role of the teacher or parent as 'mediator' and the consequences of the lack of 'mediated learning experiences' for children, are features of his programme of which all teachers should be aware and must surely be considered in developing a Thinking Skills Programme.

Philosophy for Children

The Philosophy for Children Programme was developed by Mathew Lipman (1980) because he believed schools were failing to teach children to think. It differs considerably from Instrumental Enrichment yet it seeks to foster many of the same intellectual skills though in a very different manner.

A professor of philosophy at Columbia University, New York, Lipman was concerned at the low level of Thinking Skills in his college students and concluded that their otherwise successful progress through the school system had not enabled them to think logically. If, he wondered, education is supposed to be about teaching young people to think, why does the education system produce so many unthinking people?

> I began to think that the problem I was seeing at the University could not be solved there. That thinking was something that had to be taught much earlier, before thinking habits became entrenched, so that by the time a student graduated from High School, skilful, independent thinking would have become a habit.
>
> (Lipman, 1980, p.83)

Lipman's view is that all children can be transformed by education; but education must be transformed to make thinking, rather than knowledge, a priority. While a thorough grounding in the 'three R's' was essential, the transformation will come about by teaching a fourth 'R' – reason itself.

He argues that most children bring to school a curiosity and eagerness to learn. They have a need to know and to understand, but gradually that curiosity fades and we blame it on everything except what school does to

them. It is the school's failure to nourish such needs which sets so many children against school. "We must capitalise on the 'treasures' that children bring to school, their curiosity and their hunger for meaning" (Lipman, 1990, p. 39).

He proposed therefore, a course in philosophy to teach children to think because he believes philosophical discussion develops reasoning skills, self-esteem and moral values. Skilled reasoning, according to Lipman, requires more than just an "intellectual bag of tricks", it is learned through the social interaction of disciplined discussion.

From Socrates the importance of dialogue has been recognised as a means of seeking answers to the most fundamental questions about life and Lipman decided to use dialogue as a means of introducing philosophy into the school curriculum. Like Vygotsky, he believed that thinking and language are inextricably linked and that children are able to function at an intellectually higher level when in collaborative or co-operative situations.

The overall aim of his Philosophy for Children Programme therefore is the formation of 'communities of inquiry' in the classroom where pupils engage in self-corrective thinking as they internalise the dialogical process of classroom discussion. The 'community' helps create confidence and courage by building mutual respect and equality. As self-esteem and autonomy grows, each child comes to feel increasingly responsible for his or her own education.

Lipman (1990) stresses however that it is not the kind of community that encourages uniformity, where everyone marches together in the same step, creativity and individuality are encouraged by respecting difference. Important too, is that the community of inquiry claims to develop the whole child because it recognises the importance of the emotional side of learning.

The best way to get children to engage in philosophical discussion, Lipman decided, was through stories and in 1974 he published Harry Stottlemeir's Discovery (a play on the name Aristotle). It was intended for ten to twelve year olds and introduced philosophical topics and some elements of logic in a fictional context. The plan was to use the story to initiate discussion in the classroom to help develop reasoning skills. Thus, by discussing the ways in which Harry and the other characters in the novel try to reason and unravel the mysteries of thought, children think about their own thinking and how to improve it.

In 1974 the Institute for the Advancement of Philosophy for Children (I.A.P.C.) was founded to develop further curricular materials, resulting in a complete Philosophy for Children Programme for ages five to sixteen. Materials are linked in a continuous fashion to ensure reinforcement of acquired skills and dispositions. Thus, the cognitive skills developed in each programme prepare children for the cognitive performances required in the next.

The programme consists of a series of stories in which fictional children spend a considerable portion of their time thinking and reflecting, not only about ordinary everyday problems and experiences but on philosophical topics such as the nature of thinking and how the mind works. Through reading the stories and engaging in classroom discussion, Lipman's objective is that children will identify with the characters and join in the kind of thinking depicted in the programme.

According to Lipman (1988) the stories have a single theme – the workings of the human mind – and a single purpose – to serve as springboards for intellectual debate. Each novel is accompanied by a teachers' manual which

guides the teacher in the methodology of the programme and provides a huge range of questions and exercises to develop thinking skills.
Minnis (1990) points out that the children in the stories try to be objective and figure out the rules of logic and reasoning for themselves. They share their innermost thoughts and, with each other's support, they overcome fears of being seen as different or stupid. They listen to each other and learn to respect each other. On every level, therefore, the fictional children offer models for the class to emulate.

While to many the mention of using such topics with young children is 'mind-boggling', Coles and Robinson (1990) point out that even very young children begin to use language in a very sophisticated way and to reflect upon that usage. Sternberg (1987) also believes that, traditionally, children are equipped with books devoid of intellectual stimulation, where anything problematic has been left out, and that while this may make for literacy, the dysfunction between reading and thinking is firmly established. Lipman however has constructed a literary genre in which the stories to be read reveal to children how thinking can be conducted by presenting a model of 'thinking children'.

One example of the programme is 'Kio and Gus' (Lipman, 1986) designed for children nine to ten years of age, and its main theme is 'Wondering about the World'. It aims to capitalise on the child's natural curiosity about the world at large and to build up a network of theories about how the world works. It opens children's minds to questions about society and human existence. It consists of a novel 'Kio and Gus' and an extensive teachers' manual 'Wondering at the World', which contains a wealth of exercises and discussion plans keyed to the terms and concepts in the novel. When the children choose their own points of interest from the passage, the teacher can introduce an appropriate exercise or discussion plan to help pinpoint

issues or foster dialogue. The main aim is to help children think about the world by encouraging them to acquire reasoning and inquiry skills.

In the story, Kio and Gus become friends, Kio's mother is dead and Gus is blind. They see the world differently but find they have much to learn from each other. These different perspectives are demonstrated to children in the classroom as the characters wonder about fear and courage, truth and beauty, make-believe and reality.

Early chapters in the programme focus on thinking skills and philosophical concepts whereas in later chapters the emphasis is on applying these in a scientific context. The children move therefore from thinking philosophically to thinking within a discipline. "This means the problem of transfer is not simply dumped in the laps of teachers" (Lipman, 1986, p.3).

Kio and Gus fosters skills such as inferring, classifying, analogical reasoning and develops concepts such as rules and class/family distinctions. It also deals with concepts and ideas related to dispositions and emotions. The book makes an ideal introduction to science and environmental education, but can serve as a language, or reading programme, as well as an independent course in philosophy.

Lipman states that the theoretical and empirical framework of the programme, insofar as it emphasises classroom discussion, was derived from Vygotsky and Bruner: "For whom classroom dialogue is the key to the sharpening of thinking and the sharpening of thinking is the key to the improvement of education" (Lipman, 1986, p.54).

The idea of organising the materials into a story rather than a text, came from Dewey (The Child and the Curriculum), as did the notion that

an educational session should begin with an experience upon which to reflect; while the decision to construct the manual exercises of sequenced questions, discussion plans and inquiry strategies, is in keeping with the Socratic approach to dialogue.

The programme aims to improve the reasoning skills and reading performance of children after one year of participation in the programme. The teacher is a co-participant in the 'community of enquiry', facilitating discussion, and training is essential. An important part of the training is that teachers themselves learn the philosophical skills in the same way as the children, with a trainer modelling the role of teacher.

The essential features of the programme therefore are:

1. The use of children's novels instead of traditional text for the cognitive content of the course and the use of fictional children modelling the discovery process.

2. The use of formal and informal logic to improve reasoning skills.

3. The reliance on philosophy to provide ideas for discussion.

4. The development of critical dispositions through communities of enquiry.

5. The emphasis on classroom dialogue to improve comprehension and on teacher training to foster classroom dialogue.

6. The cross-curricular nature of the programme by demonstrating how reasoning can be applied to any discipline.

7. The curriculum is sequential and cumulative.

8. The curriculum stresses the emotional as well as the cognitive aspects of the child's experience.

Although it was developed in the United States, the Philosophy for Children Programme is now used in over twenty countries around the world. It has been extensively tested, and studies by Lane and Lane (1986) report significant improvements in reading, mathematics, logic and critical thinking as well as improvements in interpersonal relationships. Jones (1988) reported that apart from its use in promoting better attainment, the Lipman method enhanced social skills and self-esteem. Similar results were found in studies by Shipman (1983) and Weinstein and Martin (1984), while a study conducted by The Educational Testing Service in the United States on over two thousand children showed significant improvements in reasoning abilities (Costa, 1991).

Data from my own study (Kite,1991) suggests that children who used the programme made significantly greater gains in Reading Comprehension, Creative Thinking and Self-esteem than their non-programme peers, even though less time was devoted to the programme than Lipman recommends.

The strengths of the Philosophy for Children Programme are that the stories are exciting and motivating for children. They enjoy reading the stories and identify with the characters. The use of fictional characters to model the thinking processes and help children spark off their own thinking is important. Studies suggest the programme is effective in raising the level of a broad range of thinking skills as well as children's self-esteem and the infusion of thinking skills into content areas should aid 'transfer'.

On the negative side, however, children of below average ability can have difficulty with the reading and reasoning in the programme, while others may have difficulty relating to the middle-class values of the characters in the stories (Sternberg, 1984). Also, some of the novels have a strong American flavour and the linguistic differences in the material – spelling, grammar, etc., can present a problem. The programme requires extensive teacher training

and therefore considerable commitment in terms of time, training costs, etc. Sternberg suggests the success of the programme is as dependent on the teacher as it is on the material and that some teachers themselves may have trouble with the thinking skills taught in the programme. Despite this Sternberg believes, "No programme I am aware of is more likely to teach durable and transferable thinking skills than Philosophy for Children" (Sternberg, 1984, p.44).

Despite the limitations with regard to costs and the range of children for whom it is appropriate, the Philosophy for Children Programme has much to commend it. Using fictional characters to model the thinking processes and 'intellectually stimulating' material to promote philosophical discussion; using the 'community of inquiry' to develop reasoning skills and promote self-esteem; helping children achieve a new sense of identity as thinkers and learners and become more rational, more reasonable and more reflective human beings in the process are surely goals worth considering in any Thinking Skills Programme.

The CORT Thinking Programme

Edward de Bono's CORT Thinking Programme (which stands for the Cognitive Research Trust) is one of the most widely used programmes for the direct teaching of thinking as a set of basic skills. It differs from Instrumental Enrichment and Philosophy for Children in that it focuses on the 'perceptual' aspects of thinking and the purpose of the CORT lessons is to broaden perception so that in any thinking situation the child can see beyond the obvious and the immediate. The aim is to equip people with appropriate 'tools' designed to create a broader perceptual map, or framework, so that they are able to see things more broadly and in different ways.

According to de Bono (1991), the emphasis on critical thinking has long been the bane of society and education, and he suggests, critical thinking is reactive and lacks the creative, constructive elements necessary for social progress. He believes that when youngsters leave school they will be 'operating' in the future, that, "life is not written out as textbook passages waiting for reactions" (de Bono, 1991, p.27). They have to plan, decide, choose, take initiatives and make things happen. Children will need, what de Bono has termed, Operacy - the skill of doing things, of making things happen - and, he believes the term Operacy should stand with literacy and numeracy as a primary goal of education. He defines thinking as: "The operating skill with which intelligence acts upon experience" (de Bono, 1991, p. 27).

The C.O.R.T. Thinking 'Tools' therefore are the 'operating tools' to broaden thinking and develop creativity or 'lateral thinking', de Bono (1970). He suggests however that when children begin to use lateral thinking to solve problems they **then** need the critical or evaluative aspects of thinking and the programme deals with this by including lessons on evidence, use of analysis

and selection etc. The important point being critical thinking skills are not sufficient in themselves, but part of a broader set of skills.

To those who suggest thinking is a natural ability which cannot be taught as a skill, de Bono points out that walking and running are also natural, but athletes can be coached to a much better performance. Therefore, what seems to be natural, can still be improved by direct training and practise. Using the same analogy he suggests:

> Soccer players practise kicking and passing so that they can do them accurately and without hesitation when the need arises. The deliberate practise of different aspects of thinking has the same purpose so that when we need to use these aspects, we do so accurately and without hesitation.
>
> (de Bono, 1986, p. 67)

De Bono refutes the suggestion that thinking is nothing more than the visible operation of innate intelligence and makes the point that many people with a high I.Q. are not effective thinkers. The CORT Thinking Programme is a deliberate attempt to avoid what he terms the 'intelligence trap', which occurs when a high I.Q. is not accompanied by effective thinking skills.

He asserts that to be effective, thinking does need an information base but it is absurd to suppose if we have enough information it will do our thinking for us. "Information is no substitute for thinking" (de Bono, 1991, p. 27).

He believes therefore that while some thinking skills can be developed as a by-product of specific subjects, they are only a small part of the broad range of thinking skills required for life. The ideal situation is to have focused practice on thinking processes, then use them in other areas. De Bono (1991) suggests that a specific place in the curriculum must be set aside for

the teaching of thinking skills to establish 'thinking' as a subject in its own right.

To the theorists who believe there is thinking in history, thinking in mathematics, thinking in science and that no generalisable thinking skills exist, de Bono points out that looking for alternatives is a generalisable thinking skill, and deliberate provocation is a technique that can be applied to generate ideas in any situation. His view is that generalisable thinking skills exist but cannot be taught using specific content. He also suggests that little transfer of thinking skills takes place from one subject to another which is why the CORT Programme deliberately focuses on 'tools' that can be easily transferred to other situations.

The design criteria for a practical instructional programme, de Bono (1991) suggests, should include the following elements:

- The programme should be useable by a broad range of teachers, not just highly qualified or highly gifted.
- It should not require complicated teacher training.
- The programme should employ parallel design so that if some parts of the programme are badly taught or other parts skipped, what remains is useable and valuable in its own right. (This contrasts with hierarchical design in which a child must grasp a basic concept before moving on to the next and therefore failure at any layer in the programme makes the whole system unworkable).
- The programme should be enjoyable for both teachers and children.
- The programme should focus on thinking skills that will help children function better in life outside school.

The emphasis in the CORT Programme therefore is on simplicity and practicality. The tools are designed to be easy to operate, have a useful effect and have practical value. The programme has six sections each consisting of ten lessons covering:

1. Breadth
2. Organisation
3. Interaction
4. Creativity
5. Information
6. Feeling and Action

All teachers who use the programme should teach CORT 1 (Breadth) first, (indeed, some teachers use only the ten lessons of CORT 1). Thereafter, the sections can be used in any order.

The CORT 1 Programme - Breadth - aims to broaden student perception by demonstrating a number of different directions that thinking can follow. It covers around eight to ten hours of instruction. First, the particular thinking skill is described and explained by the teacher, then the children, working in groups of three or four, apply the skill to the practice items. A whole-class feedback and discussion session follows, then a discussion on the use of thinking skills.

The first of de Bono's lessons involves the P.M.I. strategy which involves looking for Plus, Minus and Interesting points in any idea. A number of ideas would be considered such as:- Should all cars be painted yellow? or, Is homework a good idea? or, Should people wear badges to show their mood at a particular time? etc. The items are not related and the groups spend only two to three minutes on each item so that attention stays on the 'tool' and not the content. Once the skill is developed, children can apply the P.M.I. to other situations and settings. The term P.M.I. is designed to be artificial, memorable and easy to pronounce and while some teachers reject it as pointless jargon, de Bono (1991) believes that without the artificial term

P.M.I. to crystallise the process and create a meta-pattern, the exhortation does not stick.

Other 'tools' suggested in the Breadth package include:

C.A.F. – Where children consider all the factors in for example, buying a car, choosing a new teacher, deciding how to spend a holiday, etc.

C. & S. – Consequence and sequel where children think of the consequences, not only to themselves but to others if, for example, school exams were abolished or if children had to leave school aged twelve to earn a living, etc.

A.G.O. – Aims, goals and objectives to make children aware that human actions have a purpose. They would list the aims of the police or their objectives when they turn on the T.V., etc.

F.I.P. – First important priorities where children prioritise their ideas in running a school, organising a party, etc.

A.P.C. – Alternatives, possibilities, choices where children consider the choices they have if, for example, they find a five pound note, etc.

O.P.V. – Other people's views where children look at the same situation from different points of view, misbehaving in class for example where they look at the situation from the point of view of the teacher, parents, classmates, etc.

Other 'tools' in the Breadth Package include, making decisions, planning and setting rules. The emphasis is on having a variety of practise problems so that attention remains focused on the 'process' and the operations are rehearsed till they become second nature.

While de Bono (1991) believes thinking is best taught to 9, 10 and 11 year olds, who have sufficient verbal fluency and experience to operate the 'thinking tools', his programme has been used by children and adults of all ages, by the elite and disadvantaged, by gifted students in Canada, by children in the jungles of South America, by top executives of the Ford Motor Company and in the IBM Headquarters in Paris.

An intensive study into the effects of the CORT Programme by Edwards (1989) highlighted improvements in self-esteem as well as gains in language arts and social science. It also confirmed evidence from two previous studies (Edwards and Baldauf,1983,1987) of the transfer of CORT 1 skills to other areas of learning. Similar results were found in a study by Jeffries (1989) who also found greater breadth of perception in problem-solving situations.

My own research, Kite (1991), confirms the above findings, although the success of the programme depends, to a large extent, on the skill of the teacher in introducing variety to the 'operations' and adapting the 'tools' to meaningful situations. While both teachers and children enjoyed using the CORT Programme, perhaps the most important aspect is that it significantly enhanced children's view of themselves as thinkers.

The strengths of the CORT Programme are therefore that it can be used across a wide age range and ability levels, across cultures and socio-economic groups. The emphasis is on simplicity and practicality. It does not incur huge costs or extensive teacher training. There is an excellent teachers' guide, and teachers and children enjoy using the programme. A most important aspect of the programme is that it encourages children to think of themselves as thinkers and to see thinking as something that can be modified and improved.

On the negative side, the lack of content in the programme is criticised and claims made regarding transfer of skills to other curricular areas is questioned (McPeck, 1981). There is a sameness about the lessons and the materials appear less intrinsically motivating to children than, for example, the Lipman programme. Therefore, while the material provides a framework, the teacher has to adapt the material, introduce variety, make it interesting and use the operations in meaningful contexts to aid transfer. The teacher has to make it work.

A further concern is that much of the discussion is teacher directed. There are no right or wrong answers and there is a danger of teachers becoming judgmental, imposing their own ideas. As de Bono (1991) stresses, however, PM1, CAF etc, are scanning tools not judgement tools. The programme is also criticised for failing to consider children's own beliefs and values. Therefore, while it may enhance cognitive skills, it is lacking in the affective domain (Costa, 1991).

Despite the limitations, however, the programme has much to commend it. The simplicity of the programme and ease of administration are features which must be considered in the realities of today's schools. Also, de Bono's concern with taking children beyond traditional reactive thinking to improve breadth of perception and creativity, and with improving children's concept of themselves as thinkers, are important considerations for any Thinking Skills Programme.

Overview

The three major Thinking Skills Programmes described are excellent examples of programmes with strong theoretical foundations. They illustrate the diversity and multi-faceted nature of thinking and the broad range of Thinking Skills Programmes available.

They are among the most widely used, have been extensively tested and evaluated and have solid data to demonstrate their success. Collections of research evidence on these and other Thinking Skills Programmes can be found in Segal et al (1985), Nickerson et al (1985), Perkins et al (1987), MacLure and Davies (1991) and Edwards (1994).

Despite these exciting results, as stated earlier, Edwards (1994) suggests, Thinking Skills Programmes probably influence less than 5% of schools across the U.K., U.S.A., and Australia, largely because programme developers have failed to consider effective implementation strategies for the complex realities of schools.

While Instrumental Enrichment and Philosophy for Children are both excellent programmes, they require a substantial commitment in terms of time and training costs. Teachers, for example, need a minimum of 45 hours training, each year of the programme, to teach Instrumental Enrichment. It is difficult for schools to make this kind of commitment when, as can happen, staff who have been specially trained leave or move on and enthusiasm for the programme fades. Or, a 'feast or famine' syndrome occurs when children have the opportunity to engage their thinking in one year but have no opportunity the next.

On the other hand, while the CORT Programme offers an 'easy way in' for teachers, in that it requires relatively little training, and while teaching one strategy is better than teaching none, a range of strategies need to be introduced if children are to be adequately skilled.

Whichever programme one adopts, the criterion of effective teaching of thinking is whether children can use the strategies in new and unfamiliar situations, but transfer of skills has been disappointing. I suggest this is because programme developers have failed to provide explicit links with functioning in the 'real' world for children. Children **must** be able to relate the programme to the world in which they live, to use the skills in real-world situations **then** apply them to other areas of the curriculum when they recognise the need for them. Kohlberg (1985) believes that the development of Thinking Skills is far more effective when children's thinking is challenged by real problems and real decisions, so that they can experience the consequences of these decisions. It is important therefore, if we are to achieve durable and transferable learning, that we not only teach the skills and strategies, but that we teach children how and when to use them.

