

**THE IMPORTANCE OF IDENTIFYING
PARTICULAR STRENGTHS: SPATIAL ABILITY IN PUPILS
WHO ARE AT RISK OF NOT LEARNING TO READ**

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to the University of Exeter as a thesis for the degree of
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Dedicated
to the memory of
Edward Bond Hopper
1911 - 1970

ABSTRACT

Recent studies have shown that there may be evidence that children with reading difficulties have particular compensatory spatial ability, although the exact spatial ability has not been identified. This study used qualitative and quantitative methods to examine closely two spatial abilities, spatial visualisation (mental rotation from memory) and visual realism (three-dimensional drawing and construction ability) in students with reading problems and students with no problems.

The aim was also to explore the question of whether students with spatial ability and reading problems were encouraged to use these strengths either in or out of school and whether such abilities could be identified in the early years environment. Equally, the question of motivational failure related to possible unrecognised potential, particularly in the area of non-verbal/spatial ability was also examined. This study used longitudinal case studies with five children and their mothers over a period of ten years. Interviews were transcribed and analysed using a grounded theory approach. Researcher observations as the teacher of the five children in their primary years provided additional evidence of their reading and spatial abilities at an early age. In addition, the study uses a Further Education College survey that examines spatial ability and reading problems in 133 post-16 year olds that provides the quantitative element of the study providing evidence about students with spatial abilities and their career choices.

The data analysis revealed that the five case studies had largely overcome their reading problems due to early intervention strategies for reading together with encouragement and support outside school for their spatial abilities. Additionally, they have pursued careers, which for the most part, uses their spatial skills. The data analysis of the College survey showed that the link between spatial ability and reading problems was less secure, although there were a number of students with Specific Learning Difficulties (SpLD) who had high spatial abilities and this proved to be important from the point of view of identifying strengths alongside weakness in literacy, particularly in the early years at school.

Early identification and acknowledgement of spatial ability as a perceived strength and used to support learning, as opposed to identification of reading problems, a perceived deficit, proved to be a key finding of the research.

ACKNOWLEDGEMENTS

This research would not have been possible without the support of the parents and young people who took part in the case study and the college students who participated willingly in the drawing and computer based tests.

I am grateful to all the staff at Exeter University, and particularly Brahm Norwich my supervisor, for the opportunity to complete this study and for their encouragement and support throughout this lengthy research process.

Finally, I wish to thank my husband and family who have supported me throughout the last ten years

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INTRODUCTION

Hypothesis

The hypothesis for this research is that some students with specific literacy difficulties may have compensatory or specific spatial abilities that largely go unrecognised during their school careers. As a result of literacy problems, such students may become disenchanted and disillusioned in the classroom because they are likely to be identified and assessed for what they can't do, not what they are able to do easily. This has implications for learning and possibly self-image and as such becomes an issue of motivational failure related to possible unrecognised potential, particularly in the area of non-verbal/spatial abilities.

The main focus of the thesis arises from the researchers experience teaching infants and pupils with specific reading difficulties over a number of years. Through the teaching it was observed that some pupils with literacy problems were able to draw and design in three dimensions to a seemingly high degree of accuracy and at a variance with their reading able peers. This seemed to be an extraordinary talent, as the ability to draw in three dimensions and to understand the concept are normally skills not naturally observable in children until the ages of nine and ten years (Piaget & Inhelder, 1958). Equally, according to (Cox, 1991), many adults also find it difficult to draw in three dimensions.

As a result of this phenomenon the researcher was determined to try and establish whether it was possible to identify students who had strong spatial abilities and poor literacy skills, and to determine as far as possible whether a) the spatial skills, if they existed, had been acknowledged and used to support learning and b) whether the literacy problems had impacted in any way on students self-confidence and motivation to learn.

The main focus of the research therefore was on the question of strength versus deficit in the classroom situation. The specific strength being the ability to draw and construct easily in three dimensions and the specific literacy problem being pupils who found

reading a slow process, who had difficulty linking phonology to the written word and who were reluctant to write without adult support.

Additionally, the research looks at the relationship between support in the home for pupils with these particular strengths and weaknesses and addresses the question of motivation and self-confidence both in the school and in pursuits outside the home.