Direct experience with these three major programmes and with a number of other Thinking Skills Programmes available suggests that while there are essential components to be considered in each, no one programme is all-inclusive and the difficulties of administering a variety of programmes cannot be over-estimated.

Sternberg (1987) suggests that while each of these programmes do an excellent, if incomplete, job of teaching thinking, the most profitable programme will probably be one that combines the best elements of the various programmes and approaches. I consider therefore there is a need to combine the different perspectives and use a mixture of methods. A need to provide intellectually challenging material for children with issues of real concern, that can be applied to real-life situations and provide explicit links with functioning in the real world. Material which provides teachers with the philosophical background, but which stresses their crucial role as 'mediators' of experience, in motivating children and in 'bridging' to other areas of learning.

Brandt (1984) and Costa (1991) warn, however, that the teaching of thinking skills alone is insufficient for good thinking. The repertoire of strategies each child constructs will be of little use if the child cannot think metacognitively about which will be likely to work in a given situation. The teaching of thinking skills therefore should be accompanied by the teaching of metacognition – the topic of the next section of this review.

Metacognition

Much of the literature on teaching thinking has focused on metacognition and there has been growing recognition that metacognition practised as an integral part of thinking skills instruction can have a dramatic impact on learning (Swartz and Perkins, 1990).

Yet, while the Thinking Skills Programmes described have metacognitive components, metacognition is rarely taught in schools perhaps because, as Fisher (1998) suggests, there is in the literature some confusion about the meaning of metacognition and little clear guidance as to how it should be taught.

It is important therefore to be clear about what metacognition is, how it can be developed, and the factors that will enhance children's metacognitive performance.

The term metacognition was introduced by Flavell in 1976 to refer to the art of reflecting on and guiding one's own thinking processes. Swartz and Parks (1994) define metacognition as, the internal managing process we use to take charge of and direct our own thinking so that it is no longer determined by impulse and association.

Flavell considers metacognition to be the essence of intelligent activity and most theories of intelligence identify metacognition as a key component. Binet (in Brown, 1985), highlighted 'Autocriticism', the ability to reflect on and regulate cognition, as a central component of intelligence, while Vygotsky (1962) recognised that conscious reflective control and deliberate mastery were essential factors in school learning. He suggested two phases in the development of knowledge, first its automatic unconscious acquisition

followed by a gradual increase in active conscious control over that knowledge, which was essentially the separation between cognitive and metacognitive aspects of performance.

More recently, Sternberg (1984), stresses the importance of 'Executive Skills', or metacognition, and considers that the ability to be metacognitive is a key aspect of intelligence which can be taught, practised and improved. Swartz and Perkins (1990) also stress the role of 'Mental Self Management', or metacognition, in intelligence and suggest metacognition is important because it:

1. **Cultivates cognitive resourcefulness** – helps children tackle problems independently rather than waiting passively to be told what to do.

2. **Promotes responsible, independent thinking** – gives children tools to develop into responsible independent thinking adults rather than following mindlessly in others' footsteps.

3. **Fosters strategic thinking and playfulness** – allows children time to think through decisions carefully, to stand back and consider how to proceed. Avoids hasty decisions.

Flavell (1995) argues that if we can bring the processes of learning to a conscious level and encourage children to be more aware of their own thought processes, to become more reflective, then we help children gain control over the organisation of their learning.

Traditional schooling, however, rarely provides opportunities for children to reflect on and evaluate their own thinking processes. Children often follow tasks without wondering what they're doing, seldom ask questions about their own learning strategies and are often unable to explain them (Costa, 1991).

Research suggests however that those who persevere in problem-solving, who think critically and flexibly and who can consciously apply these intellectual skills are those who possess well-developed metacognitive abilities (Brown, 1978, Whimby, 1980), and that children given opportunities to develop metacognitive skills perform better. Sternberg (1984) also suggests that if there is one characteristic of very able or gifted children, it is that they have more 'metacognitive awareness' than their less able peers. Metacognitive awareness includes both knowledge of ourselves as learners and knowledge about the strategies we use to tackle tasks. Brown et al (1983) highlight these two levels of metacognition i.e. the distinction between self-regulation during learning and knowledge of one's own thought processes. Adey and Shayer (1994) agree with this distinction and categorise it as 'going beyond' and 'going above' the present learning behaviour:

'going beyond' – activities which take children beyond their present level of competence (through the zone of proximal development)

'going above' – activities which help children monitor and control their own cognitive processes (self-awareness)

Adey and Shayer believe that adults can play a key role in encouraging metacognitive awareness in children and that metacognition must be developed in schools to help children make the most of their mental resources.

Swartz and Parks suggest that everyone can learn to manage their thinking in more productive ways,

> To take charge of our actions we have to know what we're doing and how we can act differently to do things better – To take charge of our thinking we similarly have to understand what kind of thinking we're doing and how it can be done differently to improve it.
>
> (Swartz & Parks, 1994, p. 519)

In what they describe as a 'ladder of metacognition', Swartz and Perkins (1990) distinguish four levels of thought that are increasingly metacognitive.

- Tacit use: decisions made without really thinking about them.
- Aware use: becoming consciously aware of the kinds of thinking involved in the decision-making process.
  e.g. today we're going to learn about predicting.
- Strategic use: planning the most effective thinking strategies.
  e.g. a list of steps to follow before the thinking activity begins.
- Reflective use: reflecting on thinking before, after and during the process, considering how to proceed and how to improve.
  e.g. describe how you thought about a particular problem – could you have done it better?

Swartz and Perkins (1990) suggest that if designing a programme for thinking, we must keep these levels of metacognitive instruction in mind to promote the development of thinking beyond the range of the immediate instruction. He asserts that, if metacognition is an essential ingredient in intelligent behaviour, the challenge for teachers is how to teach for metacognition.

One approach to developing metacognition is to teach children a general set of strategies before they try to solve a problem. Tishman, Goodrich and Owen (1990) suggest a 'Four Thought Strategy' which they suggest should be placed on the classroom wall to remind children they are in charge of their own thinking. An example is:

FOUR THOUGHT STRATEGY

1.
BEFORE THINKING
GET READY – MENTAL PREPARATION
(Create a fertile frame of mind by taking a moment of quiet time to visualise topic)

2.
DURING THINKING
SET GOALS and STANDARDS
(Articulate thinking goals and set standards to check if goals are met)

THINKING CHALLENGE

3.
DURING THINKING
MONITOR THINKING
(On-line monitoring – stand back and check how you're doing

4.
AFTER THINKING
REFLECT and EVALUATE
(Review how well goals are met and what improvements could be made in thinking)

(Tishman, Goodrich & Owen, 1990).

Brown and Campione (1978) also suggest performance can be enhanced by teaching children an explicit set of metacognitive questions before proceeding with problems. For example:

(a) Stop and think

(b) Do I know what to do?

(c) Is there anything else I need to know before I begin?

(d) Is there anything I already know that will help me?

Swartz and Parks (1994) on the other hand suggest a 'Thinking Map' with questions to raise metacognitive awareness. For example:

Thinking Map

1. What kind of thinking did you engage in?
2. How did you do the thinking?
3. Was this an effective way to do this thinking?
4. How will you do this kind of thinking next time?

This approach is consistent with Flavell's (1979) recommendation to cultivate children's introspective abilities by engaging them in cognitive activities designed to evoke metacognitive ideas and feelings. Enquiring into a child's thinking facilitates thinking (Bonnet, 1994).

Metacognitive questions therefore can offer the challenge children need to become conscious of their thoughts and feelings before, during or after an activity. However, while this approach is helpful in that it focuses the attention of both children and teachers on thinking about thinking, most children, and indeed many teachers, would find some of these questions difficult to answer. Few could state, for example, the kind of thinking they engaged in or how they did the thinking. Also, being able to name the kind of thinking we are doing does not necessarily help to modify it. Nevertheless, given an appropriate set of questions, this appears to be a useful strategy for developing metacognition.

Tishman, Perkins and Jay identify sub-categories of metacognition – planning monitoring and evaluation. They believe,

> Metacognition is essential to critical and creative thinking. One cannot reason efficiently and effectively without understanding what one knows/does not know or how to plan, monitor and evaluate.
>
> (Tishman, Perkins & Jay, 1995, p. 52)

Brown and Campione (1978) note that 'novices' differ from experts in their ability to use these skills but believe that these skills can be 'consciously developed'. They suggest strategies to help children plan, monitor and evaluate their thinking which include:

Planning:-

Planning strategies, which allow children time to focus their thinking, involve

listing, categorising, predicting possible outcomes and their consequences, arranging events in order, and selecting a course of action.

Monitoring:-

Children need to stand back and monitor how their thinking is going and need opportunities to monitor progress. Costa (1991) believes that without checking on their progress, children fall victims to 'the illusion of knowing' where they are unaware of gaps in understanding and that questions inserted throughout the text or at the end of each section like, 'How am I doing?' etc., allow children to monitor progress,

If children are to monitor and control their learning goal however, they must understand the nature of the task and the appropriate outcome. Pintrich, Brown and Weinstein (1994) suggest that children cannot monitor the learning goal because teachers fail to explain it. Indeed, Bandura (1997) suggests that 50% of teachers make no introduction to the task at all. It's impossible therefore to know if you have reached a learning goal if you are not clear about the nature of the goal.

Co-operative learning groups where children explain strategies to each other and review materials are suggested by Markham (1979). In this way the 'peer community' can provide the supporting structure or 'scaffolding' needed to monitor thinking until children take over the task themselves (Heiman and Slomianko, 1989).

Evaluating:-

Giving children time to reflect on or evaluate the process is, according to O'Tuel and Bullard (1993), an essential aspect of metacognition. Beyer (1987) believes this is often sacrificed when time runs out, while Tishman, Perkins and Jay (1995) suggest that in the faster-paced school curriculum the rush for coverage overtakes teachers and children are rarely given time to reflect on work they have done. In Beyer's model, children reflect on the

process by considering what they did, how they could do better, where they could use this skill in other areas and in real-life situations. Beyer suggests this is critical for transfer and, according to Swartz and Parks, "Without metacognition, students' transfer and use of skilful thinking in other appropriate contexts will be minimal" (Swartz & Parks, 1994, p. 522).

O'Tuel and Bullard believe that children of all ages should have opportunities to plan, monitor and evaluate their thinking and suggest metacognitive activities which can be used as part of a pre-school curriculum with four - year -old children. Questions and activities using higher levels of Bloom's Taxonomy are suggested and, "If four - year - olds can do it, anyone can" (O'Tuel & Bullard, 1993, p. 39/40).

Costa (1991) also suggests strategies to enhance metacognition. In addition to planning, monitoring and evaluating, he proposes:

asking children to pose questions for themselves to facilitate comprehension;

exploring the consequences of choices and decisions to perceive causal relationships;

categorising actions according to certain criteria – what they liked/disliked, pluses/minuses of an activity or idea to help justify reasons for decisions;

feedback from peers on what they've done well to help develop a set of internal criteria for 'good thinking';

asking children to describe and clarify their strategies for thinking to identify errors and aid self-correction;

role-playing which contributes to the reduction of ego-centred perceptions;

journal-keeping to chart the processes of strategic thinking and decision-making;

and, the strategy that Costa believes has the greatest influence on children, modelling.

Modelling:

Children learn much of their behaviour, attitudes and values, not by direct instruction, but through imitation of both adult and peer models. Vygotsky believed that: "In learning school subjects, imitation is indispensable" (Vygotsky, 1962, p. 104). A number of studies bear out the conclusion that children adopt new behaviour patterns or modify their own behaviour on the basis of observation alone (Bandura and Walters, 1973; Good and Brophy, 1986). Having someone to model the thinking strategies, therefore is an important aspect of metacognition. Tharp & Gallimore (1988) stress that modelling is a powerful means of assisting performance – one that continues its effectiveness into adult years, but, while teachers often model psychomotor performance e.g. dancing, tennis, etc., assisting cognitive performance by modelling is less well understood.

While Costa and Lowery (1989), Swartz and Perkins (1990), O'Tuel and Bullard (1993), stress the importance of teacher modelling and believe that one of the most important characteristics of an environment that develops thinking, is a teacher who models metacognitive strategies, Costa and Lowery (1989) believe that many teachers do not know how to teach or model thinking strategies and that many are poor critical thinkers themselves. A study by Unks (1985) found, for example, that 51% of teachers could not differentiate between statements of fact and opinion. Peterson (1988) found, however, that with minimal training, teachers were able to learn strategies which led to significant improvements in performance, particularly among low ability children, and Stiggins et al (1989) found that just one workshop on the assessment of thinking skills changed teacher attitude and confidence in this area.

Tharp and Gallimore (1988) suggest that, "Teachers themselves must have their performance assisted if they're to assist the performance of their students" (p.43). Opening teachers' minds to ways in which they can

facilitate the development of thinking in the classroom would seem, therefore, to be the first step in the process and, to that end, this study seeks to develop a resource which models thinking processes and strategies for the teacher as well as for the child.

The importance of peer modelling to help children overcome obstacles to good thinking, fear of failure, impulsivity, closed-mindedness etc. is highlighted by Owen (1990) and, as will be discussed more fully in the section on motivation, Bandura (1997) contends that peers can act as a potent force in modelling. Indeed, he suggests exposure to peers modelling cognitive skills boosts the sense of self-efficacy more than observing teachers modelling the same cognitive skills. Tharp and Gallimore (1988) believe that this interpersonal process is the basis for the eventual internalisation of the strategy.

Heiman and Slomianko (1989) suggest that metacognition is essential to developing an 'internal locus of control', which helps children realise they're in charge of their own thinking and learning. They suggest helping children develop an internal voice or 'internal editor' with whom they can converse during the revision process. The importance of the 'inner voice of learning' is also stressed by Corno (1985).

Research on metacognition is therefore encouraging in its pedagogical possibilities. Many theorists consider it to be the essence of intelligent activity and Bruner (1986) confirms that metacognition can be taught successfully as a skill. The reality is however that, in today's classrooms, these skills are rarely taught and children have little opportunity either to learn the skill or even discuss thinking strategies with each other. Rarely are there 'significant others' (Costa, 1991) to model the metacognitive processes, or adults to provide 'the loan of consciousness' (Bruner, 1986) to children to help them reach their full potential as thinkers.

Teachers need therefore appropriate materials to assist children's metacognitive performance – materials that will guide both teachers and children by setting appropriate tasks and modelling the metacognitive processes for, as Perkins (1992) suggests, all well-designed Thinking Skills Programmes should contain metacognitive components.

Bandura warns, however, that:

> Adding metacognitive skills broadens the scope of a theory of cognition but still neglects the affective and motivational processes that play a vital role in cognitive development and functioning. There is an important difference between metacognitive skills and their effective use. Knowing what to do is only part of the story.
>
> (Bandura, 1997, p. 223).

The next step therefore is to examine the literature on motivation to identify features which motivate children's thinking.

Motivation

While most efforts to teach thinking aim at cultivating skills and strategies, children often fail to use the thinking skills they're taught and, as Sternberg points out, "All the finely honed thinking skills in the world will be for naught if they are not actually used" (Sternberg, 1987, p. 254). Dewey believed it was the responsibility of schools to provide not only instruction but also the conditions which would develop the habits of mind needed to think well, "Knowledge of the methods alone will not suffice, there must be the desire, the will to employ them" (Dewey, 1933, p.278).

We must, therefore, not only teach the skills of thinking but encourage the disposition and attitude to use them for, as Coles and Robinson (1990) suggest, children will be unlikely to demonstrate their ability to think if they do not believe such thinking is either possible or permissible. As to how such attitudes and dispositions are acquired, Vygotsky (1962) believes that thought itself is engendered by motivation and emphasises the role of the social context in learning.

Resnick (1987) agrees that it is the social setting which shapes this willingness or disposition to engage in thinking. She asserts that most successful programmes provide co-operative problem-solving where children can 'scaffold' complicated performances for each other and that, through the medium of participation, the child's self-esteem is enhanced.

However, while the connection between the cognitive and affective dimensions of thinking has long been recognised for example, (Schaefer,1967, Burns, 1982,) and Bloom's (1976) study indicates that up to 25% of the variance in achievement can be attributed to affective characteristics, guidelines as to the conditions necessary to motivate children's thinking are missing.

Baron and Sternberg (1987) believe that programme goals for teaching thinking too rarely include references to changes in children's attitudes and dispositions. They suggest there is a lack of effective measures to evaluate attitude and disposition and that the area is ripe for teachers to develop such measures. Indeed, while most of the Thinking Skills Programmes available claim to improve children's concepts of themselves as thinkers, none include such evaluation measures in their design.

As to how we can motivate children to use the thinking skills they have been taught, Bandura (1997) suggests that most human motivation is cognitively generated and identifies three different theories related to cognitive motivators - causal attribution, outcome expectancy and cognized goal.

According to the causal attribution theory people who credit their success to personal capabilities and their failure to insufficient effort, will undertake difficult tasks and persist in the face of failure. They see the outcome as influenced by how much effort they expend. In contrast, those who ascribe their failure to differences in ability and success to situational factors will give up easily when they encounter difficulties (Schunk & Gunn, 1986).

According to the outcome expectancy theory people motivate themselves in anticipation of an outcome they expect to achieve from a given course of action. The higher the expectancy and the more highly those outcomes are valued, the greater is the motivation to perform the activity. Bandura (1997) found that, regardless of the incentive system, people of high efficacy and goals outperformed those who doubted their efficacy to meet difficult standards and scaled down their aspirations accordingly.

According to the cognized goal theory behaviour is seen as motivated by setting clear goals. Bandura (1997) believes that explicit, challenging goals enhance motivation and people seek self-satisfaction from fulfilling valued

goals. Simply adopting a goal without knowing how one is doing, or knowing how one is doing in the absence of a goal, has no lasting motivational impact. However, the combined influence of goals with knowledge of performance heightens motivation substantially.

It is important therefore to understand these theories and their implications for the classroom. The importance of convincing children they can control outcomes by their own personal effort, by setting high standards and challenging goals, by giving children feedback on progress etc., are aspects of motivational research which need to be taken into account in designing a Thinking Skills Programme.

Weiner (1974) identified two major sources of motivation, internal and external. The internally, or intrinsically, motivated child enjoys the activity for its own sake or for the satisfaction of mastering it. Externally or extrinsically motivated children look for reasons or 'pay-off' outside themselves to engage in the task.

Paris, Olsen and Stevenson (1983), and Swartz and Perkins (1990), stress the importance of building intrinsic motivation and believe it develops in children the tendency to value knowledge and skills for their own sake and should lead to enjoyment of the process of learning. They suggest teachers should stress the intrinsic value of the task, gains in knowledge rather than external rewards, and provide feedback about quality of performance. To create intrinsic motivation, Bandura (1997) suggests: creating tasks which are enjoyable; setting personal challenges through goal-setting; adding variety to counteract boredom;encouraging personal responsibility for accomplishments; and providing feedback on progress.

Costa (1991), however, believes that conventional schooling does not foster intrinsic motivation, that teachers often project off-hand or mechanical

attitudes towards knowledge and teaching, and that children pick up this attitude and project it back.

Paris, Olson and Stevenson (1983) suggest that, to increase intrinsic motivation, the person who presents the task should articulate positive expectations and stress the knowledge and skills the task should provide. They found that over 50% of teachers made no introduction to the task at all and only 25% described the task in positive terms. They concluded that teachers were not doing enough to foster intrinsic motivation and suggested that they must communicate positive expectations to children and give children feedback on progress.

Nickerson, Perkins and Smith also stress that an important aspect of skilled performance is the ability to determine whether one is making satisfactory progress towards the objective of a specified task and to modify behaviour if progress is not satisfactory. They state:

> One wonders how far teachers could go towards motivating children to learn simply by making the effort to explain clearly why what they are learning is important to know. It is not surprising therefore that children show little interest in acquiring skills for which they see little use.
>
> (Nickerson, Perkins & Smith, 1985, p.102/103).

The problem is, that many teachers do not have a clear concept of the importance of building intrinsic motivation and need a framework, or scaffolding, to carry out the process themselves. This study seeks therefore to make teachers more aware of their role in motivating children, in communicating positive expectations and attitudes, and in setting clear goals and giving feedback on progress, to avoid a sense of frustration and failure in children.

A key element in the recent research on motivation concerns children's concept of themselves as learners and many studies, Lane and Lane (1986) and Covington (1992) for example, stress the importance of a positive self-concept. Fisher (1990) also points out that children who regard themselves as effective thinkers will not be slow to offer their thoughts, while those with negative self-regard will develop a sense of worthlessness about their thinking.

Consequently, teaching strategies that encourage the development of independent mastery and control of learning improve both children's self-concept and level of academic achievement. In particular, the use of cognitive and metacognitive strategies assists children with low self-concept to close the gap between their attitude towards a task and the level of effort needed to master it. Hay et al (1994) suggest that cognitive interventions become a 'circuit breaker' from the downward cycle of low self-concept – leading to low levels of effort which produce low levels of performance and so low levels of self-concept. Teachers need therefore to sequence learning tasks into manageable steps so that children with low academic ability and low self-concept can achieve success. As children become more confident at mastering tasks, self-concept, persistence and motivation should increase.

Tasks that children find meaningful and of value, that have personal relevance, are more likely to increase children's level of persistence and motivation (Sternberg et al, 1990), whereas Hay et al (1994) suggest that activities with no real challenge and which the child perceives as meaningless time fillers, or below their level of ability, are unlikely to enhance children's self-concept or motivate them to expend effort. Indeed, studies by Covington (1983) and Dweck (1986) indicated that continued success on personally easy tasks is ineffective in producing stable confidence, challenge-seeking and persistence, and is found to produce lower confidence in ability.

To motivate children therefore, material must be intellectually challenging. Yet, a study by Goodlad (1984), found that the intellectual level of the learning tasks in school text books was very low, with 50% at the lowest level of intellectual demand. The intellectual demand of teachers' questions was also worrying. Goodlad's study revealed that less than 1% of teachers' questions invited more than recall of information. Indeed, Edwards (1995) describes the level of cognitive demand in school learning as a 'largely unrecognised disaster'.

Teachers also need to monitor feedback. Performance feedback is a significant factor in shaping self-concept and consequently levels of academic effort. If always negative, it may accelerate the formation of negative self-concept and reduce children's level of performance and motivation. Similarly, praise is a form of feedback that shapes children's self-concept. McCombs (1989) and Hay et al (1994) found that praise that has a purpose, that is age appropriate and is associated with both effort and the use of strategies, can assist in the positive formation of children's self-concept and influence motivation. Hay does not imply that teachers should only provide positive feedback but does suggest children need a supportive educational environment that encourages co-operation and in which effort and performance are valued. Costa (1989), however, warns that praise used indiscriminately becomes a meaningless response and children derive little benefit from it. Indeed, he suggests that teachers using rewards and praise as motivators can actually increase the child's dependence on others for their worth rather than themselves. Therefore, while praise can be effective in motivating children, Costa believes teachers must use praise sparingly and judiciously and gradually replace it with an 'internal motivation system'.

Cornett (1986) suggests one of the most powerful instructional resources in motivating children's thinking and improving children's self-concept is humour. Humour provokes thought and involves higher order thinking

processes. The riddle and punch line, for example, involves problem-solving, prediction, decision making, visual imaging, etc. Cornett believes humour in the curriculum stimulates the thinking processes used frequently by highly creative people and that humorous material is ideal content to teach thinking skills because it motivates children to read and use the skills and improves children's concept of themselves as learners. Goleman (1996) contends that laughter helps children think more broadly, recognise complex relationships and foresee consequences of a decision and suggests that the teacher saying, for example, 'Wouldn't it be great to improve decision making and have fun at the same time', positively motivates both children and teachers. Costa and Lowery (1989) also maintain that humour has positive effects on physiological functions, provokes higher level thinking and liberates creativity. They also suggest that humour improves motivation, helps children develop a positive self-concept and a sense of personal control over the learning process, and must be considered therefore in developing a Thinking Skills Programme.

This sense of capability and personal control, termed self-efficacy by Bandura (1986), facilitates the development of cognitive and metacognitive strategies and affects how well they are used once acquired. Dweck believes this sense of self-efficacy depends on people's perception of intelligence. Those who believe it is a fixed, stable quality, attribute outcomes to differences in ability and often give up in the face of failure while those who believe intelligence can be expanded through their own efforts will use strategies to overcome difficulties. Teaching children to attribute difficulties to lack of strategy and effort therefore can lead to improved motivation and avoids children falling into the trap of 'learned helplessness' (Dweck, 1986).

Bouchard (1991) found that children with a greater sense of self-efficacy set higher goals for themselves, showed greater strategic flexibility and achieved higher intellectual performance than children of equal cognitive ability but with

low self-efficacy. Locke et al (1984) also found that increased self-efficacy promoted creative thinking both directly and by adoption of motivating personal challenges, while Sharon (1987) found that children's success at solving problems is as dependent on their feeling of competence as on the actual competence. If that is not present, children expect defeat and do not try. A positive self-concept therefore is an important factor in successful learning – children must believe the task is possible.

To improve self-efficacy, Bandura (1997) suggests setting proximal goals for, without standards against which to measure performance, children cannot judge what they are doing and need frequent feedback rather than distal goals. Schunk and Rice (1986) found that those who motivated themselves with personal sub-goals made rapid progress while those who set no goals made no change. Distal goals had no demonstrable effect. Schunk and Cox (1986) also found that children who verbalise cognitive and metacognitive strategies as they solve problems achieve greater self-efficacy and higher proficiency. The more the feeling of self-efficacy was raised, the more the cognitive strategies were used.

Bandura also believes peer modelling can act as a potent force in developing self-efficacy. He warns, however, that children gain more from 'coping' peer models demonstrating the task than from 'masterly' peer models. With 'masterly' peer models, children often see the skills as beyond their reach and do not make the effort to master them. Perceived dissimilarity is considerably greater in relation to teacher models than even 'masterly' peer models. As already noted, then, exposure to peers modelling cognitive skills can boost the sense of self-efficacy and achievement even more than observing teachers modelling the same skills.

This study therefore proposes to develop materials where cognitive and metacognitive strategies are modelled by children for children, which will set

clear goals for children and give them confidence to exercise some control over the learning process.

The factors that influence children's motivation are varied and complex. They depend on children's self-concept and beliefs about intelligence, on whether or not there are clear goals, positive expectations, intellectually challenging tasks, opportunities to collaborate with others and performance feedback. It depends, too, on the learning environment, on children's emotional state, on whether children feel they are 'allowed' to think, and on their relationship with their teacher – an area not well covered by research literature.

While Ames and Ames (1984) suggest that debilitating motivation is not necessarily a 'terminal disease', that it can be reversed or even 'inoculated against', research by Amabile (1983) suggests that motivation is more easily undermined than created. Research literature highlights a growing awareness of 'teacher expectancy' effects, for example, where teachers' impressions about children's ability actually affect children's performance. Brown et al (1983), and Dweck (1986), raised serious concerns that teachers were hampering the intellectual achievement of children they labelled as having low ability, that teacher expectations became in effect a self-fulfilling prophecy. Lozanov (1978) describes this as the 'social suggestive norm', where we become what others expect and we learn to expect it of ourselves. To break this negative spiral, Lozanov suggests, we must teach children how they can take control of their own feelings and their own thinking.

Bandura (1997) also warns that teachers who themselves have a low sense of self-efficacy often undermine academic interest and motivation. He suggests that teachers who believe strongly in their ability to promote learning, create mastery experiences for children but teachers beset by self-doubt about their instructional efficacy, construct classroom environments likely to undermine both children's judgement of their ability and their

cognitive development. When dealing with 'difficult' children for example, Bandura (1997) found that teachers with high efficacy view them as 'reachable and teachable' and regard their learning problems as surmountable. Teachers with low perceived self-efficacy on the other hand were inclined to evoke low student ability as an explanation of why children cannot be taught. Bandura's research also suggests that teachers who find themselves faced with disruptive, non achieving students day in and day out, eventually lose their sense of efficacy to fulfil academic demands.

Teachers with a strong sense of personal efficacy therefore create a positive climate for learning, but the reality is that the education system is strewn with conditions that erode teachers' sense of efficacy and occupational satisfaction. There is a growing sense of futility about being able to control the learning process or influence children's learning. Indeed, a recent study by Strathclyde University, Improving School Effectiveness Project, which is reported in MacBeath and Mortimore (2001), of 2500 Scottish secondary school teachers reported that fewer than a third of secondary teachers believed their pupils could be successful and two out of five did not agree that all children had the capacity to learn. It is difficult therefore to help children become more effective thinkers and learners if the teacher does not believe it is possible in the first place.

Yet, there is virtually no preparation for the teaching of thinking in the majority of teacher training programmes and, while there are clearly articulated guidelines and policies in schools for most areas of the curriculum, the teaching of thinking is the notable exception. Without such knowledge, teachers cannot be ready to assist the performance of children.

Fullan (1991) believes that many teachers feel frustrated, bored and burnt-out and that change is needed. He warns that, if any curricular innovation is ever to get behind the classroom door, the teacher must understand its purpose, know how to do it and want to do it. He also stresses however that

most attempts at educational reform fail because the innovation does not take account of the realities of the classroom. To succeed in implementing a Thinking Skills Programme therefore it is important to understand not only the content but the dynamics of the change process itself (Fullan, 1997).

There is a need therefore for a 'support system' to help teachers through a number of important issues and questions about the teaching of thinking - not just ready made lesson plans, but a 'scaffolding' for carrying out the process for themselves, a comprehensible framework, that synthesises the relevant work of leaders in the field but that takes account of constraints the classroom teacher faces. A resource that will help teachers define contexts to develop metacognition and thinking skills, and that will both motivate children and raise their self-concept as thinkers.

> To teach for Thinking is to open the doors of the mind and to cultivate the most potent human tool we have. To empower children as Thinkers, there can be no greater teacher's gift.
>
> (Raths et al, 1986, p.194).

The literature review has highlighted important features for developing children's thinking. With Raths' statement in mind therefore, the following chapter will describe the design of a programme, which incorporates these features, to facilitate the development of thinking skills in our schools and thus empower children as thinkers and learners.

CHAPTER THREE

PROGRAMME DESIGN

In the preceding literature review, the development of thinking skills as a top priority educational goal and the need to provide teachers with a manageable framework for teaching thinking in the realities of today's schools was firmly established. In response to this need, a major aim of this study was to develop a resource which would enhance children's thinking and learning and make a unique contribution to teaching thinking in our schools. The programme produced, 'A Guide to Better Thinking', has been designed to be used over one term with 10-12 year old children.

This chapter describes the rationale of the programme design and includes:

- general rationale – establishing the distinctive features of the programme design as a whole;
- main aims within each section of the programme;
- specific purposes within individual worksheets;
- piloting of materials.

The aim is to give the reader a general view of the design process then focus more narrowly on individual parts of the programme.

Rationale of Programme Design

The first aim of the study was to produce a resource which would help children become more effective thinkers and learners and promote the teaching of 'good thinking' in our schools – a resource that would bridge the gap between theory and classroom practice and move teaching for thinking into the classroom.

As the literature review has highlighted, existing programmes have failed to make significant headway in classroom practice because programme developers have not taken account of the realities of today's classrooms. Teachers are not trained to teach thinking and, such is the strain on an already overcrowded curriculum, that any new programme will be counter-productive, if it increases the stress in teachers' lives. If we are to move teaching for thinking into the classroom therefore, these factors must be considered in the programme design.

While Sternberg (1987) warns that many of the existing programmes lack consistent research evidence, 'A Guide to Better Thinking' rests on a theoretical basis dealing with the nature and development of thinking, which has been described in the literature review. A major feature of the programme design, however, is that this is combined with insights developed from years of classroom experience and research in teaching thinking, and a knowledge of what will work in the realities of today's classrooms.

'A Guide to Better Thinking' is designed therefore to:

- inform and guide both children and teachers;
- identify important thinking skills and strategies and help teachers implement them in their classrooms;

- provide a framework that will help teachers in their busy lives to reach their goals and targets.

It is important that teachers understand the principles of the programme design for, as Raths suggests:

> Putting teaching for thinking into classroom practice can be helped by understanding the principles upon which the programme rests. To understand them and their implications is the key to successful classroom implementation.
>
> (Raths et al, 1986, pXII).

One of the major principles upon which the programme rests is that children need a broad range of thinking skills to become successful thinkers. Many of the existing programmes are narrow in focus and have limitations with regard to skills taught. Some develop only critical thinking, others only creative thinking and few include the development of positive thinking in their design. Rarely is it possible to find just one programme to cover the range of thinking skills needed if children are to be adequately skilled, hence several programmes need to be used making it expensive and difficult to administer and teach.

Accordingly, 'A Guide to Better Thinking' is designed to equip children with a broad range of thinking skills to use throughout their lives, and strategies to develop positive, critical and creative thinking are included. Children are shown, however, that these 'types' of thinking rarely occur in isolation but work together and complement each other.

Important too in the design of the programme is the fact that children need access to 'higher-order' thinking skills to become successful thinkers. Many programmes emphasize 'lower-order' thinking skills that children already have and children spend hours on workbook exercises which emphasize

recall of information or single correct answers. Goodlad (1987) suggests this is because there is a virtual dearth of instructional material that requires children to gain skills in higher-order tasks.

The emphasis in the 'Guide' therefore is on the generation of ideas rather than the retrieval of information; giving children opportunities to think and to discuss the thinking being done; giving opportunities to monitor and reflect on their thinking and how to make it better; emphasizing not only the teaching **of** thinking as most programmes do, but teaching **for** thinking and **about** thinking. Brandt (1984) and Costa (1991) stress that a comprehensive thinking skills programme requires teaching in all three areas.

The 'Guide' includes co-operative learning strategies and the development of metacognitive skills to help children become aware of their own cognitive processes and develop an 'internal locus of control.' A major principle upon which the programme rests, however, is that the exercises should not be remote or sterile but closely related to situations actually encountered by children. There must be a relationship to what is real.

Many programmes teach thinking as a set of isolated skills but building isolated skills does not mean children will be able to think well in the context of a real situation. As discussed in the literature review, perhaps the main reason the transfer of thinking skills has been disappointing is that programme developers have failed to provide explicit links with functioning in the 'real' world for children. The development of thinking skills is far more effective when children's thinking is challenged by real problems and real decisions.

Kohlberg (1985) found this to be true in the area of moral development. After years presenting children with fictional moral dilemmas to foster moral development, Kohlberg found it far more effective when children were confronted with real moral dilemmas of day to day school life. Thus, the

basic strategy in the 'Guide' is to involve children in making decisions about problems that affect their lives so that they can use their thinking purposefully and experience the consequences of their decisions. A very important aspect of the programme is enhancing children's ability to deal with life's problems, to become more self-directed, to see that they have control over their lives and their learning and are not just passive pawns in someone else's hands.

A key element in the design of 'A Guide to Better Thinking' concerns children's concept of themselves as thinkers and learners. One of the primary goals is to increase children's confidence in themselves as thinkers and strengthen their ability to do their own thinking. The 'Guide' is not restricted therefore to the cognitive domain alone, as many programmes are, but embraces feelings, attitudes, beliefs and values.

Research by Weinstein (1982) Weiner (1983) and Costa (1991) indicates that children's performance is strongly influenced by their belief regarding the extent to which they are in control and have the capability to succeed. If children's self-concept is poor (e.g. I'm hopeless) then they are unlikely to succeed at the task. As the literature review established, a positive self-concept is an important factor in successful learning. If this is not present, children expect defeat and do not try. Strategies that encourage independent mastery and control of learning, and that help children see how their thinking can make a difference to their own lives and the lives of other people, are crucial in cultivating a positive self-concept and so are included in the design of the programme.

Children, however, also have to want to use the skills they are taught and a programme will be of little value if it is not actually used. While the need to encourage the disposition to use the thinking skills is stressed by Sternberg (1994) and Bandura (1997), they also point out that guidelines to motivate children's thinking are often missing from existing programmes.

The literature review identified other factors which influence children's motivation (see pp.67-69). These factors are an important aspect of the programme design and include:

- experiences which are meaningful and have personal relevance to children
- setting clear goals and positive expectations
- intellectually challenging material
- giving feedback on progress
- co-operative learning strategies – paired problem solving etc.
- encouraging personal responsibility for accomplishments
- humour to create tasks which are enjoyable and fun
- attractively presented material so that children want to use it.

Research by Amabile (1983) suggests that motivation is more easily undermined than created. An important aspect of the programme design therefore is to provide a scaffolding for teachers to guide them in their role in motivating children.

Modelling is also important in motivating children and developing self-esteem and is a very important aspect of the programme design. As stated earlier, Costa (1991) believes that, of all the strategies suggested for teaching thinking, the one that has the greatest influence on children is modelling. He considers that modelling reinforces values and goals and greatly enhances the probability of achieving the goals.

While the literature suggests that children will have 'significant others' in their lives to model the thinking processes for them, for many children the opposite is true. Often children have no one to model the metacognitive processes for them. As discussed in the literature review, many teachers do not know how to model thinking strategies for children and many are poor critical thinkers themselves. Some teachers need, therefore, their own performance assisted if they are to assist the performance of children.

Bandura (1997) believes that peers modelling cognitive skills boosts the sense of self-efficacy more than teachers modelling the same skills. He suggests that children gain more from 'coping' peer models than from 'masterly' peer models. With 'masterly' peer models children see the skills as beyond their reach and don't make the effort to master them. Thus, a vital aspect of the programme design is to have children model the thinking strategies for children and for teachers.

Thus the programme features two main characters one of whom, 'Sparky', has failed in his thinking and needs a 'guide' to make it better. The objective being that children will identify with the character and spark off their own thinking. Marg, the other main character, provides the 'scaffolding' for Sparky, clarifying ideas, helping him when he gets stuck and when things go wrong, allowing him to look through different lenses. Together they resolve problems related to the real situations they encounter. They model the thinking strategies in setting goals, planning, monitoring and reflecting, correcting mistakes in their thinking as they go along. They overcome obstacles to good thinking such as lack of confidence, fear of failure, impulsivity and closed-mindedness, modelling how to take control of their own feelings and their own thinking.

Using characters to model the thinking strategies for children and teachers is an essential feature of 'A Guide to Better Thinking' and not generally included in the design of existing programmes.

Worksheet Design

The worksheets are constructed to take all of these principles into account. They are designed to be graphically attractive, challenging yet fun, to motivate children to want to use them. Each worksheet begins by describing how Sparky feels and why he needs to improve that particular aspect of his thinking, e.g., he is too impulsive so he needs to plan, lacks confidence so he needs to be more positive, etc. The goals are clearly stated. Marg becomes the 'critical friend' providing the scaffolding for Sparky until he can do it for himself. She explains and illuminates the operations. Together they discuss the ideas and share viewpoints, modelling the thinking needed to solve the real-life problems they encounter. They discuss their thought-strategies and, by listening to others, incorporate alternative strategies into their repertoire. As they model how to consider alternatives, be more rational etc., they guide children and teachers as to how 'Better Thinking' will help them in their lives.

This is followed by practice exercises where children are given the opportunity, in a co-operative setting, to apply the thinking exercises to their own real-life experiences. The emphasis is on stimulating thinking processes and learning that by their own personal efforts they can control what happens in their lives. Sparky's message at the end of each worksheet illustrates the important point of the lesson for both children and teachers.

The main aims and design of individual worksheets within each section will now be discussed. Copies of the worksheets described are presented separately.

Introduction – The introductory worksheet sets the scene. It introduces children to the main character in the story, the reason why he needs to become a 'Better Thinker', and the different kinds of thinking he will need to achieve his goal. The aim is, that children will identify with the character and be motivated to become 'Better Thinkers' themselves.

Positive Thinking

A very important feature, rarely included in existing programmes, is the section on Positive Thinking. Children **must** believe the task is possible or they will not even attempt it. The aim therefore is to build children's confidence in themselves as thinkers, to let them see that it is possible to improve their thinking and to give them tools and strategies to help them become independent thinkers and learners.

Worksheets to develop positive thinking include:

The Brain – Children learn about the brain and how it works, that we use only a very small percentage of our 'brain power' and, just as training will improve running and swimming, we can train ourselves to improve our thinking. The aim is to show children it is possible for them to become 'Better Thinkers'.

Six Steps to Successful Thinking – This six step strategy is designed to develop metacognition and give children some sense of control over the learning situation. The importance of developing metacognition was discussed fully in the literature review and is a vital aspect of the programme design. The aim is to give children a strategy to help them become independent thinkers rather than waiting passively to be told what to do or following mindlessly in other people's footsteps.

Interviewing 'Good Thinkers' –This worksheet gives children opportunities to: observe similarities and differences; plan questions and organize data; classify good or bad thinking; discriminate, analyse and compare their interpretations with each other, not in a trivial or superficial way but to some **real** purpose. The aim is to reinforce the Six Steps to Successful Thinking and help children make value judgements about what 'good thinking' is so that they can copy it.

Good Thinking Questions – Sternberg (1987) stressed the importance of fostering 'good questions,' yet many children lack confidence in this area and

are scared to ask questions in case they are wrong and people will laugh. While Costa (1991) believes that teacher questioning skills are a prerequisite to better thinking, Goodlad's (1984) study, as discussed in the literature review, highlights that less than 1% of teachers' questions elicit more than a literal response. The aims are to develop children's confidence in asking questions that elicit thinking and to give guidance to teachers in this area as well.

Positive Words – This is intended to help children stop talking themselves down and move from an 'I can't' to an 'I can' attitude. Robbins (1988) suggests that helping children focus on the positive rather than the negative, changes their internal representation about what they can or cannot do, i.e., if they think they can – they can. The aim therefore is to build confidence and self-esteem and help children think positively about themselves as thinkers and learners.

Liking Yourself – How to elicit self-worth and help children become aware of their own personal efficacy is the theme of this worksheet. It deals with the problem of other people 'talking you down' and highlights the dangers of, not only believing what other people tell us we are, but becoming what other people tell us we are – stupid, hopeless etc. This is described by Lozanov (1978) as the 'social suggestive norm,' where we become what others expect and we learn to expect it of ourselves. Children's self-esteem can be destroyed by these negative messages. The aim is to give children strategies to 'fight off' the negative messages they receive from other people and help them become aware of their own ability to deal with such situations.

Things I Do Well – The aim of this worksheet is to combat 'Negativitis' and help children develop a positive self-concept. Often children are overwhelmed by all the things they can't do and just give up. The hope is that concentrating on what they can do well will improve children's self-perception and help them value themselves and their ideas. The aim is to help children build an 'internal locus of control' so that they can take charge of their own thinking and learning.

How Am I Doing? – An important feature of the programme is to help children monitor their own progress. Self-assessment instruments are included at the end of each section to give children feedback on how they are doing, not only in the cognitive aspects of the programme, but in the affective aspects as well. As discussed in the literature review, being able to monitor their own progress is a powerful means of nurturing self-awareness, increasing motivation and helping children take responsibility for their own thinking. Feedback on how they are doing as positive thinkers is designed, not to show children how incompetent they are, in contrast to some tests, but to have a positive effect on their learning and build children's confidence in themselves as thinkers and learners. This is rarely included in existing programmes but is an essential feature of 'A Guide to Better Thinking'.

Critical Thinking

Norris and Ennis (1989) stress the need for critical thinking in everyday life because it is essential for success and survival. While in many programmes critical thinking is introduced only in terms of fact or opinion, Paul (1990) points out that the most basic issues in life simply do not reduce to fact or opinion but call for reasoned judgement. He suggests that most programme developers have failed to take this into account. Critical thinking is included in the programme design therefore, not in terms of finding fault with others or criticism in the negative sense, but reasonable, reflective thinking to help children understand things from different points of view and make reasoned judgements about the best courses of action to follow. The main aim is to facilitate self-understanding and help children develop the disposition to be open-minded so that they will not just passively accept the status quo but become independent thinkers, able to resist manipulation and form rational points of view about their own thinking and the thinking of others. The ultimate aim is that children will have not only the skills, but the courage to think for themselves.

Worksheets to develop critical thinking include:

Setting Goals – As highlighted in the literature review, children who set their own goals are more likely to achieve academic success and consider they have control over their own fate and that they are not just pawns in the system. While Bandura (1997) agrees that behaviour is motivated by setting clear goals, he suggests the higher the expectancy the greater the motivation to perform the activity, that setting challenging goals enhances motivation. Raths (1986) considers we think to achieve the goals we hold precious but all too often we are unaware of the goals we prize. Setting goals, though rarely included in other programmes, is a very important aspect of 'A Guide to Better Thinking'. In the 'guide', children are given the opportunity to set their own personal and school goals. If we are building a relationship between what we teach and the larger social environment however we must also show children they can contribute to solving bigger issues in the world. Setting 'world' or 'life' goals is included in the programme design therefore to help children see that **they** can help other people and help create a better world. The aim is to show children their thinking is valued and what they think can make a difference.

Knowing the Goal – If children are to monitor and control their own learning they must understand the nature of the task. However, as discussed in the literature review, often children cannot monitor the learning goal because teachers fail to explain it. In his study, Bandura (1997) found that 50% of teachers make no introduction to the task at all. It is impossible for children to know if they have reached a learning goal if they do not know what it is in the first place. The aim therefore is to highlight the importance of knowing the learning goal for children and teachers.

Reaching Goals – This worksheet is designed to encourage children to persevere. Many children give up at the first hurdle, as soon as problems arise, or are afraid to try in case they make a mistake. The worksheet is

designed to help children see how errors increase our understanding, that mistakes are not failures, simply feedback. The aim is that children will have the confidence to try; to take cognitive risks; to find ways of dealing with complex problems in their lives; to see that even though the solution may be difficult, the situation is not hopeless; that **they** can persevere to reach their goals. While examples are given of 'famous' people who have persevered to reach their goals, a vital aspect of the programme design is that children are given the opportunity to identify people in their **own** lives, in their **own** experience, who have persevered against all the odds, people who are unemployed or disabled, for example.

Planning – Consequences – As already discussed in the literature review, if children are to take charge of and direct their own thinking, they need opportunities to plan their thinking. Planning how to reach their goals is an essential feature of the programme. In the first planning worksheet, children are given opportunities to consider the potential consequences of their actions. The hope is that these will stop them from rushing blindly into a situation without thinking it through and help them make an informed choice about the best course of action to follow. Again it must be stressed however that this is not done in a remote or superficial way, as in the de Bono C.O.R.T. Programme, but in the real situations they encounter. The aim is that as children consider the consequences of taking drugs, stealing, bullying etc., they will become less impulsive, more self-reliant and more independent instead of depending on others for direction.

Planning – Other People's Views – In the second planning worksheet, children are given the opportunity to consider other points of view. Costa (1991) notes that perceiving a situation from another's point of view involves a complex set of cognitive processes. It requires overcoming one's own egocentricity, detecting subtle emotional and physical cues etc. Feuerstein (1980) stressed the need to avoid impulsivity and take time to consider other points of view as a key strategy in overcoming learning failure. This

worksheet is included in the programme to help children see there is more than one course of action open to them, that it is important to consider other points of view even if they do not agree with them. The aim is that as children hypothesize, in real-life contexts, how others might view the situation, they will become more rational and less impulsive in their approach.

The next four **Planning** worksheets involve children in:

Decision Making – Deciding what we should believe or what we should do is considered by Ennis (1989) as the main concern of critical thinking. Having considered alternative points of view and the consequences of their actions, it is important that children be given opportunities to make decisions for themselves, as stated earlier, not in a trivial or artificial way but about the real-life issues that affect them. Ennis also suggests that schools pay little, or no, attention to clarifying the values held by children. The aim is that as children decide on the best course of action to take, on what should be done and why, on what is right or wrong, this will clarify values and help children see they are responsible for the decisions they make. It is an essential aspect of the programme design. 'Planning Organisers' are provided to guide children through the decision-making process until they can do it for themselves.

Monitor – As already discussed, children need to be able to monitor their progress so that they can change their strategies if necessary to meet their goals. While the importance of setting goals has been stressed, Bandura (1997) warns that knowing the goal without knowing how one is doing has no lasting motivational impact. Further, without feedback on how they are doing, children fall victims to the 'illusion of knowing', where they are unaware of gaps in understanding. Although rarely included in existing programmes, strategies for children to monitor their own thinking are an important aspect of 'A Guide to Better Thinking.' Co-operative learning groups where children discuss their progress, and 'Thinking Diaries' which help children monitor and direct their

own thinking are included. The aim is to help children realize they have control of their own learning and are responsible for their own performance.

Reflecting – Flavell (1995) suggests that if we bring the processes of learning to a conscious level and encourage children to be more reflective, we help them gain control over the organisation of their learning. While Dewey, Bruner, Bloom, Piaget and others have stressed the importance of reflective thinking, traditional schooling rarely provides opportunities for children to reflect on and evaluate their own thinking processes. Children often follow tasks without wondering what they are doing, seldom ask questions about their own learning strategies and are often unable to explain them. Costa (1995) suggests that as children engage in reflective thinking they go beyond the input-recall into the higher levels of thinking. He also considers it increases intrinsic motivation and increases the chance that learning will become lasting, and applicable to new situations. While it is a major component in Lipman's Philosophy for Children Programme, few of the other programmes include it in their design. Metacognitive strategies to help children reflect on their thinking are an essential component in 'A Guide to Better Thinking'. The aim is to help children develop an 'internal locus of control' and help them realize they are in charge of their own thinking.

How Am I Doing – Following the pattern of the previous section on positive thinking, children are able to monitor how they are doing in terms of critical thinking. The importance of feedback has already been discussed, it helps children refine their thinking and increases motivation. Assessing how they are doing involves higher-order skills of comparing, classifying, analyzing, interpreting and evaluating. Marzano et al (1988) believe it furthers the possibility of transfer - that children will more effectively store their knowledge in their long-term memory for later retrieval. The worksheet also provides information for the teacher as to whether or not children can transfer their new learning to different situations and use 'reasoning' in real-life contexts.

Giving children tools for tracking their own progress is a very important feature in 'A Guide to Better Thinking'.

Creative Thinking

Piaget (1973) suggests that one of the major goals of education is to form minds which can be critical, can verify and not just accept everything they are offered. He believes, however, that the principal goal of education is to create people who are capable of doing new things – not simply repeating what other generations have done – people who are creative, inventive and discoverers. While Costa (1991) considers that all of us have the capacity to generate novel, original, products, solutions or ideas, if that capacity is consciously developed, Perkins (1992) suggests schools generally give students tasks that do not exercise or even allow creative effort and that schooling is too right-answer oriented. Strategies to develop creative thinking are therefore an important aspect of the programme design. As already stated, however, it is important to highlight for children the interdependence of these 'types' of thinking, how they work together and complement each other in the real-life situations they encounter.

Worksheets to develop creative thinking include:

The Great Escape Game – Many children become trapped in what they already know, they passively accept the status quo and are not open to new ideas. An important aspect of the programme is to help children break away from established ways of thinking, to see situations in new ways and open up their minds to new ideas. The first 'Great Escape Game' worksheet is designed to help children 'escape' from established ways of looking at everyday objects, to open up their minds to new possibilities and be more flexible in their thinking.

In the second 'Great Escape Game' worksheet, children move on to using their creative ideas to improve objects. The aim is to help children see that their ideas are important, that they do not need just to accept how things are

but that they can make things better. The children then use their critical thinking to judge the best creative ideas, establishing the interdependence of the different types of thinking.

Humour – The benefits of using humour to stimulate creative thinking have already been discussed in the literature review. Goleman (1996) suggests that humour enhances the ability to think flexibly and find creative solutions to problems. He suggests that laughter helps people think more broadly, recognize complex relationships and foresee the consequences of decisions. Costa and Lowery (1989) maintain that humour provokes higher-order thinking and liberates creativity. They also suggest it improves motivation and helps children develop a positive self-concept and a sense of personal control over the learning process. However, while Cornett (1986) suggests humour is one of the most powerful instructional resources in motivating children's thinking, it is rarely used in schools and none of the existing thinking skills programmes, as far as I am aware, include it in their design. The aim of including it in 'A Guide to Better Thinking' is to help children see how they can use humour to find creative solutions to some of the problems they encounter but also to show them that thinking can be fun.

Wonder – Socrates said that all thinking begins with wonder. The worksheet on wonder is included in the programme design to stimulate children's curiosity and help them make sense of the world around them. The aim is to help children understand the environment and the part they can play within it, encouraging them to be curious, to question and seek answers rather than just passively accepting how things are. According to Costa, "Wonder and a sense of awe are the prerequisites for intelligent life" (Costa, 1991, p. 106).

Imagination – Einstein believed that imagination is more important than knowledge. Having used their creative thinking to improve other people's ideas, an important aspect of the programme is that children should be given the opportunity to develop their own original ideas. The aim is to push the boundaries of accepted practice into the new and innovative and

help children realise they are free to create new and different things. As discussed in the literature review, as children create 'mental pictures' of what they can do and achieve, this increases motivation and self-efficacy, helps them become more flexible in their thinking and more able to transfer information from one situation to another.

The Brain Game – Is included to give children an example of what is possible and to help them see that if Sparky can create something new and original, so can they. The idea is to give them the confidence and the courage to create something new and original of their own. It is important that children are given time to play 'The Brain Game' as it reinforces, in a congenial way, all aspects of the programme.

How Am I Doing – As in the previous sections, a 'How am I doing' worksheet is provided to give children feedback on their progress in creative thinking. The hope is that it will increase intrinsic motivation and help children take responsibility for their own learning. It also provides valuable information for the teacher as to whether or not children can transfer their learning to new situations and use their creative thinking in different contexts. As previously stated, a major aim of the programme is also to improve children's concept of themselves as thinkers. It is important to know therefore how children **feel** about themselves as thinkers after using the programme and to that end, a before and after self-rating measure is included in this worksheet. On a scale of 1 – 10, children rate themselves as thinkers before and after the programme providing a valuable measure of the degree to which they feel their thinking has improved.

The programme ends on a very positive note. Sparky has achieved success. He knows he is a 'Better Thinker', that he is in control, but:

> While Sparky knew it was good to be winning,
> He also knew it was just the beginning.
> **Now** he would apply it to
> Every single thing he'd do.

One of the major aims of the programme is that, when children believe it is possible for them to become 'Better Thinkers' and see that it works in real-life situations; when they know some of the strategies to use and have the confidence to try; when they have a sense of personal control over the learning process and see it's really up to them; the hope is that children will then use their 'Better Thinking' throughout the curriculum and in other areas of their lives.

Piloting the Programme

While an essential aspect of the programme design was to draw from my own experience, it was important to see whether other teachers shared my own perception regarding the suitability of the materials. As the programme was being developed therefore, a number of experienced colleagues - teachers and headteachers - were consulted as to the relevance of the materials, whether it was pitched at the right level, would it work in a real-life context, etc. This allowed me to step back from my role as developer of the programme and provided clarification for the research design.

A vital aspect of 'A Guide to Better Thinking' was also to include children's views in the overall design of the programme. Prior to the formal 'trialling' therefore, a pilot study was carried out with a primary six class of 24 children, aged approximately 10 years. Robson (1993) believes that advance planning is all very well, but is no substitute for the 'real' situation and maintains that programmes should be piloted in virtually all circumstances. Berk & Rossi (1990) also suggest it is one thing to have a programme that works well in theory, but quite another to have a programme that works well with 'real' subjects. They stress the need for a pilot study where modifications can be made. Thus, the pilot study was used in the formative development of the programme, to help 'fine-tune' the material and include children's views in the programme design.

It was also important that the piloting took place in a 'realistic' situation, not in an 'ideal' setting as has often been the case with existing programmes. Indeed, Yin (1994) suggests that the pilot site should represent the most complicated of the real cases, so that nearly all data collection issues will be encountered. With that in mind therefore, the pilot study was carried out in a large inner-city school with children of very mixed ability and social background. The teacher and all 24 children in the class, who volunteered to take part in piloting the materials, had no experience of Thinking Skills Programmes.

The purpose of the 'pilot' was explained to the children and the importance of their role as 'consultants' in the final design of the programme was emphasized. The children were consulted individually, in groups and as a class and a number of important issues were considered:

Was the material set at the correct readability level?

Did they like the characters?

How long did it take to complete?

Were the instructions clear?

Were any questions ambiguous?

Was the layout clear and attractive?

Was it challenging, fun, boring?

(Example of Children's Questionnaire used in Piloting, in Appendix 1).

Each worksheet was discussed and analyzed by the children and a few minor changes were made in the light of their comments. For example:
They enjoyed the introduction because it rhymed and children felt that they could identify with the main character because they had all been in a similar situation themselves. They really liked Sparky because he was fun, didn't give up, but most of all because he wasn't too clever so they didn't feel threatened by him. The general feeling was that if Sparky could become a better thinker, so could they. In one of the original illustrations however

Sparky's tongue was hanging out and the children thought this made him look silly. This was changed in view of their comments.

While they wanted to retain words like hemisphere and metacognition because they were more challenging, a sentence in 'The Brain' worksheet which originally read,

> "Recent research shows that to be a Good Thinker it is necessary to link the faculties of the two hemispheres – to use the whole brain."

was changed at their suggestion to,

> "Recent research shows that to be a Good Thinker it is necessary to use the whole brain", because it was more 'user friendly'.

'Fighting' was added to the planning worksheet on consequences because they felt,
"Everyone would want to discuss the consequences of that!"

The overall reaction to the programme was very positive. The children thought it was set at the right level and that the layout was attractive and motivating. Challenging, interesting and enjoyable were the words most used to describe the material. No child thought it was boring. All agreed that it would stimulate their thinking and improve their self-esteem. They took their role as consultants very seriously and were delighted to have contributed to the final design of the programme.

The programme design was informed therefore by prevailing theories, by children's observations, and by years of classroom experience and research in teaching thinking. The next step was to conduct a formal evaluation of the programme and this is described in the following chapter.

CHAPTER FOUR

EVALUATION OF THE PROGRAMME

In this chapter, the methodology used in the evaluation of the programme is explained. The aim of the evaluation was to examine whether, and to what extent, children using 'A Guide to Better Thinking' demonstrated improvements in:

- positive thinking – their self-concept as thinkers;
- critical thinking – their ability to reason and reflect on their thinking;
- creative thinking – their creativity and flexibility of thought.

In conducting the evaluation, very careful consideration was given to selecting appropriate assessment procedures and, important general issues concerning the evaluation of Thinking Skills Programmes are raised.

The chapter will provide a description of the evaluation design and focus on the measures used to evaluate each of the programme goals and the overall effects of the programme.

The evaluation of the programme – research design, site and sample selection, and data collection techniques will be outlined. Trialling of the programe in two contrasting schools – a large inner-city school requiring urban aid and a middle-class school with mainly professional parents – will also be described.

Evaluation Design

A central goal of the research design of this study was to use evaluation instruments well targeted to the different individual areas of thinking skills and attitudes being developed in the programme. In view of the broad range of skills and attitudes being developed in 'A Guide to Better Thinking', however, the aims were quite wide in distinction to earlier programmes. This clearly presented more of a challenge in evaluating it appropriately. Before describing the exact form this evaluation took, there is a need to address wider issues in the evaluation of Thinking Skills Programmes and to present the rationale of why particular methods were used.

Having searched widely among different programmes for appropriate evaluation measures, the main concerns were, the severe limitations of existing tests actually to measure thinking skills and what appears to be considerable confusion over what constitutes an effective evaluation of Thinking Skills Programmes in general.

The problem is that existing programmes rarely provide any research evidence of their success in achieving their stated goals. Often what is being measured differs considerably from the aims of the programme. While de Bono reminds us that testing thinking is "extraordinarily difficult", he prefers CORT users to carry out their own tests and suggests,

> We do not have any adequate way of measuring thinking performance. Standardised tests are largely irrelevant because they do not allow us to observe the thinker's composite performance.
>
> (De Bono, 1991, p.32).

Sternberg (1984) points out that there is often no "psychological basis" that tests given actually measure thinking skills, indeed, some tests that claim to

do so measure prior knowledge that has nothing to do with thinking. Further, despite the dismissal of conventional I.Q. tests by some programme designers (Feuerstein,1979, for example), the main criterion measure used to evaluate many Thinking Skills Programmes is a conventional group I.Q. test. Sternberg (1984) stresses the need for more effective evaluation of Thinking Skills Programmes and suggests that there are many people eager to implement Thinking Skills Programmes but not to have them evaluated.

Whimbey on the other hand, believes there is no need for separate tests to measure thinking abilities and suggests that a school can determine the effectiveness of a Thinking Skills Programme simply by assessing improvement in reading ability. "The reasoning skills children develop will be manifested as accelerated improvement in reading ability therefore no test is needed" (Whimbey, 1985, p.39).

Quellmalz (1985), however, disagrees with this view. He further suggests that higher-order thinking skills tend to be measured within subject matter tests, most often in a multiple choice format, with a focus on isolated skills. He believes the one right answer format and piece-meal testing of components dominate and that there is a need to design tests that include a broader array of items and tasks.

Norris and Ennis (1989) also criticise the lack of available tests to measure thinking skills adequately. They suggest there is not a lot of choice in commercially available critical thinking tests. Most of them are in a multiple-choice format and test for critical thinking in the context of general knowledge. If critical thinking dispositions are the focus of concern, they believe that the available multiple-choice tests will probably be of no help.

Effective evaluation of Thinking Skills Programmes therefore is 'fraught with difficulties'. Often success is determined by a narrow range of standard

achievement tests in a number of content areas and a selection of somewhat questionable instruments that fail to measure the goals of the Thinking Skills Programme being developed.

Swartz and Perkins (1990) conclude that most Thinking Skills Programmes have not been well evaluated and that the entire field suffers from under-evaluation.

There is clearly a need for tests that measure, for example,

- children's metacognitive performance
- children's ability to use reasoning in real-life situations and to explain their reasoning
- how proficient children are at transferring their learning to new situations
- children's ability to generate cognitive strategies and know when and how to apply them
- enjoyment of the programme and motivation to succeed at the tasks.

The development of such tests would seem to me to be a top priority and the great challenge for future research.

Because of the difficulties, many programme developers have opted for no evaluation at all but, as Costa and Kallick warn, the danger is that someday we will reflect that:

> What was educationally significant but difficult to measure was replaced by what was educationally insignificant but easy to measure.
>
> (Costa and Kallick, 1995, p.213).

Problems of evaluation, therefore, should not be underestimated and careful consideration must be given to selecting appropriate assessment procedures to evaluate Thinking Skills Programmes. While there are many programmes which have been poorly evaluated, the aim is that this programme will not be one of them.

Berk and Rossi (1990) stress that determining the effectiveness of a programme depends on the validity of the evaluation. My initial concern therefore was with construct validity, i.e., does the programme achieve its stated aims, and a major goal of this study was to make the testing more focused on what is actually being developed in the programme than has occurred in the past. Evaluation is guided therefore by the different types of thinking skills identified and the key matter of enhancing children's concept of themselves as thinkers. Because the aim is to develop a broader range of thinking skills, no single test is available that would cover all aspects of the programme. This prompted the need to look for a variety of measures to assess the different domains. This would help form a far more balanced picture than can be revealed by a score on a standardized test and allow some exploratory analysis between self-concept and 'harder' cognitive measures. Given the constraints around, however, the major problem was in balancing what needed to be measured with what was actually feasible in terms of availability, time, costs, etc.

As the concern was with the effectiveness of the programme, evaluation was largely summative and included a range of qualitative and quantitative measures for, as Holt suggests,

> Evaluation of any programme should be based on qualitative as well as quantitative measures of achievement. The danger is that commitment to scientific objectivity will blind professionals to the value of qualitative judgements.
>
> (Holt, 1983, p.27).

Patton (1990) also suggests that another reason for using qualitative measurement is that for particular outcomes no acceptable valid and reliable quantitative measures exist. It is more appropriate to gather descriptive information about what happens as a result of programme activities than to use some scale which has the merit of being quantitative but whose validity and reliability are suspect.

To conduct this evaluation, therefore, a mixture of qualitative and quantitative measures were used. The measures finally adopted to evaluate the programme were:

'Self-Concept as a Thinker' Evaluation Measures

The development of Positive Thinking is an important aspect of the programme and one of the major goals is to enhance children's concept of themselves as thinkers. Arbitman-Smith et al (1984) reviewed a number of self-concept scales and highlighted the problems of finding appropriate self-concept measures. They concluded that, "The sensitivity of these tests to measure changes in self-concept has to be questioned" (p.461). After an extensive search, the most promising instrument available for this population was a 'Self-Concept as a Thinker (SCAT) Scale produced by Edwards (1987) to assess the effects of the De Bono CORT Programme on children's self-concept as thinkers. It has since been used in a number of studies, for example, by Jones (1988) to evaluate the Lipman Programme, and by McGrath (1997) to evaluate Mind Questions. An 'adapted' version of the SCAT Test was produced by this researcher, Kite (1991), to evaluate the effects of the Lipman Programme on children's self-concept. The same questions were used but the format was simplified i.e. the response option was changed from five to four, to meet the needs of the younger population being tested. Robson suggests it will sometimes be necessary to, "Change existing instruments to better fit your needs" (Robson, 1993, p.267) but warns of the need to re-establish validity and reliability. This 'adapted' version has since been used across a wide variety of school populations in different social settings, to measure children's concept of themselves as

thinkers after using Thinking Skills Programmes. It is, in my view, the best measure available for this population.

Other measures used to evaluate this aspect of the programme included: worksheet analysis, 'How Am I Doing' Positive Thinking self-assessment check, self-rating before and after scale and children's written statements of how they felt about themselves as thinkers before and after the programme.

Critical Thinking/Reasoning Ability Evaluation Measures

The development of Critical Thinking is an important aspect of the programme and a major goal is to enhance children's ability to reason and reflect on their thinking. Few suitable measures are available, however, and instruments to measure children's ability to reason in real-life situations are conspicuous by their absence. After an extensive search the measure finally selected to evaluate this aspect of the programme was the Thorndike, Hagen & France (1986), Cognitive Abilities Test (CAT), published by NFER-Nelson. The reasons for this selection were that it was developed to appraise reasoning abilities that are of importance in both academic and everyday life activities and the emphasis is on flexibility of thinking. In constructing the items, the authors have attempted to keep the basic elements relatively simple, clear and familiar. Specialised or trivial content has been avoided. Through the use of familiar activities in novel combinations, the tasks on the test are more likely to require analysis and reasoning and thus tap the analytic or 'fluid' aspects of ability, that is, ability not bound by formal school instruction, rather than 'crystallized achievement'. The test consists of three batteries, verbal, non-verbal and quantitative but only the verbal and non-verbal batteries were used. This was partly because, as the quantitative battery correlates most highly with mathematical reasoning it was considered less appropriate to what was being developed in the programme. Additionally, as the children faced a variety of other tests, administering the three batteries would undoubtedly have resulted in test fatigue. The Cognitive Abilities Test is now widely used across the U.K. to measure children's reasoning. While detailed information on the reliability

and validity of the CAT can be found in the manual, the test has been found to have high internal reliability (0.94 for the verbal and 0.92 for the non-verbal batteries on the Kuder-Richardson Formula No.21 Reliability Estimates) and high external reliability as measured on a test / re-test basis (r = 0.8 for the verbal and r = 0.7 for the non-verbal batteries). Individual batteries of the CAT have been shown to have criterion validity in correlating with subsequent GCSE performance.

Other measures used to evaluate this aspect of the programme included: worksheet analysis, 'How Am I Doing' Critical Thinking self-assessment check, and thinking diaries.

Creative Thinking Evaluation Measures

A major goal of the programme is to enhance children's Creative Thinking, but again there is a lack of effective instruments to measure creativity. Patton (1990) questions the validity of some instruments that purport to measure creativity and suggests that to evaluate a programme that was attempting to make students more creative it would be better to document in detail the activities, behaviours, thoughts and feelings of participants rather than administer some instrument which is at least open to question. Perkins, also questions the validity of the most popular instruments actually to measure creativity and suggests:

> If we really want to find out about the impact of a creative course, compare the people who took the programme with those who did not – a control group. Difficult to do and almost never happens but that would be the ideal scenario.
>
> (Perkins, 1985), pp.14/15).

With that in mind, therefore, after an extensive search of existing tests – many of which were inappropriate in that they did not measure the creative thinking being developed in the programme – and failure to find a test that would measure creative thinking in real-world situations, the instrument

chosen to evaluate this aspect of the programme was a 'What Can It Be Used For' Test. This instrument was devised, and has been widely used, by the Educational Testing Service in the United States to assess creative development and Shipman (1983) found it to be 'highly reliable' in assessing this aspect of the Philosophy for Children Programme. Children record in a four minute period as many different uses as they can imagine for familiar objects such as a brick, button, shoe, coathanger etc. Responses must be relevant and repetitions such as 'to hang clothes' and 'to hang shirts' are not accepted. While it is appreciated that this instrument measures only one aspect of creativity, it does provide a useful measure of creative development and flexibility of thought.

Other measures used to evaluate this aspect of the programme included: worksheet analysis, and 'How Am I Doing' Creative Thinking self-assessment check.

Measures to Evaluate the Effects of the Programme as a Whole

- Teacher questionnaires – to evaluate, not only the overall effects of the programme on the children, but the effects on the teachers themselves, whether or not it changed their own thinking, how easy the programme was to implement etc.
- Parent questionnaires – to evaluate any changes in children's attitude or behaviour as a result of the programme.
- Children's written summative evaluations both in terms of their experience of the programme and their enjoyment of it.

The aim in designing the evaluation was to keep well focused on the goals of the programme. The measures chosen therefore are the best and most appropriate available to evaluate 'A Guide to Better Thinking'. An important aspect is that teachers using the programme can carry out their own evaluations using these measures. A summary of the evaluation design is presented overleaf.

Evaluation Design Summary

PROGRAMME GOAL	PRE/POST EVALUATION MEASURES	OTHER EVALUATION MEASURES
To develop Positive Thinking and improve children's concept of themselves as thinkers and learners	Self Concept As a Thinker Scale Pre and Post-Test	Worksheet Analysis Positive Thinking 'How Am I Doing' Self-Assessment Check Self-Rating Before and After Scale
To develop Critical Thinking and improve children's ability to reason and reflect on their thinking	N.F.E.R. – Nelson's Cognitive Abilities Test Pre and Post-Test	Worksheet Analysis Critical Thinking 'How Am I Doing' Self-Assessment Check Thinking Diaries
To develop Creative Thinking and flexibility of thought	"What Can It Be Used For" Pre and Post-Test	Worksheet Analysis Creative Thinking 'How Am I Doing' Self-Assessment Check
To measure children's enjoyment of the programme and evaluate the 'overall' effects Children's written summative evaluations Parent/Teacher Questionnaires		

METHODOLOGY

De Bono (1991) suggests that tests carried out by designers of programmes are of limited value because the conditions of teaching are 'ideal' and often far removed from those prevailing in schools where the programme will actually be used. As this study is based on teaching thinking in the realities of today's schools, it was important to trial the programme in a 'real world' situation.

School A

The school in which the initial trialling took place was a large inner city primary school, identified as requiring urban aid. There were 380 pupils. Many of the children came from a poor socio-economic background with over 50% receiving free school meals. Discipline problems were not unknown. It was, however, a very caring school with the headteacher and staff committed to improving children's learning.

Research Design

Berk and Rossi recommend 'Randomised Experimental Design' to test the effectiveness of new programmes that have been developed. They suggest that randomly allocating persons to an experimental group to which the programme is administered, or a control group from which the programme is withheld, assures that all the factors ordinarily affecting the outcome in question are on average distributed evenly across those who receive the programme and those who do not. The experimental and control groups will be, on average, comparable before the treatment is introduced. This allows for a fair, unbiased, test of the intervention's impact and, as a result, "internal validity is enhanced enormously" (Berk & Rossi, 1990, p.56).

Classes – Control and Experimental Class 1

With this in mind therefore, two primary seven classes, of mixed ability, each with 23 children, naturally formed through school enrolment procedures and similar in age, ability and social background, were selected for the study. The final decision as to which should be the 'experimental' and which should

be the 'control' class was taken by the toss of a coin. Primary 7(a) became the 'control class', primary 7(b) the 'experimental' class.

Time Frame

Preliminary discussions were held with the headteacher and class teachers and a time framework was agreed. The same amount of time would be spent in both classes. Two/three weekly sessions over a ten week period would be spent in the 'experimental' class delivering the programme and an equivalent amount of time would be spent in the 'control' class doing 'normal' curriculum work. This was to try to create as similar conditions as possible. Although they had no experience of teaching thinking or Thinking Skills Programmes, the teachers had volunteered to take part in the study and although I was to administer the programme, they were keen to assist with testing, data collection, etc.

Programme Implementation

The first week was spent administering the pre-tests and getting to know the children. Each session began by reflecting on the previous worksheet and a discussion of how children had used their 'Better Thinking'. The individual worksheets are self-explanatory, but opportunities were given in each session for children to discuss the goal of the exercise and compare their thinking strategies. Any initial reluctance by the children to take part was soon overcome as they identified with the characters and became enthusiastic about the programme. Problems that did arise concerned the realities of school life rather than the programme itself, changes to the timetable because of teacher illness and school visits, for example.

Data Collection

Three pre-tests were administered to both the experimental and control groups in January 1999, at the beginning of the programme. These were:

The Self-Concept as a Thinker Test;

The Cognitive Abilities Test;

'What Can It Be Used For' Creative Thinking Test.

Post-tests, using the same measures, were administered to both groups in March 1999 at the end of the programme.

De Bono (1991) believes that tests carried out by designers of programmes are limited in value because they always contain an element of bias. With that in mind, great care was taken in testing the children. Each class teacher was present at the administration of the pre and post-tests. The Cognitive Abilities Test was administered according to the instructions in the manual and was computer scored by NFER – Nelson. The SCAT tests and the 'What Can It Be Used For' tests were scored independently by myself and the class teacher then the results were checked by the headteacher.

Pre and Post-Test results will be presented in chapter 5 and discussed fully in chapter 6.

Other Data were gathered through:

- Worksheet analysis
- 'How Am I Doing' self assessment checks
- Thinking Diaries
- Self-rating before and after scale
- Teacher questionnaires
- Parent questionnaires
- Children's written evaluations
- Anecdotal evidence from parents and teachers.

Arbitman-Smith et al, suggest that, "Anecdotal evidence, while not ultimately convincing, can illuminate the nature of cognitive change." (Arbitman-Smith et al, 1984, p.461.)

These measures provided a rich source of information about the programme and will again be presented and discussed in the following chapters.

A vital issue in all evaluations, however, concerns the generalizability or 'external validity' of the study. Robson (1993) suggests the study should be repeated in a deliberately different setting, with a different operator and different target group to assess the generalizability of its findings. Indeed, Berk and Rossi suggest, "If findings cannot be generalized they are useless" (Berk and Rossi, 1990, p.24). They believe that programmes must be 'robust' enough to produce the same results, with different clientele, in different settings. The question was therefore, would these results be applicable to children who differ in ability and socio-economic background, with someone else administering the programme?

School B

To test the generalizability therefore, the programme was trialled in a second school. While it was also a large city school with 360 pupils, it was in a middle-class catchment area with a high proportion of professional parents. Fewer than 8% of the children received free school meals. Discipline problems were rare. The depute headteacher, who was aware of the programme, volunteered her school for the trial and a primary six teacher agreed to run the programme. This became Experimental Class 2 in the study. The teacher had no experience of teaching thinking, or using Thinking Skills Programmes and apart from a brief introduction to the materials by the depute headteacher, no other training was given. The teacher used the material 'cold'.

Experimental Class 2

The class consisted of 24 primary six children, of mixed ability, naturally formed through school enrolment procedures.

Time Frame

The depute headteacher and class teacher agreed that the same time framework would be followed as in the previous trial. Two/three weekly sessions over a ten week period would be spent delivering the programme.

Data Collection

Pre-tests were administered in April 1999 and included as before:

The Self Concept as a Thinker Test;

The Cognitive Abilities Test;

'What Can It Be Used For' Creative Thinking Test.

Post-tests, using the same measures, were administered in June 1999 at the end of the programme.

The class teacher and depute headteacher administered the Pre and Post-Tests. The Cognitive Abilities Tests were computer scored by NFER – Nelson. the SCAT Tests and 'What Can It Be Used For' Tests were scored independently by the class teacher and depute headteacher and checked by the headteacher.

Pre and Post-Test results will be presented and discussed, with the other class results, in chapters 5 and 6. Other Data, using the same procedures as in the previous trial, were gathered by the teacher administering the programme and will also be presented and discussed fully in the following chapters.

The overall timetable for the evaluation of the programme is represented succinctly overleaf.

A Guide To Better Thinking

Timetable for Implementation and Evaluation

DATE	
OCTOBER – DECEMBER 1998	Piloting Programme Planning Programme Trials
JANUARY 1999	Collection of Pre-Test Data – SCHOOL A Implementing Programme
FEBRUARY 1999	Implementing Programme Collection of Qualitative Data
MARCH 1999	Implementing Programme Collection of Qualitative and Post-Test Data – SCHOOL A
APRIL 1999	Collection of Pre-Test Data – SCHOOL B Implementing Programme
MAY 1999	Implementing Programme Collection of Qualitative Data
JUNE 1999	Implementing Programme Collection of Qualitative and Post-Test Data – SCHOOL B

CHAPTER FIVE

PRESENTATION OF FINDINGS

Having described the overall evaluation strategy and the specific procedures employed to evaluate the programme, in this chapter, findings from the evaluation of the programme are presented. Given the large number of measures employed within the evaluation, it was important to provide a clear structure for the reader. Accordingly the chapter includes:

- A general overview of pre/post test measures.
- Presentation of findings for each of the programme goals listed below:

  to develop positive thinking and improve children's concept of themselves as thinkers and learners;

  to develop critical thinking and improve children's ability to reason and reflect on their thinking;

  to develop creative thinking and flexibility of thought.
- Group differences within classes and across tests.
- Findings from Parent/Teacher questionnaires.

General Overview of Findings

In order to measure the effects of 'A Guide to Better Thinking' on children's self-concept as thinkers, cognitive ability and creative thinking, a pre-post test control and experimental design was used. Fitz-Gibbon and Morris (1987) suggest that the great virtue of this design is that it allows the researcher to detect even small, short term improvements and is a sensitive test of a programme.

The hypotheses being tested were that children who used the programme would make significantly greater gains than their non-programme peers in:

- positive thinking – their self-concept as thinkers
- critical thinking – their ability to reason and reflect on their thinking
- creative thinking – their creativity and flexibility of thought

The first sample consisted of two primary 7 classes from a large inner-city school identified as requiring urban aid. There were 23 children in each class, of similar age, ability and socio-economic background. There were equal numbers of boys and girls and over 50% of the children received free school meals. Classes were randomly assigned to control and experimental class by the toss of a coin. Children in the experimental class were given the programme - children in the control class continued with their 'normal' curriculum work. The researcher administered the programme but spent an equal time in both classes. Pre and post-tests in:

'Self Concept As A Thinker' - SCT

'Cognitive Ability' - Verbal & Non-Verbal - CAT V & N

'Creative Thinking' - CTT

were administered to both groups in January and March.

The CAT was computer scored by NFER-Nelson and the statistical package SPSS was used in the data analysis and presentation.

Pre-test scores indicate that the two groups were more or less equivalent in achievement in each of the tests. On a two-tailed t-test, differences between the control and experimental class at the beginning of the programme were not statistically significant. If anything, the slight differences that did exist tended to favour the control group.

To test generalizability or external validity, the study was repeated in a deliberately different setting, in a different school, with children who differed in age, ability and socio-economic background with someone else administering the programme. The teacher had no training and used the programme 'cold'. Experimental class 2 consisted of 24 Primary 6 children from a 'middle-class' school with mainly professional parents – fewer than 8% received free school meals. Pre and post-tests were administered in April and June. The CAT was computer scored and the other tests marked by the teacher and depute headteacher. The researcher took no part in administering the programme or in scoring the tests.

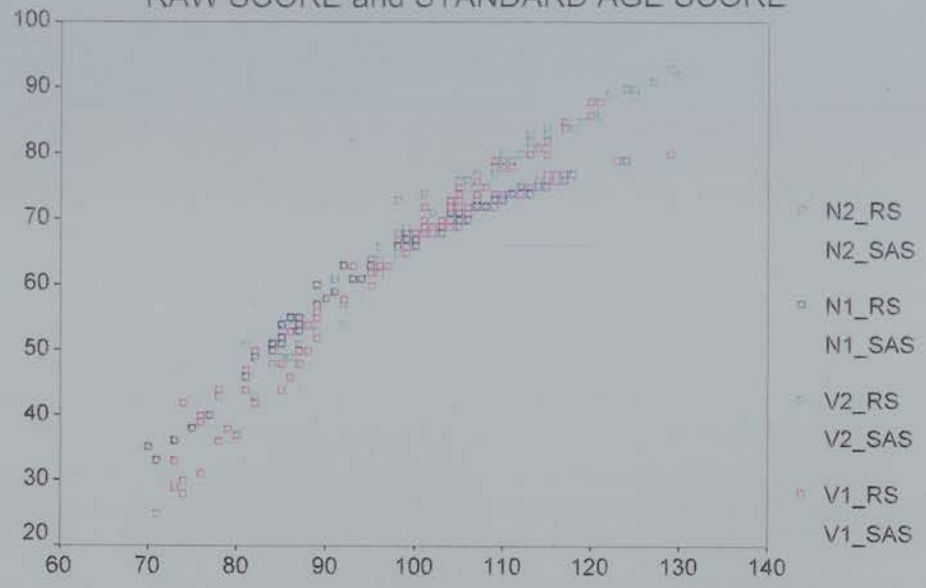
No significant pre-test differences were found in self-concept or creative thinking between the two experimental groups but differences in pre-test scores on the CAT were statistically significant. See Table 1.

Table 1 – Cognitive Ability Pre-Test Scores for 'Experimental Groups'

		COGNITIVE ABILITIES PRE-TEST VERBAL - V1 NON-VERBAL - N1					
GROUP	N	PRE-TEST	Mean	Std. Deviation	t	df	Sig (2-tailed)
EXPER. CLASS 1	23	V1	51.87	20.73			
EXPER. CLASS 2	24	V1	71.21	14.14	3.750	45	.001
EXPER. CLASS 1	23	N1	53.91	15.83			
EXPER. CLASS 2	24	N1	66.71	9.57	3.370	45	.002

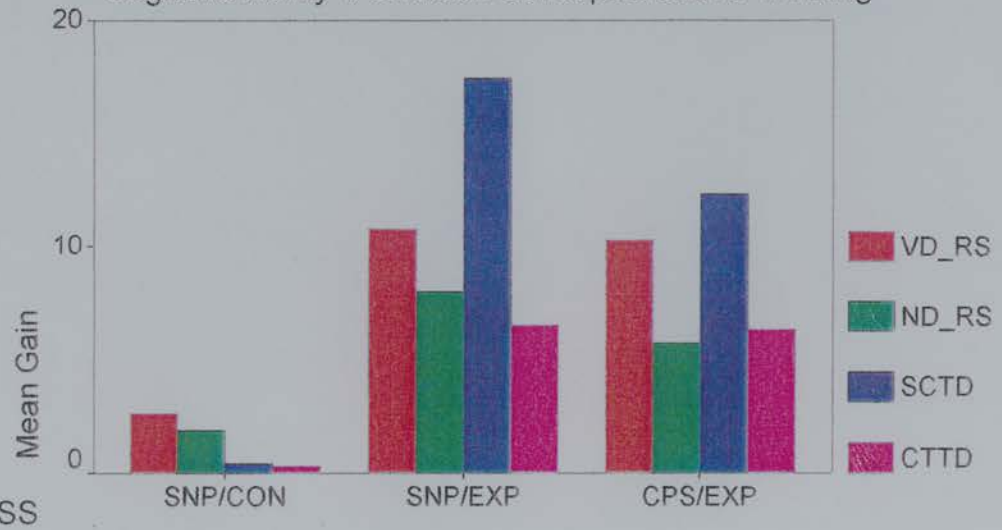
As there were missing data on the standard age score of the Cognitive Abilities Test and a high correlation between the raw score (RS) and standard age score (SAS), as illustrated in the graph, Figure 1, below, raw score data were used throughout the analysis.

Figure 1 GRAPH of CORRELATION BETWEEN RAW SCORE and STANDARD AGE SCORE



After the programme, post-test scores on each of the tests were significantly higher for the experimental groups than for the control group. The graph below, Figure 2, illustrates the pre/post-test gains for each of the groups and allows the reader to see at a glance the clear impact of the programme.

Figure 2 GRAPH OF PRE/POST-TEST GAINS IN Cognitive Ability-V & N/Self-Concept/Creative Thinking



Control / Exper Class 1 / Exper Class 2

The gain scores represent the differences between children's performance on the first and second administration of each of the tests. As can be seen from the graph, gains of a similar magnitude for each of the experimental groups are impressive and quite striking compared with those of the control group.

The statistical significance of the difference between pre and post-test scores can be seen from Table 2 and a full analysis of these gains will be presented in the following chapter.

Table 2 – Pre/Post-Test Gains for All Groups in:

Cognitive Ability - Verbal V1 & V2 and Non-Verbal N1 & N2
Self Concept As A Thinker - SCT1 & SCT2
Creative Thinking - CTT1 & CTT2

	PRE/POST-TEST GAINS FOR EACH GROUP						
GROUP	**N**	**PRE/POST**	**Mean Gain**	**Std. Deviation**	**t**	**df**	**Sig. (2-tailed)**
CONTROL CLASS	23	V1-V2	2.61	5.98	2.091	22	.048
		N1-N2	1.87	4.45	2.013	22	.057
		SCT1-SCT2	0.43	6.07	0.344	22	.734
		CTT1-CTT2	0.30	1.36	1.071	22	.296
EXPERIMENTAL CLASS 1	23	V1-V2	10.78	6.79	7.617	22	.001
		N1-N2	8.00	4.69	8.180	22	.001
		SCT1-SCT2	17.43	11.62	7.197	22	.001
		CTT1-CTT2	6.52	2.54	12.322	22	.001
EXPERIMENTAL CLASS 2	24	V1-V2	10.29	4.88	10.339	23	.001
		N1-N2	5.71	4.57	6.115	23	.001
		SCT1-SCT2	12.33	8.82	6.854	23	.001
		CTT1-CTT2	6.33	2.88	10.757	23	.001

A summary table of individual children's scores in all of the tests is included in Appendix 2.

While Table 2 gives the reader an overview of pre/post-test results, the following section will present in more detail, findings relating to each of the three programme goals from the variety of evaluation measures used. Patton (1990) suggests that evaluators, who want their results to make a difference, need to find 'creative ways' and a large repertoire of data collection techniques to evaluate programme effectiveness.

Self-Concept as a Thinker

Self-Concept As A Thinker Test - Pre & Post Scores

A two-way analysis of variance was carried out on pre/post-test scores for the three groups. This showed a main effect for class ($F(2, 67) = 4.03$, $p < 0.001$) and a main effect for pre/post self-concept scores ($F(1, 67) = 85.36$, $p < 0.001$). The interaction between class and pre/post-test self concept as a thinker scores was also significant ($F(2, 67) = 21.10$, $p < 0.001$).

The results of post hoc t tests are shown in Table 3. Differences between pre-test scores for the control and experimental groups were not statistically significant. After the programme however, post-test scores for the experimental groups were significantly higher than those of the control group. See graph, Figure 2, on page 116 and Table 3 below.

Table 3 – Pre/Post-Test Gains in Self Concept As A Thinker

	SELF-CONCEPT AS A THINKER TEST PRE - SCT1 POST - SCT 2						
GROUP	**N**	**PRE/POST**	**Mean**	**Std. Deviation**	**t**	**df**	**Sig. (2-tailed)**
CONTROL CLASS	23	SCT 1	107.57	17.08	0.344	22	.734
		SCT 2	108.00	16.90			
EXPERIMENTAL CLASS 1	23	SCT 1	110.00	14.11	7.197	22	.001
		SCT 2	127.43	11.18			
EXPERIMENTAL CLASS 2	24	SCT 1	102.67	16.29	6.854	23	.001
		SCT 2	115.00	14.52			

Results suggest that children participating in the programme had post-test scores which were much greater than those of children not participating in the programme. These results will be analysed fully in the following chapter.

An important aspect of the programme was to evaluate children's own feelings about themselves as thinkers before and after using 'A Guide To Better Thinking'. To that end, data were collected from three further sources:

- a self-rating before and after scale
- positive thinking how am I doing self-assessment check
- children's written statements of how they felt about themselves as thinkers after the programme.

How Do You Feel About Yourself As A Thinker?
Self-Rating Scale

On a scale of 1-10, the experimental group children rated themselves as thinkers before and after the programme. All of the children felt their thinking had improved and the results when subjected to statistical analysis were highly significant - see Table 4. The graph below, Figure 3, highlights both the size and similarity of gains made for each of the experimental groups.

Figure 3 GRAPH OF PRE/POST-PROGRAMME SELF-RATING SCALE

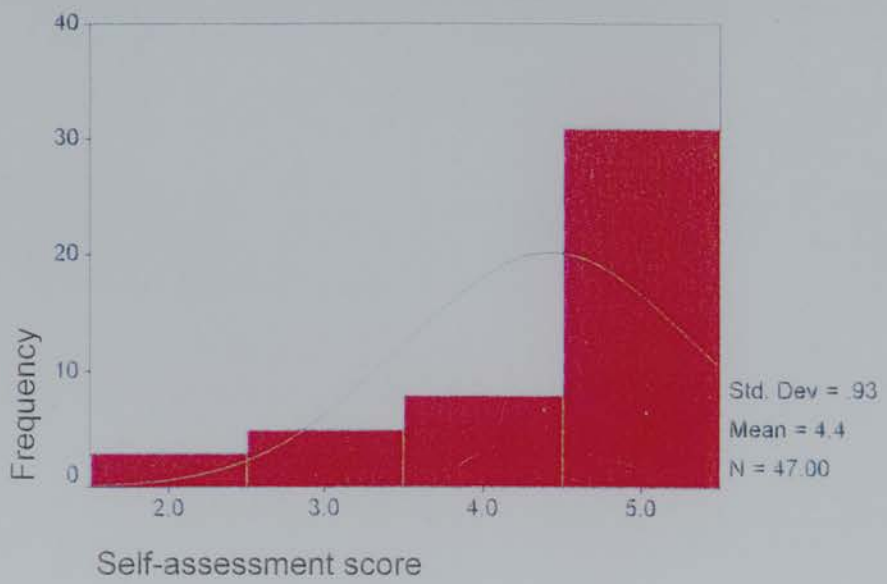
Table 4

	SELF-CONCEPT AS A THINKER SELF-RATING SCALE PRE/POST DIFFERENCE					
	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Self-Rating Scale 1	47	3.6809	1.5052			
Self-Rating Scale 2	47	8.8511	0.8592	21.887	46	.001

Positive Thinking - How Am I Doing?
Self-Assessment Checks

As discussed previously, (pp. 67/68), a self-assessment check was included at the end of each section of the programme to help children monitor their own progress. The positive thinking self-assessment check was designed to give positive feedback and build children's confidence in themselves as thinkers and learners. Additionally, it provides valuable evidence as to children's progress in meeting the programme goals. The graph below, Figure 4, illustrates the combined scores for the experimental groups in terms of positive thinking. The pattern for each group was again very similar, see graph, Figure 8, page 127, and will be discussed more fully later in the chapter.

Figure 4 GRAPH OF POSITIVE THINKING SELF-ASSESSMENT CHECK



Patton (1990) suggests that often evaluations become 'lulled into a routine' of producing a series of statistical tables which begin to have a 'numbing effect' and can, in themselves, reduce the impact of the results. For programmes that include enhanced self-esteem as an outcome goal, Patton believes it is important to document the thoughts and feelings of participants. Further evidence is provided therefore by children's written statements of how they felt about themselves as thinkers after the programme. While the next chapter will look in more detail at different dimensions of change that are evident in these statements, at the moment, by way of illustration, a few examples include:

Children's Views Of Themselves As Thinkers After The Programme

- "I used to think I was a good thinker – now I think I'm fantastic."

- "I am much better at thinking. I am much more in control and feel good about myself."

- "I've learned to believe in myself – to set a goal and go for it."

- "My thinking has changed because I tell myself I can do it and I feel more positive. I've learned how to help myself."

- "I never really thought about thinking until Sparky showed me how to think. I didn't know you could make it better. Most of all I've learned not just to follow other people's ideas but to use my own."

- "It's good to know all about thinking – why did they not tell us before? I'll definitely use what I've learned when I do my work at school."

Critical Thinking

To test children's ability to reason and to reflect on their thinking, data was collected from a number of sources.

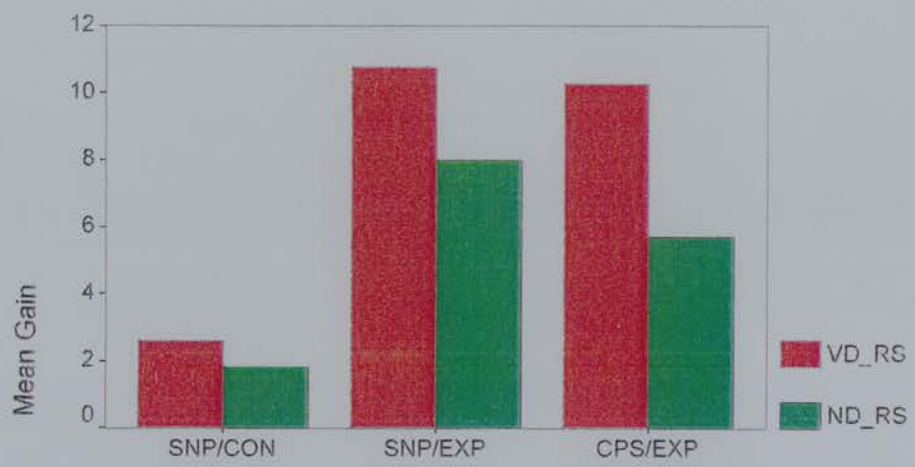
The Cognitive Abilities Test, verbal and non-verbal battery, was administered to each of the groups and computer scored by NFER-Nelson. A two-way analysis of variance was carried out on the Cognitive Ability pre/post-test, verbal and non-verbal scores for the three groups. This showed a main effect for class ($F(2, 67) = 10.34$, $p < 0.001$) and a main effect for pre/post verbal raw scores ($F(1, 67) = 124.41$, $p < 0.001$). The interaction between class and pre/post verbal raw score was also significant ($F(2, 67) = 13.87$, $p < 0.001$). Main effect for class ($F(2,67) = 6.07$, $p < 0.005$) and a main effect for pre-post non-verbal raw score ($F(1,67) = 90.19$, $p < 0.001$). The interaction between class and pre/post non-verbal raw score was also significant ($F(2,67) = 10.56$, $p < 0.001$).

The results of post hoc t tests are shown in Table 5, page 124. While there were no significant differences on pre-test scores for the control group and experimental class 1, differences in the ability of the two experimental groups are reflected in pre-test scores on the CAT - verbal and non-verbal batteries. Those scores, presented earlier in Table 1, page 115, illustrate a significant difference between the two experimental groups.

It is interesting therefore, to compare the changes pre - to post-test of the experimental groups with those of the control group. While the gains on the verbal battery for the control group is significant, $p < 0.05$, the actual difference is only 2½ points on the raw score. Post-test scores for the experimental groups are significantly higher than for the control group and represent in 'real' terms gains of over two years on the

Cognitive Abilities Test for each of the experimental groups (see NFER-Nelson instruction manual). Given the different starting points for each of the experimental groups on the CAT, the similarity of gain scores is 'interesting' and will be discussed fully in the following chapter. The difference between pre and post-test scores are illustrated in the graph below, Figure 5, and in Table 5. Results are highly significant in both verbal and non-verbal batteries for each of the experimental groups participating in the programme.

Figure 5 GRAPH OF PRE/POST-TEST GAINS IN COGNITIVE ABILITY



CLASS

Control/Exper Class 1/Exper Class 2

Table 5 – Pre/Post-Test Scores in Cognitive Ability

		COGNITIVE ABILITIES TEST VERBAL –PRE - V1 POST - V2 NON-VERBAL – PRE- N1 POST - N2					
					Paired Differences		
GROUP	N	PRE/POST	Mean	Std. Deviation	t	df	Sig. (2-tailed)
CONTROL	23	V1	53.48	20.72			
		V2	56.09	21.62	2.091	22	0.048
		N1	58.17	14.71			
		N2	60.04	14.68	2.013	22	0.057
EXPERIMENTAL CLASS 1	23	V1	51.87	20.73			
		V2	62.65	18.24	7.617	22	0.001
		N1	53.91	15.83			
		N2	61.91	13.08	8.180	22	0.001
EXPERIMENTAL CLASS 2	24	V1	71.21	14.14			
		V2	81.50	11.01	10.339	23	0.001
		N1	66.71	9.57			
		N2	72.42	7.41	6.115	23	0.001

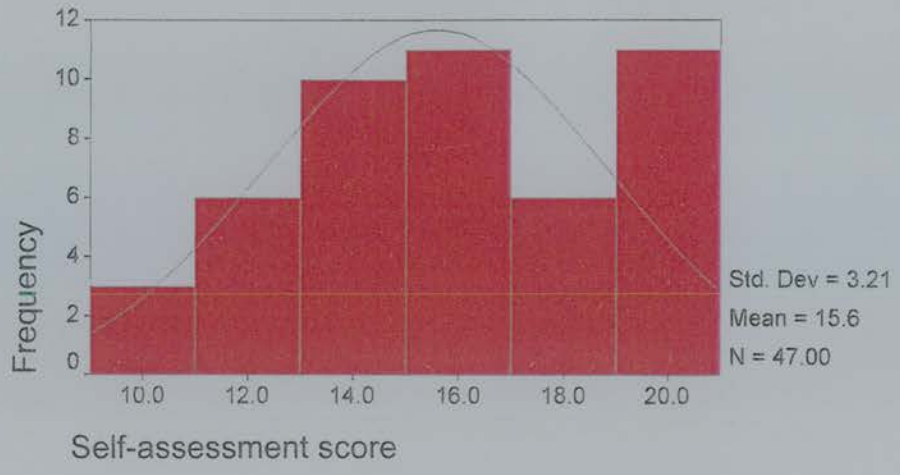
Other sources of data to evaluate children's reasoning skills include:

- critical thinking how am I doing self-assessment check.
- extracts from 'Thinking Diaries'.

Critical Thinking - How Am I Doing? Self-Assessment Check

The critical thinking self-assessment check was devised by the researcher to test if children could use their reasoning skills in a real-life context. In part of the test, children are given a 'bullying' situation, have to consider all the evidence for and against, then judge who is guilty. It provides valuable information as to whether or not children can transfer their new learning and use their reasoning skills in different situations. Combined experimental group scores on the critical thinking self-assessment check are displayed in the graph, Figure 6 on page 125. The graph, Figure 8, on page 127, also highlights the striking similarity of results for each of the experimental groups.

Figure 6 GRAPH OF CRITICAL THINKING SELF-ASSESSMENT CHECK



Extracts From Thinking Diaries

The 'Thinking Diaries' were introduced to help children monitor and direct their own thinking. Children set their own goals and monitored progress in reaching them. Data from the diaries provide a valuable insight into how children applied their thinking to other areas of their lives and their learning and the degree to which they had engaged in the programme. While these data will be analysed in the following chapter, examples of goals set by the children fall into three distinct categories and include:

School Goals -

"To pass level E in language and reading – I'm convinced I will do it. My plan is ....."

"My goal is to use my positive thinking to improve my school work - especially my writing and spelling – here's my plan ....."

Personal Goals -

"To complete everything I try and not give up so easily."

"To be more honest and be a better friend."

Life Goals -

"To help people with heart disease. This is how I'll do it ....."

"I know this is a big goal, but I'd like to become a doctor and help people in poor countries who have no food or water. If I plan it carefully, I think I can do it."

Creative Thinking

A 'What Can It Be Used For' test was given pre and post to each of the groups. A two-way analysis of variance was carried out on pre/post-test scores for the three groups. This showed a main effect for class ($F(2,67) = 5.98$, $p < 0.005$) and a main effect for creative thinking pre/post-test scores ($F(1,67) = 241.23$, $p < 0.001$). The interaction between class and pre/post-test Creative Thinking scores was also significant ($F(2,67) = 51.87$, $p < 0.001$).

The results of post hoc t tests are shown in Table 6. Differences between the groups before the programme were not statistically significant. Post-test scores for the experimental groups, however, were significantly higher than for the control group although the control group had a higher starting point. It is important to note that, as opposed to the CAT, the experimental groups were not starting from very different points but gain scores were again very similar.

Differences between pre and post-test scores for each of the groups are reported in Table 6 and presented graphically, Figure 2 on page 116. Results were highly significant for each experimental class.

Table 6

		CREATIVE THINKING PRE/POST-TEST SCORES PRE – CTT 1 POST – CTT 2					
					Paired Differences		
GROUP	N	PRE/POST	Mean	Std. Deviation	t	df	Sig. (2-tailed)
CONTROL	23	CTT1	4.87	2.38			
		CTT2	5.17	2.33	1.071	22	0.296
EXPERIMENTAL CLASS 1	23	CTT1	3.48	1.75			
		CTT2	10.00	3.03	12.322	22	0.001
EXPERIMENTAL CLASS 2	24	CTT1	3.79	1.82			
		CTT2	10.13	2.82	10.757	23	0.001

Other sources of data to evaluate children's creative thinking include:

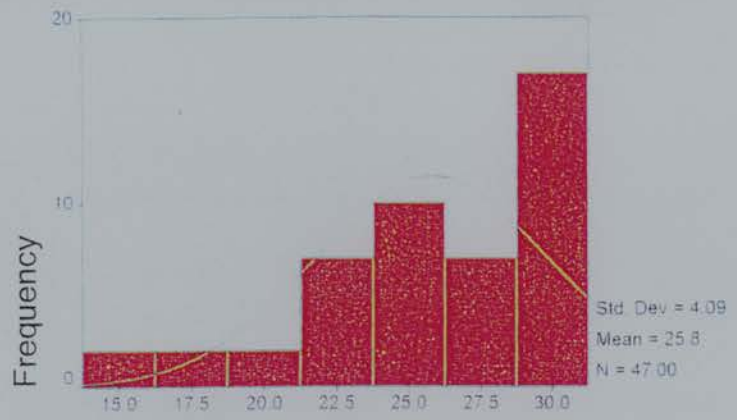
- creative thinking - how am I doing self-assessment check.

Creative Thinking - How Am I Doing?

Self-Assessment Check

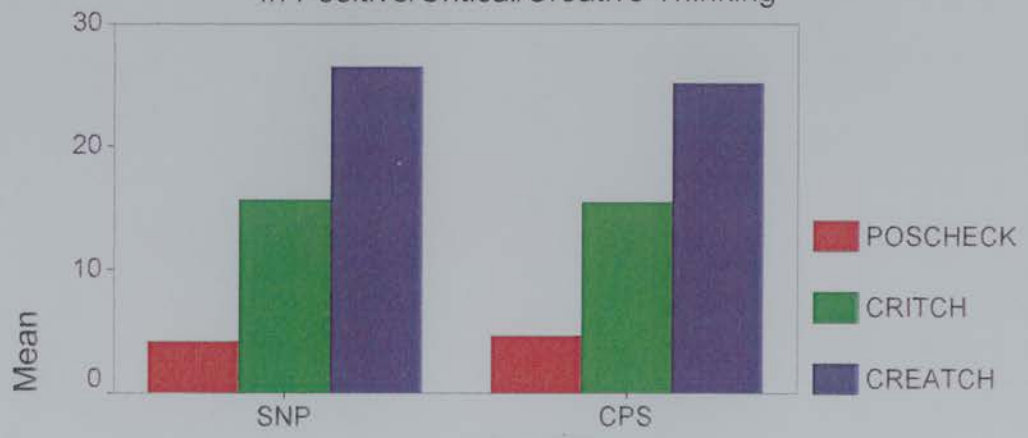
As discussed earlier in the chapter, the self-assessment checks provided valuable information as to whether or not children could transfer their new learning to different situations and use their creative thinking in real-life contexts. Combined scores on the creative thinking self-assessment check, for the experimental groups, are displayed in the graph below, Figure 7, and will be discussed in the following chapter.

Figure 7 GRAPH OF CREATIVE THINKING SELF-ASSESSMENT CHECK



When subjected to statistical analysis, differences between the two experimental groups on the self-assessment checks were not significant. The graph below, Figure 8, highlights for the reader the similarity of results for each of the experimental groups.

Figure 8 GRAPH OF SCORES ON SELF-ASSESSMENT CHECKS In Positive/Critical/Creative Thinking



Groups

It was also important to study the effects of the programme on children within and across groups. Were there gender differences? What were the effects of the programme on children of different abilities - which group gained most and which gained least? Did children's performance on one of the tests correlate with their performance on another?

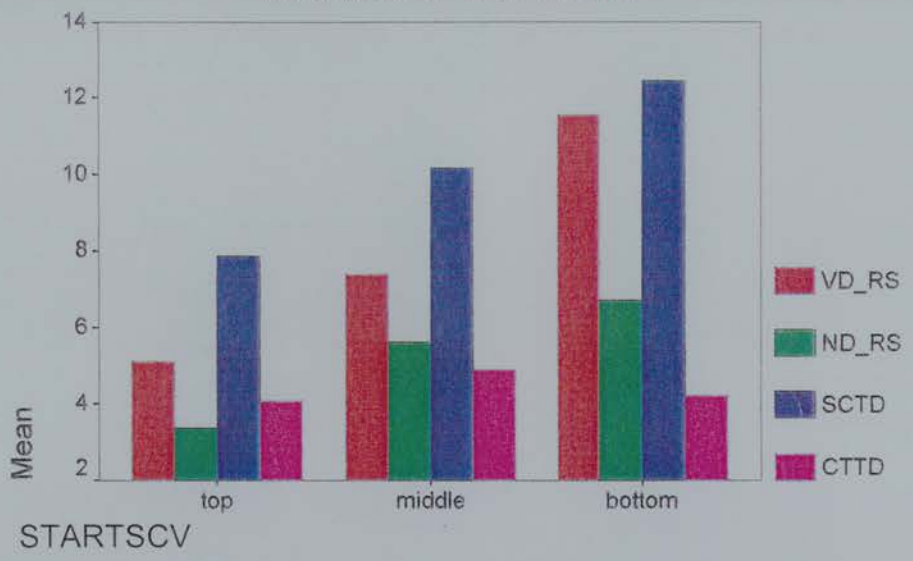
Gender

The graphs below Figure 9 illustrate that in each of the tests, boys made greater gains than girls, particularly in the areas of verbal reasoning and self-concept. When analysed, however, differences were not large enough to be statistically significant.

Figure 9 GRAPHS OF GENDER DIFFERENCES

To evaluate which group of children within the experimental classes gained most from participation in the programme, each class was divided into three groups, top - mid - bottom on the pre-test scores. As can be seen from the graph below, Figure 10, children in the bottom group made the greatest gains in each of the tests with the exception of creative thinking where there was a slight difference in favour of the middle group. These results will be discussed fully in the following chapter.

Figure 10 GRAPH OF GROUP DIFFERENCES IN EACH OF THE TESTS



Parent Questionnaires

While there was a great deal of very positive anecdotal evidence from parents in both schools, during the delivery of the programme, the response rate to the parent questionnaires was disappointing. (Example in Appendix 3). In total, only around 25% of parents responded. Most of those who did, however, were very positive. They said their children talked about the programme and that they had noted changes in behaviour.

Typical comments included:

"My child has been really motivated by this programme and has a much more positive attitude to her school work".

"Can't believe my son is actually talking to us about thinking. Could you do it with us as well?".

In all, there was only one negative comment from a mother who said she had enough to worry about without worrying about what her daughter was thinking.

Teacher Questionnaires

Questionnaires were completed by teachers and headteachers a few months after completion of the programme so that they had time to reflect on changes in children and their own experience of using the material. (Example in Appendix 4.)

They found the programme easy to use and manageable, stressed how much they themselves had benefited from the programme and how much it had changed their own thinking.

"The programme changed not only the children's thinking but my own. I have taken responsibility for my own destiny."

The most significant changes they noticed in children were in terms of improved self-esteem and their willingness to talk about their learning strategies and how they could improve them.

"The most significant change in children using the programme was the positive attitude to their learning. this was very apparent during the National Tests where more than 50% of children were writing – I will pass – they really believed they could."

Examples of anecdotal evidence from parents and colleagues, of children actually using the thinking skills in 'real' situations are: at inter-school sports, on a cross-country run, and during High School visit etc.

Having presented the findings, of the studies, attention is focused in the following chapter on the task of analysing and interpreting the results.

CHAPTER SIX

ANALYSIS OF FINDINGS

The main focus of the evaluation design of this study was to use tests which would provide as much information as possible about changes in children's performance in relation to the programme goals. In analysing the data therefore, the crucial questions to be answered were, whether, and to what extent, using 'A Guide To Better Thinking' had increased children's self-concept as thinkers, their ability to reason and reflect on their thinking and their creativity and flexibility of thought.

This chapter will analyse:

- to what extent each of the programme goals has been met;
- the overall effects of the programme and children's affective response to it;
- the effects of the programme within classes and across groups;
- the effects of the programme from the parents' and teachers' perspective.

Analysis of Findings : Self-concept as a Thinker

A major goal of the programme was to improve children's concept of themselves as thinkers, and a 'Self-Concept as a Thinker Test,' was administered pre and post to each of the three groups, control class/experimental class 1 / experimental class 2.

The two-way analysis of variance, page 118, shows a main effect for class, main effect for pre/post Self-Concept as a Thinker scores and a significant interaction between these.

The results of post hoc t tests are shown in Table 3, page 118. Although differences between pre-test scores for each of the groups were not statistically significant, it is interesting to note that although experimental class 2 came from a much more privileged background, their self-concept as a thinker pre-test mean score was lower than either of the other two classes.

As Table 3 (page 118) indicates, differences in post-test scores for the control group were not statistically significant with a mean gain of 0.43. Pre/Post-test differences however were highly significant for the experimental groups. The very considerable gains made by the experimental groups in comparison to the control group can be clearly seen in the graph, Figure 2, page 116. Results strongly suggest that children given the programme made considerable gains in self-concept.

In the evaluation of the programme it is important that judgements are based on cumulative evidence rather than the results of a single test. It is interesting to note therefore that gains of a similar nature are indicated on children's self-rating scale where, on a scale of 1 - 10, children rated how they felt about themselves as thinkers before and after the programme.

As can be seen from Table 4, page 120, the pre-programme mean for both

experimental groups was 3.69 while the post programme mean was 8.85. The results, when subjected to statistical analysis were 'highly significant'. It is also important to note that while the mean has increased, the standard deviation has almost halved, showing the high measure of consistency with which the children rated themselves as thinkers after the programme. As can be seen from the graph, Figure 3, page 119, the similarity of gains made for each of the experimental groups was quite striking and consistent with the self-concept as a thinker pre/post measures. All of the children exposed to the programme felt their thinking had improved.

Evidence of these 'feelings' of competence being applied to their actual performance, is shown in the Positive Thinking Self-Assessment Check. The pattern of gains is consistent with the other measures and scores of a similar magnitude are clearly seen in the graph, Figure 8, page 127. There was no statistical significance between the experimental group scores. The combined scores for the experimental groups is shown in Figure 4, page 120. With a possible score ranging from 0 - 5 points, the mean is 4.4 and, as the graph clearly shows, over thirty of the children scored the maximum 5 points indicating the high level of positive thinking in the majority of children after the programme.

An important aspect of the evaluation was also to consider children's feelings about themselves as thinkers after the programme. There was no attempt to impose pre-conceived categories or a pre-determined set of alternatives, children, from both experimental groups, were asked to write how they felt about themselves as thinkers after the programme. The question was open-ended to allow children to respond in their own terms or, as Coolican (1999), suggests, to "tell it like it is."

While there are many ways of analysing the children's statements, the three main themes running through their comments appear to be in terms of how they had changed as a result of the programme, both in themselves and in their thinking, and what they had learned from it.

The first main theme reflects changes in themselves, in their self-concept, the sense of feeling more positive and more in control.

"I feel more positive about myself – I like myself more."

"Makes you feel better about yourself that you're not hopeless."

"It lifted my spirits – my thinking has improved every day."

"I felt lonely before – now I know what to do it's not so bad."

"I feel good now I know I'm not hopeless."

"I feel more positive and more in control of my thinking."

The second main theme running through their statements reflects changes in their thinking, the idea that thinking can be improved, which is not something they had considered before. The element of surprise that they could actually improve their thinking:

"My thinking has changed drastically – I'm amazed you can actually improve your thinking."

I'm definitely a better thinker – this is a big surprise to me – I never really thunk before, that was for wimps."

"The best thing I've learned is that it's possible – FANTASTIC."

"Thanks – naebody telt me I could think."

The third main theme reflects the idea that thinking is not context bound, that they can use what they have learned in other areas of their lives:

"To control my temper."

"To improve my behaviour – it's bad."

"To stop me getting into a fight at football."

"To meet new challenges in gymnastics."

"I can use it in my work and at school and in my life to help my mum."

"Thinking isn't only for school."

The children's statements would appear to support the evidence that children using 'A Guide To Better Thinking', made considerable gains in their self-concept as thinkers. These very clear findings, from the different sources of evidence, highlight a set of results that are not only internally consistent, but consistent across sites, with children of different ability and social background.

Analysis of Findings : Critical Thinking

A major goal of the programme was to develop critical thinking and improve children's ability to reason and reflect on their thinking. To test this aspect of the programme, the Cognitive Abilities Test (CAT) verbal and non-verbal batteries, were administered pre and post to each of the groups.

The two-way analysis of variance, page 122, shows a main effect for class, main effect for pre-post verbal and non-verbal raw scores and a significant interaction between these.

Results of post hoc t tests on pre/post-test scores are shown in Table 5, page 124. There was no significant difference in pre-test scores for the control group and experimental class 1. The two groups performed at a similar level, indeed, slight differences that did exist favoured the control group. As can be seen from Table 1, page 115, however, differences on pre-test scores for the two experimental groups were 'highly significant' on both the verbal and non-verbal batteries and reflect the difference in ability of the two experimental groups at the outset of the programme. In analysing the data therefore a fundamental question to be answered was whether the programme differentially affected children who began at different levels of ability.

While there is no statistical significance on pre/post-test scores for the control group on the non-verbal battery, as can be seen from Table 5, page 124, difference in pre / post-test scores on the verbal battery is significant, $p < 0.05$. This represents a mean gain of 2.61 on the raw score and much less than gains made by the experimental groups. According to NFER-Nelson, 1999, personal communication, gains of this order could be expected, without an intervention, given the time between pre and post-test measures.

Differences in pre/post-test scores for each of the experimental classes on both the verbal and non-verbal tests were highly significant, $p < 0.001$. As

can be clearly seen in the graph, Figure 5, page 123, gains made by each of the experimental groups were surprisingly similar and, given the different starting points of the two classes, suggest that the programme was equally effective with children who began at different levels of ability. Even subtracting gains made by the control group, these figures represent in 'real' terms gains of over two years on both the verbal and non-verbal batteries of the CAT for each of the experimental groups.

Results strongly suggest that children receiving the programme made very significant improvements in cognitive ability and that the programme had a similar effect on children from different social backgrounds of different ability, starting from a different baseline of achievement.

The Critical Thinking Self-Assessment check was included in the evaluation as it was devised to test if children could apply their reasoning skills in a real-life situation. The graph, Figure 8, page 127, highlights the similarity of scores for each of the experimental classes. Differences in scores between the classes were not statistically significant. The combined scores for the experimental groups are shown in Figure 6, page 125. With a possible score ranging from 0-20 points, the mean is 15.6 and standard deviation 3.21. All of the children scored 50% or more and of these, 11, or 23.4%, scored a maximum of 20 points, not only an indication of applied reasoning, but also consistent with pre/post-test scores.

Analysis of the Thinking Diaries provided further evidence of children applying their reasoning skills to other areas of their lives. Children used the diaries to set their goals and monitor their progress in reaching them. Children responded in their own terms and set their own questions to monitor progress. While the goals set were personal to each individual child, the children's responses could be readily categorised into the different sets of goals being encouraged in the programme. The main categories were school goals, personal or family goals and life goals.

All of the children set quite specific school goals for themselves, for example:
"To pass level D in reading – this is my plan . . . . . ".
Personal and family goals tended to focus on relationships,
"To be happy and not mess up my life with drugs like my mum."
Whereas life goals focused more on their future career, and how they could help other people,
"To become a lawyer and use my thinking to help people feel better about themselves."

Some children used their reasoning skills to develop a logical progression of their goals.
"My goal is to pass all my exams so that I can get to university so that I can become a doctor so that I can work for the united nations so that I can help children in the third world."

The Thinking Diaries provided further evidence of children applying their reasoning in a 'real-life' context and are consistent with the quantitative data and data from the self-assessment checks. Data from these different sources strongly suggests that children using 'A Guide To Better Thinking,' made considerable gains in cognitive ability – in their ability to reason and reflect on their thinking – and that these gains were consistent across sites, with children of different ability and social background.

Although not part of the original design, data subsequently became available from National Tests for children in the control class and experimental class 1. This gave an indication of whether these gains in cognitive ability were reflected in children's school performance. These data show levels of attainment in Reading, Writing and Maths at the end of Primary 6 and Primary 7. The same teachers took the children on, P.6(a) to P.7(a) – the control class, P.6(b) to P.7(b) – the experimental class. The National Test levels range from A to E. By P.7, pupils would normally be expected to have attained level D in each of the three subjects, some children would attain level E.

There was no significant difference between the classes in the number of children attaining level D or E in Reading, Writing or Maths at the end of P.6. An analysis of the data of pupils having reached levels D or E at the end of P.7 shows that for reading there were highly significant differences between the control and experimental class. Chi Square = 16.325, $p < 0.001$. Differences in Writing and Maths were not significant, possibly because they are less applicable to the programme and its goals whereas the programme is more reading based and more focused on the verbal reasoning required in the reading tests. Unfortunately, no such figures were available for experimental class 2.

Given that National Tests are not well-focused on the central aims of the programme, it is therefore an interesting indication of possible transfer.

Analysis of Findings : Creative Thinking

One of the main goals of the programme was to develop Creative Thinking and flexibility of thought. To evaluate this aspect of the programme, a 'What Can It Be Used For' Test was administered pre and post to each of the groups.

The two-way analysis of variance, page 126, shows a main effect for class, main effect for pre/post-test scores and a significant interaction between these.

Results of post hoc t tests on pre/post-test scores are shown in Table 6, page 126. No significant pre-test differences were found between the groups, slight differences that did exist favoured the control group. Post-test scores for the control group were not statistically significant, the mean gain was 0.32. Differences in pre/post-test scores for each of the experimental groups however were highly significant and the mean gains of 6.52 and 6.34 were

much greater than gains made by the control group. The graph, Figure 2, page 116, clearly shows the striking similarity of gains made by each of the experimental groups. Results strongly suggest that children given the programme were more flexible in their thinking and made considerable gains in this aspect of creative thinking.

Further evidence of children applying their creative thinking in a practical situation came from the Creative Thinking Self-Assessment Check. The graph, Figure 8, page 127, shows the striking similarity of gains for each of the experimental groups. Differences in scores between the groups were not statistically significant. Given the similarity of gains, scores for the experimental groups were combined and are clearly seen in the graph, Figure 7, page 127. With a possible score ranging from 0-30, the mean for the group was 25.8 and 38% of the children achieved the maximum score of 30. These figures are consistent with the pre/post-test measures and suggest that children have not only acquired the creative thinking skills but are able to apply them appropriately in real-life contexts. Again, these results are not only internally consistent, they are consistent across sites with children of different ability and social backgrounds.

Gender Differences

The graphs, Figure 9, page 128, illustrate that boys made greater gains than girls, particularly in the areas of verbal reasoning and self-concept. The overall pre-test mean score for girls was 59.00 and 54.00 for boys, a difference of 5 points. The overall post-test mean score for girls was 68.60 and for boys, 66.62, a difference of only 2 points, showing that the gap had narrowed. When analysed, however, differences were not statistically significant and could therefore be due to chance variation.

Group Differences

While every child across the ability range made gains, with the exception of creative thinking where there were slight differences in favour of the middle group, the bottom group in each of the pre-test scores made the greatest

gains. See the graph, Figure 10, page 129. While the means in Figure 10, suggest such a pattern, statistical analysis showed no significant differences among the three groups in pre/post-test scores. The programme, therefore, seemed to be pitched at a level where children most in need gained most from it. However, gains were not confined to this group but applied very much across the board, indicating that it would work in classes of differing social composition and ability levels.

Parent Questionnaires

Children's own views of how they had changed as a result of the programme were paralleled in parents' reports. With only one exception, they were very positive and indicated that parents had observed changes in their children's thinking and behaviour during the course of the programme. The main messages were that children had a much more positive attitude and were not only using the skills in different situations themselves, they were encouraging parents to use them as well. Therefore, while the focus of the evaluation has been on children's performance within the confines of the school, these give some evidence of transfer beyond it.

Teacher Perceptions of the Programme and its Effects

Questionnaires were completed by teachers and headteachers involved in piloting and trialling the material. All thought the children's thinking had improved, and all commented on how motivated children were by the programme. Comments regarding changes in attitude and behaviour included:

"Not so impulsive, thought more about the consequences before they acted."
"Behaviour is much better, children are much calmer."
"Definitely more self-confident and enthusiastic."

All of the teachers who completed the questionaires, stressed that the programme had improved their own thinking and that they too were more confident. Headteachers reported increased motivation in staff. One of the

major aspects of the programme design was that it would be easy for teachers to implement. All teachers thought it was easy to use and manageable, for example:

"I knew nothing about teaching thinking before so I've learned a lot by using this programme. I even feel more confident and more in control. It was really easy to use because it's all there for you."

Results therefore, from the teacher questionnaires, are highly encouraging and, taken in conjunction with other sources of evidence, Provide confirmation that the goals of 'A Guide to Better Thinking' have been achieved.

Overview

There is therefore considerable evidence, from both quantitative and qualitative data, to suggest that children using 'A Guide To Better Thinking' made substantial gains in their self-concept as thinkers, in their cognitive ability, and in their creative thinking and flexibility of thought. These gains were accomplished in different educational settings, with children across the ability range, from different socio-economic backgrounds, and, in one of the schools, by a teacher who had no training and had never used a Thinking Skills Programme. There also appears to be some evidence of children transferring their thinking skills to other situations and other areas of their learning. Teachers' and parents' views supported the evidence and teachers found the material easy to use. Children enjoyed the programme, a significant factor often overlooked in programme evaluation.

Having analysed the findings, the final chapter summarises the main issues that have emerged from the study. Key features which should be included in Thinking Skills Programmes are identified and a new model for developing children's thinking is proposed.

CHAPTER SEVEN

SUMMARY and CONCLUSIONS

The development of children's thinking has long been an educational ideal and there is ample evidence from research literature to suggest that the teaching of thinking should be the major focus for education. Yet, as every practitioner knows, the gap between theory and practice can be difficult to bridge and, while the development of thinking skills is seen as the key to raising educational standards and to educating children to live successfully in the 'information age,' it is frequently the least emphasised activity in classroom practice.

There is growing concern over the increasing number of children, from across the ability spectrum, failing to fulfil their potential as learners and an even greater concern over children's concept of themselves as learners. Many young people leave school, expert at recalling information but unable to deal effectively with the real-life issues that confront them. Schools are accused of mainly producing, 'skilled regurgitators of knowledge,' (Edwards, 1995), and not children who can think for themselves.

A disturbing picture is also painted by reports, such as the International Assessment of Educational Progress (in Costa, 1991), and the Third International Maths and Science Study (1997), which show a deterioration in higher-order thinking in all areas of the curriculum. These reports recommend the development of thinking skills as a top priority educational goal. Therefore while it seems clear there is a need to teach thinking, there is considerable evidence to suggest that need is not being met by the current system. In general, little guidance is given to teachers as to how to translate the teaching of thinking into classroom practice and there is a dearth of instructional material to help children gain the thinking skills they will need to function effectively in their lives.

The main purpose of this thesis was to develop a resource that would help children become more effective thinkers and learners, that would bridge the gap between theory and classroom practice, and move teaching for thinking into the classroom. Given that the study has involved an analytical review of the relevant literature on teaching thinking; the development of a model for Thinking Skills Programmes; the design and evaluation of a programme; reporting and discussing findings and an analysis of results, a great deal of ground has been covered. It is useful, therefore, to recap on some of the main features of the study and organisation of the thesis.

Summary

The thesis began with a broad overview of the literature on teaching thinking and its implications for practice. It included a review of relevant research on motivation and metacognition, identifying features which motivate children and promote their self-esteem. The question of whether thinking skills should be infused into, or separated from, the regular curriculum was considered. This highlighted the need for a programme which would provide the explicit teaching of thinking skills but model for children, in a realistic way, how these skills can be infused into other areas of their lives and their learning.

A wide analytical review of existing programmes, highlighting their strengths as well as the practical and theoretical weaknesses, was presented. Despite some very convincing findings showing the benefits of using programmes for teaching thinking, they are not widely used, largely because programme developers have failed to consider effective implementation strategies for the complex realities of schools. Many require a substantial commitment in time and training costs. Many are narrow in focus and several programmes have to be used to cover the broad range of skills required, making it expensive for schools and difficult to administer and teach. Exercises are often remote or sterile and fail to provide explicit links with functioning in the real world for children. Some neglect the affective and motivational processes that play a vital role in cognitive development and functioning. Often little attention is

given to the impact on teachers and many teachers are rightly critical of programme developers for ignoring the practical realities which underpin teaching and learning.

The study attempted to address these issues concerning the design of effective thinking skills programmes and proposed a new model for teaching thinking. The goals of 'A Guide To Better Thinking' were:

- to develop positive thinking and improve children's concept of themselves as thinkers and learners;
- to develop critical thinking and improve children's ability to reason and reflect on their thinking;
- to develop creative thinking and flexibility of thought.

A pilot study was used in the formative development of the programme and, as described earlier, modifications were made to include children's and teachers' views. This helped establish internal validity. Thus the programme design was informed by: prevailing theories; by children's observations and by years of classroom experience and research in teaching thinking.

Evaluation

Berk & Rossi (1990) stress that determining the effectiveness of a programme depends on the validity of the evaluation and many programme developers are criticised for using instruments which fail to measure the goals of the programme being developed. A major concern, therefore, was with construct validity and a crucial element of the evaluation strategy was to use instruments well targeted to the goals of the programme. Evaluation was guided by the broad range of thinking skills being developed and the key matter of enhancing children's concept of themselves as thinkers. Careful consideration was given to selecting appropriate assessment procedures and to the tailoring of instruments to the capacities being developed. A variety of quantitative and qualitative measures were used. Wider issues concerning the evaluation of thinking skills programmes were raised and

recommendations for test improvement presented. An important aspect is that teachers can carry out their own evaluations using these measures.

Trialling

McGuiness (1999) suggests that many of the existing thinking skills programmes have been trialled under optimal conditions, with highly trained teachers, and cannot be transplanted into ordinary classrooms. As this study is based on teaching thinking in the realities of today's schools, it was important to trial the programme in a real-world situation.

With that in mind, the first trialling took place in a large inner-city school identified as requiring urban aid. Over 50% of the children received free school meals. A pre/post-test control and experimental design was used. The sample consisted of two primary 7 classes, each with 23 children, similar in age, ability and socio-economic background. Classes were randomly assigned to control and experimental groups by the toss of a coin. Children in the experimental class were given the programme, children in the control class continued with their 'normal' curriculum work. The researcher administered the programme but spent an equal time in both classes. Pre and post-tests in Self-Concept As A Thinker, Cognitive Ability and Creative Thinking were administered to both groups before and after the trial period. The Cognitive Abilities Test was computer scored by NFER-Nelson, the Self-Concept As A Thinker and Creative Thinking Test were scored independently by the class teacher and the researcher and checked by the headteacher. Pre-test scores indicate that the two groups were more or less equivalent in achievement in each of the tests at the beginning of the programme. Differences were not statistically significant, indeed, the slight differences that did exist tended to favour the control group.

To test the generalizability or external validity, the study was repeated in a deliberately different setting, in a different school, with children who differed in age, ability and socio-economic background with someone else

administering the programme. The teacher had no training and used the programme 'cold'. Experimental Class 2 consisted of 24 Primary 6 children from a 'middle-class' school with mainly professional parents. Fewer than 8% received free school meals. The same pre and post-tests were administered before and after the programme. The CAT was computer scored and other tests marked by the teacher and depute headteacher. The researcher took no part in administering the programme or in scoring the tests. No significant pre-test differences were found in self-concept or creative thinking between the two experimental groups but differences in pre-test scores on the CAT were highly significant on both the verbal battery, $p < 0.001$, and the non-verbal battery, $p < 0.002$, and reflect the difference in ability of the two experimental groups at the outset of the programme.

After the programme, post-test scores on each of the tests were significantly higher for the experimental groups than for the control group. Differences in pre/post-test scores for each of the experimental classes on each of the tests were highly significant, $p < 0.001$. Gains made by the experimental groups were impressive and surprisingly similar and, given the different starting points of the two experimental classes on the CAT, suggest that the programme was effective with children across the ability spectrum. The scores represent, in 'real' terms, gains of over two years on both the verbal and non-verbal batteries of the Cognitive Abilities Test for each of the experimental groups.

Gains of a similar nature were evident on the self-rating scale where children rated how they felt about themselves as thinkers before and after the programme. Differences were highly significant, $p < 0.001$, and all of the children, in each of the experimental groups, felt their thinking had improved. Data from thinking diaries, self-assessment checks and children's written views of themselves as thinkers after the programme, confirmed these findings and provided further evidence of construct validity.

There is, therefore, considerable evidence, from both quantitative and qualitative data, to suggest that children using, 'A Guide to Better Thinking,' made very substantial, and statistically highly significant, gains in their self-concept as thinkers, cognitive ability and in creative thinking and flexibility of thought. These very clear findings highlight a set of results that are not only internally consistent, but consistent across sites with children from different social backgrounds, of different ability, starting from a different baseline of achievement. There is also some evidence of transfer to other areas of their learning. Children enjoyed the programme and all felt they had benefited from it. Teachers found it easy to use and manageable and reported shifts in attitude and increased motivation.

Conclusions

The purpose of this study was to produce a resource that could be effectively implemented in schools to develop children's thinking. Results show that the programme was successful and that gains made were not only highly statistically significant but of considerable magnitude in each of the areas of thinking being developed. The first major conclusion to be drawn from the data is that cognitive change is possible and there is substantial evidence that thinking skills can be taught effectively in the classroom.

While it is gratifying to report that the programme has worked well, the study also affirmed that 'A Guide to Better thinking' was a very effective model for teaching thinking. This individual programme was guided by an analysis of the literature, on Thinking Skills Programmes, and on learning and teaching, to identify, not only the key features which should be included in any such programme but also the essential characteristics to help translate the programme into classroom practice. The model provided:

- a theoretical framework for teachers that is easy to use and manageable, that takes account of the constraints the classroom teacher faces, but provides guidance as to how they might effectively promote children's thinking;

- a broad range of skills in positive, critical and creative thinking, considers how we can motivate children to want to use the skills and emphasizes the development of metacognition to help children monitor and direct their own thinking;
- a balance of the social and affective as well as the cognitive aspects of teaching thinking and recognizes the importance of developing children's concept of themselves as thinkers and learners;
- 'child and teacher-friendly' material which introduces characters to model the thinking strategies and how to overcome obstacles to good thinking;
- worksheets which are intellectually challenging that teach children about thinking, explicitly, in meaningful, real-life contexts, then show them how to transfer the skills to different situations;
- carefully designed evaluation, including, piloting the materials in the formative development of the programme to establish internal validity and incorporate children's and teachers' views; trialling the programme in real-life situations with instruments well focused on the goals of the programme, to ensure construct validity, which can be used by teachers themselves.

A further conclusion is that the programme was feasible in economic and practical terms. The realities of classroom life, overwhelming demands on teachers, financial and time constraints, were considered in designing the programme. It did not impose a heavy workload on teachers, did not require expensive training, and therefore, would be far more likely to be successfully implemented than many other programmes.

A crucial point for general classroom use was that the programme was applicable to all abilities. It did not discriminate between children but improved thinking across the board with children of different ability and from different social backgrounds. All children benefited from the programme. A major conclusion is, therefore, that all children can become better thinkers as a result of using 'A Guide to Better Thinking.'

The study has also shown that the programme improves both self-concept and thinking skills. Further work might usefully explore the relationship between the cognitive and affective dimensions of thinking – the interdependence of self-esteem, self-efficacy, motivational, metacognitive and cognitive variables.

A central challenge in the present study, as preceding chapters have indicated, was to employ evaluation instruments that were well-focused on the abilities being developed. This has often been neglected in previous studies. It is to be hoped that future work will give careful attention to the need to refine and extend diagnostic procedures for Thinking Skills Programmes.

To help children become effective thinkers and give them some control over their lives and their learning must be the major concern of education. Nisbet (1993), stressed that, " . . . . . before the century is out, no curriculum will be regarded as acceptable unless it can be shown to make a contribution to the teaching of thinking."

To make a contribution to the development of children's thinking and in doing so make a difference to the quality of their lives is the hoped for result of this study.

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LIST OF APPENDICES

Appendix 1

A GUIDE TO BETTER THINKING

CHILDREN'S QUESTIONNAIRE

NAME: ..... AGE: ..... CLASS: .....

1. Can you read the material?

2. What do you like/dislike about Sparky and the other characters?

3. In what ways can you identify with Sparky?

4. Are questions and instructions clear?

5. Is the layout clear/attractive and what would you suggest to improve it?

6. Can you understand each worksheet?

7. Do you find the tasks? too easy too difficult just right

8. Describe how the material motivates you.

9. Do you find the material?

   interesting boring enjoyable dull challenging

10. Discuss how this will help you become a Better Thinker.

Appendix 2

SUMMARY TABLE OF INDIVIDUAL CHILDREN'S SCORES

	Cognitive Abilities Test (Raw Score) Verbal	– Non-Verbal	Creative Thinking	Self Concept as A Thinker
Pre-Test –	V1	NV1	CTT 1	SCT 1
Post-Test –	V2	NV2	CTT 2	SCT 2
Difference –	VD	NVD	CTT D	SCT D

CHILD	SEX	AGE	SCHOOL	GROUP	V1_RS	V2_RS	VD_RS	N1_RS	N2_RS	ND_RS	CTT1	CTT2	CTTD	SCT1	SCT2	SCTD
1	F	11:07	SNP	CON	76	80	4	72	75	3	6	5	-1	124	113	-11
2	M	12:6	SNP	CON	33	39	6	35	42	7	4	5	1	102	109	7
3	M	11:1	SNP	CON	86	89	3	69	76	7	9	10	1	143	143	0
4	M	10:11	SNP	CON	70	77	7	53	63	10	9	9	0	109	116	7
5	F	11:3	SNP	CON	73	70	-3	70	68	-2	4	4	0	115	118	3
6	M	11:5	SNP	CON	50	51	1	59	51	-8	3	3	0	120	113	-7
7	M	11:6	SNP	CON	48	48	0	61	67	6	2	3	1	96	96	2
8	M	11:3	SNP	CON	50	42	-8	63	66	5	7	5	-2	77	79	2
9	F	11:1	SNP	CON	81	81	0	74	73	-1	8	8	0	132	136	6
10	F	11:11	SNP	CON	72	76	4	74	70	-4	7	8	1	130	125	-5
11	M	11:4	SNP	CON	37	50	13	50	61	11	7	9	2	107	112	5
12	M	10:11	SNP	CON	60	62	2	70	70	0	4	3	-1	99	105	6
13	M	11:3	SNP	CON	26	36	8	54	59	5	3	4	1	70	72	2
14	F	11:8	SNP	CON	48	55	7	49	50	1	5	6	1	116	114	-2
15	F	11:10	SNP	CON	11	12	1	47	47	0	1	2	1	80	84	4
16	M	11:0	SNP	CON	62	65	3	40	40	0	1	2	1	110	104	-6
17	M	11:3	SNP	CON	63	75	12	76	76	0	7	7	0	103	108	5
18	M	11:8	SNP	CON	88	88	0	75	75	0	6	4	-2	105	109	4
19	F	11:5	SNP	CON	30	25	-5	33	33	0	5	3	-2	102	98	-4
20	F	11:4	SNP	CON	52	49	-3	74	74	0	2	6	4	115	118	3
21	M	11:1	SNP	CON	28	18	-10	28	26	-2	4	4	0	109	109	0
22	F	11:7	SNP	CON	38	49	11	61	64	3	3	4	1	109	114	5
23	F	11:1	SNP	CON	46	53	7	51	53	2	5	5	0	101	85	-16
24	F	12:10	SNP	EXP 1	16	28	12	58	61	3	3	8	5	87	112	25
25	M	12:10	SNP	EXP 1	39	73	34	60	60	0	1	15	14	111	133	22
26	M	12:3	SNP	EXP 1	63	74	11	55	69	14	5	12	7	112	115	3
27	F	12:0	SNP	EXP 1	44	61	17	54	64	10	3	8	5	130	138	8
28	F	11:9	SNP	EXP 1	56	66	10	63	71	8	2	7	5	121	124	3
29	M	11:1	SNP	EXP 1	44	57	13	46	53	7	4	10	6	95	132	37
30	F	11:8	SNP	EXP 1	79	84	5	68	72	4	4	8	4	128	136	8
31	M	11:5	SNP	EXP 1	42	49	7	36	47	11	1	8	7	108	140	32
32	F	10:11	SNP	EXP 1	80	84	4	69	76	7	4	10	6	134	142	8
33	F	11:11	SNP	EXP 1	19	31	12	19	37	18	3	5	2	101	121	20
34	F	11:9	SNP	EXP 1	85	90	5	73	80	7	4	11	7	122	129	7
35	F	11:0	SNP	EXP 1	78	84	6	66	69	3	7	17	10	124	153	29
36	M	11:1	SNP	EXP 1	33	39	6	29	37	8	2	9	7	105	113	8
37	F	11:1	SNP	EXP 1	68	79	11	68	72	4	6	10	4	99	118	19
38	M	11:5	SNP	EXP 1	67	71	4	59	66	7	5	11	6	111	128	17
39	M	11:6	SNP	EXP 1	73	82	9	70	75	5	3	8	5	116	136	20
40	M	11:6	SNP	EXP 1	55	68	13	63	69	6	3	9	6	105	118	13
41	M	13:0	SNP	EXP 1	44	51	7	63	73	10	3	10	7	77	123	46
42	M	11:7	SNP	EXP 1	36	54	18	52	54	2	2	10	8	121	137	16
43	M	11:7	SNP	EXP 1	70	76	6	65	73	8	7	15	8	119	129	10
44	M	11:5	SNP	EXP 1	29	43	14	49	61	12	2	5	3	106	118	12
45	F	12:0	SNP	EXP 1	49	54	5	31	43	12	5	14	9	102	108	6
46	F	12:10	SNP	EXP 1	24	43	19	24	42	18	1	10	9	96	128	32
47	M	10:7	CPS	EXP 2	48	64	16	55	64	9	2	12	10	90	106	16
48	M	10:6	CPS	EXP 2	72	83	11	58	72	14	4	11	7	103	118	15
49	M	10:6	CPS	EXP 2	86	90	4	79	79	0	1	8	7	112	116	4
50	F	10:6	CPS	EXP 2	69	78	9	70	76	6	5	9	4	68	72	4
51	F	10:7	CPS	EXP 2	62	75	13	57	68	11	5	8	3	110	124	14
52	M	10:5	CPS	EXP 2	50	64	14	66	66	0	4	10	6	107	115	8
53	F	11:0	CPS	EXP 2	88	93	5	71	77	6	5	10	5	112	117	5
54	M	10:9	CPS	EXP 2	58	77	19	67	71	4	3	9	6	91	113	22
55	F	10:4	CPS	EXP 2	78	85	7	72	75	3	5	10	5	95	99	4
56	M	10:6	CPS	EXP 2	89	93	4	75	77	2	8	12	4	120	131	11
57	F	10:10	CPS	EXP 2	76	89	13	71	74	3	4	12	8	109	126	17
58	F	10:1	CPS	EXP 2	80	86	6	75	76	1	3	16	13	106	114	8
59	F	10:5	CPS	EXP 2	82	91	9	72	77	5	4	11	7	101	115	14
60	F	10:9	CPS	EXP 2	62	69	7	51	68	17	2	5	3	94	104	10
61	F	10:3	CPS	EXP 2	74	92	18	65	73	8	3	12	9	148	154	6
62	M	10:6	CPS	EXP 2	31	49	18	38	43	5	2	5	3	99	120	21
63	F	10:4	CPS	EXP 2	65	84	19	63	74	11	5	11	6	90	115	25
64	M	10:9	CPS	EXP 2	74	84	10	75	77	2	5	9	4	117	121	4
65	F	10:6	CPS	EXP 2	84	90	6	73	77	4	1	8	7	105	116	11
66	M	10:3	CPS	EXP 2	89	94	5	75	77	2	6	7	1	120	125	5
67	F	10:3	CPS	EXP 2	75	84	9	67	76	9	1	9	8	109	120	11
68	M	11:0	CPS	EXP 2	75	83	8	68	73	5	2	12	10	91	105	14
69	F	10:3	CPS	EXP 2	72	79	7	77	77	0	5	10	5	94	99	5
70	F	10:3	CPS	EXP 2	70	80	10	61	71	10	6	17	11	73	115	42

Appendix 3

A GUIDE TO BETTER THINKING

Parent Feedback

Dear Parent

Your child has been taking part in a Thinking Skills Programme this term. To evaluate the effects of the programme, it would be a great help if you could complete this feedback form and make any comments you can on the programme.

Thank you for your co-operation.

Name: **Child's Name:**

1. **My child talks to me about the programme**

☐ OFTEN ☐ OCCASIONALLY ☐ NEVER

Comments:

2. **My child uses terms like**

Positive Thinking – Setting Goals – Planning – Critical Thinking – Metacognition – Creative Thinking

☐ OFTEN ☐ OCCASIONALLY ☐ NEVER

Comments:

3. **My child uses strategies learned in the programme, to my knowledge**

☐ OFTEN ☐ OCCASIONALLY ☐ NEVER

Comments:

4. **Please record any changes you have noticed in your child's thinking or behaviour as a result of doing the programme.**

Appendix 4

A GUIDE TO BETTER THINKING

TEACHER QUESTIONNAIRE

Thank you for using 'A Guide To Better Thinking'. To better understand the effects of the programme it would be a great help if you could complete this feedback form and make any comments you can on the programme.

Name: School:

1. Do you think the programme improved children's thinking? Yes / No

2. How easy was the programme for you to implement?
   very easy easy difficult

3. Did you find the material?
   enjoyable dull challenging
   boring motivating exciting

4. Did children transfer skills learned in the programme to other areas of their learning?
   often sometimes never

5. After using the programme did you find children?
   more impulsive less impulsive no change
   more self-confident less self-confident no change

6. Was their behaviour?

   better worse no change

7. Did children ask questions to find new information?

   more often less often no change

   Consider alternative ways to solve problems?

   more often less often no change

8. Please give examples of feedback from parents / colleagues.

9. What was the most significant change you noticed in children using the programme?

10. In what way has using the programme changed your thinking?

Thank you for your help and co-operation.