Spatial Ability and its role in UK Education

Traditional concepts of education have relegated practical abilities to minor significance (Smith, 1992). Smith (1964 p. 29) claimed that a 'high percentage of spatially gifted pupils failed to gain admission to grammar schools because they lacked the linguistic abilities required for success in the 11+ examination.' Later in a 1986 speech Patrick Nuttgens CBE, architect and later Director of Leeds Polytechnic, made the same point saying that 'there was a deeply ingrained belief that practical people must be stupid' (Smith, 1992). Bell (2004) was to report that in the twenty-first century there is still no commitment to 'bridging the gap' between academic ability and vocational courses, making the valid point that the United Kingdoms' greatest mistake was the loss of Technical Schools in the 1960's.

Currently work by Tomlinson (2004) has highlighted the concept of vocational diplomas to raise the 'scandalously' low proportion of English teenagers staying on in Education after the age of sixteen. To this end the 2005 Government White Paper entitled '14-19, Education and Skills' made a commitment of expenditure for Diplomas for the 14 - 19 age range aimed at supporting students who are looking for employment in areas that require practical skills. However success in these areas will still require a high degree of non-verbal reasoning skills to pass the qualifications.

The results from this study will point out that the time for identifying spatial and technical abilities is within the early and primary years, as recognized in the NACCCE Report, 'All our Futures: Creativity, Culture and Education' (1999). It will also show through five individual case studies that children identified at an early age, as having a weakness with literacy and a talent for spatial tasks have ultimately gone on to successful careers that have a strong emphasis on spatial ability.

Equally, it is well recognised that inability to acquire literacy skills in the early years results in poor self-image, lower confidence and frustration, (Goldstein & Mather, 1998; Guppy & Hughes, 1999). Pupils who cannot read and access the curriculum easily become disillusioned, de-motivated and often disruptive (Cowley, 2007). This study will show that for some pupils this was in fact the case.

Parental involvement in children's progress in school has been promoted since the 1970's (Gordon, 1977). The study highlights the importance of transition to school from playgroup in relation to parental involvement and the requirement for parents, children and schools to be understanding of particular individual needs and talents of early years' pupils. This knowledge can impart great benefit in understanding and teaching through strengths and supporting the parents of a child with the specific weaknesses. The essential role that parents play in the transition from pre-school to school is considerable (Dockett & Perry, 2004).

The rationale for the study

The rationale for the research arose from my observations as a class teacher of Year 2 children over a number of years, in an English Local Education Authority (LEA) Primary School. As an infant teacher I observed that in all the year groups of Year 2 children that I taught, on average three out of 25 children in each class failed to read and write easily compared with the rest of the class, in a particular way. This small proportion of children were slow a learning to read, they enjoyed the story content of books, being read to and they understood the storyline. They seemed unable to grasp the concept of basic phonics. Equally, these children were reluctant to 'have a go' at scribble and then emergent writing. They were only prepared to write words and sentences underneath drawings of a storyline unless an adult (either the teacher or learning support assistant (LSA)) sat beside them writing the text for them to copy.

At the same time these reluctant readers were able to draw and construct in three dimensions, a skill at a direct variance with the majority of their reading-able peers. To demonstrate this phenomenon (Figure 1) is a drawing of a pet rabbit in a hutch drawn by a six-year-old girl who was failing to read. The picture was drawn entirely from memory and

unaided by the class teacher. This drawing can be compared with one that was completed by a six-year-old boy, Figure 2, from the same class, who drew a picture of a bird in a cage, who was a reader. Both drawings were made on the same day in the same lesson by two infants in the same class, both were drawn from memory after the teacher had asked the whole group to draw a picture of their 'pets' in response to listening to a story about pets.

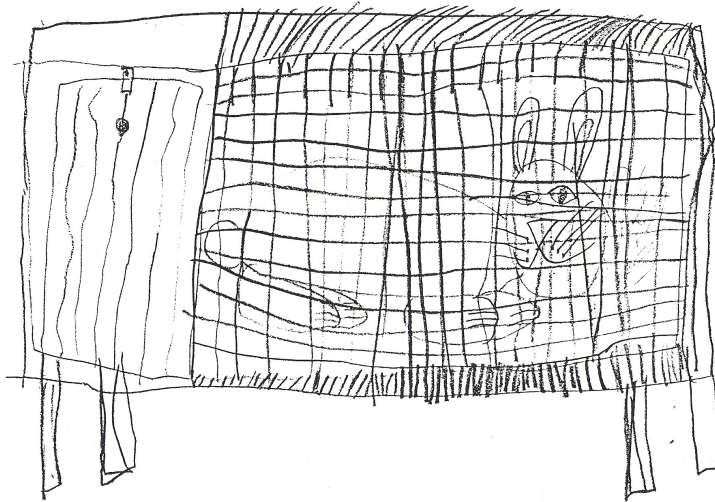


Figure 1:

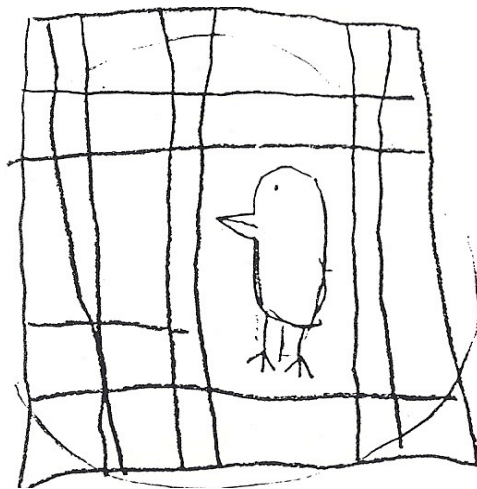


Figure 2:

The difference was that the drawing of the rabbit in the hutch was by a child who had failed to read and spell to any extent by the end of year 2, while the drawing of the bird was by an emergent reader who was beginning to write independently. The researcher found that this particular spatial strength was replicated in all the classes she taught over a five-year period. That is that in every class of year 2 children that the researcher taught some 2 - 3 children who failed to read easily could draw or design in three dimensions, while at the same time showing the particular reading and writing difficulties previously highlighted.

The researcher does not however, claim that all the children she taught in her Year 2 classes who were beginner readers had the capacity to draw and construct in three dimensions. For example, in each class, there were slow readers, children who found difficulty actually writing (because of poor motor control) and children who found spelling skills difficult to acquire. However, these children were prepared to have a 'go' at scribble and emergent writing that was at a direct variance with pupils in the class who showed strong spatial ability and who were not making good progress with reading and writing. It should be pointed out here that these children with strong spatial skills and poor reading skills had no apparent problems in any other curriculum areas.

The particular spatial ability did not however, always manifest itself in the ability to draw in three dimensions, but in the skill of constructing in three dimensions from memory. Building with Lego[®], Mobilo[®] and Unifix[®] cubes are common activities in most infant classes in England. These were popular activities, particularly with boys. However, not all the children who used these kits were able to replicate models in three dimensions. The Unifix[®] cubes came with cards showing possible models that could be built. (Appendix 1). The children putting the cards in front of them and following the diagrams could interpret these or the cubes could be used independently for them to build from their own memory. It was observed that some pupils could use these cubes to make three-dimensional models either using the guide cards or from independent thought. The majority of children however, could not follow the cards and produce three-dimensional objects, neither could they reproduce objects in three dimensions from memory. These children preferred to produce models that were only two-dimensional.

Alongside this the National Curriculum (1996) Science requires children to understand forces. This meant that children working towards their year 2 SAT's aim to produce simple models that would move using force. A standard task for the children is to give them the opportunity to use junk materials such as boxes, toilet roll cartons, cotton reels etc. to encourage them to make models that move. The result was that some children produced a simple model, Figure 3, which comprised a box with four cut off pieces of toilet roll on each corner for wheels and a piece of string tied into the middle of the box at one end to pull the 'car' along. However, some children produced a moving car, Figure 4. This comprised a more sophisticated box and wooden wheels (available to all the children) with axles. No string was needed for this model to move purely 'force'. Children (usually boys) who could not easily read and write produced these models. Equally those children producing the three dimensional Unifix[®] models were also those who failed at early literacy.

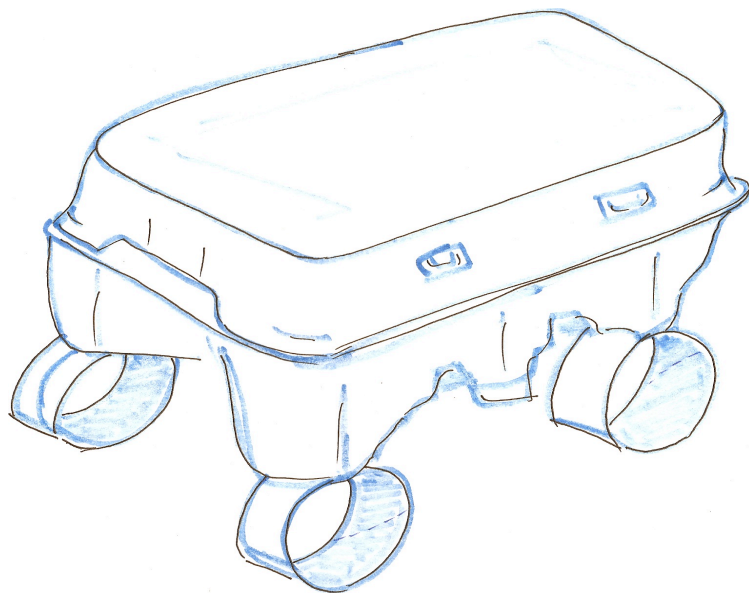


Figure 3:

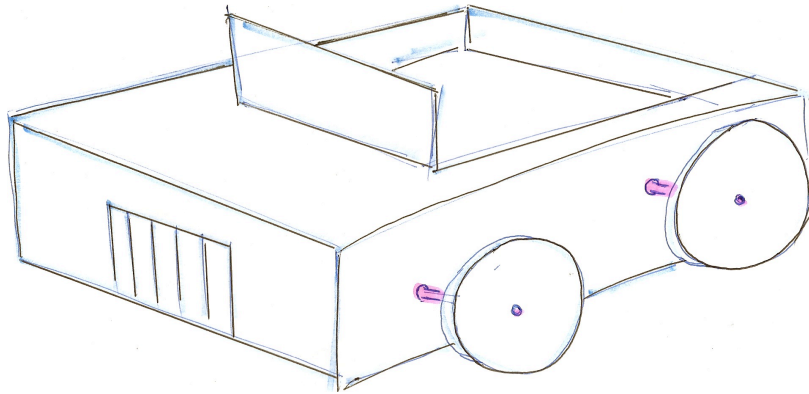


Figure 4:

As a keen gardener the researcher would spend a great deal of time choosing a particular spot where shrubs and flowers will flourish. As a teacher it was her philosophy to give all children the opportunity to develop and learn according to their strengths and weaknesses. As a mature student the researcher came to teaching later in life and wrongly assumed that all children would be identified as a matter of course for their strengths as well as their weaknesses.

Therefore the rationale for this research was to establish whether the particular spatial abilities were present in some children, alongside the specific deficits in literacy. It is possible for literacy problems to be identified early on in school through the requirements of the National Curriculum. It could also be possible to identify specific spatial or creative strengths at an early age and use these to support learning in areas of weakness or to improve a child's self-esteem and motivate learning. Equally, for the child with poor literacy skills to 'flourish' then the needs of the child, the parents, the school and the curriculum have to be addressed to make a coherent whole. At the centre of this is the need to build on each child's individual talents and to ensure that he/she remains motivated in school and that self-confidence is not dissipated.

The aims of the research

The research will aim to

- Establish whether there is a particular sub-set of pupils with poor literacy skills who have strong particular spatial skills.
- Establish whether these students had been identified both for their strengths and their weaknesses throughout their education.
- Establish whether their poor literacy skills resulted in poor motivation for study and a low self-esteem in their ability to learn.
- Examine the presence of spatial abilities amongst those with literacy difficulties.

The aims in practice

Using a combined strategy methodology the study comprised two parts, five individual case studies and a structured survey.

These take the form of a retrospective longitudinal case study that took place over ten years. It was anticipated that by using case study methodology and a college survey a combined methods approach (Cresswell, 1994) would lead to a more in depth understanding of pupils who had reading problems and yet had strong spatial strengths. The longitudinal aspect of the five case studies would, it was anticipated, show whether a) the children had used their spatial strengths in school or out of school, and b) how if any these had impacted on their motivation to learn and their self-esteem. Because the researcher would be interviewing the five children in their late teenage years, it was hoped that they would be considering career options. This would provide further evidence for the study as to whether they were considering career moves that included a spatial element.

From the point of view of the College Survey, this it was considered, was an added perspective to the research. By testing 133 College students using standardised tests of literacy, mathematical and spatial ability and including a drawing test which specifically tested three dimensional drawing skills, it was anticipated that the results would indicate a) the number of students with reading problems, b) the number of students with strong spatial ability and c) the choice of courses those students had chosen. It was anticipated

that from the 133 students there would emerge evidence of a sub-group of students who had strong spatial skills and poor reading skills.

In the same way as the case study methodology would examine the question whether the children had understood and recognised their particular spatial ability and used it either in school or in outside school pursuits, the same questions would be asked of as many of the college students as was possible in the time frame of the test period.

By using these two methods of data collection it was hoped that the results would prove to be trustworthy and hold a large degree of validity, because of the positive aspect of using the combined method approach in the data collection.

Outline of chapters to come

Chapter two is a literature review of past literature, including journals in areas associated with this study. These include general ideas, theories and specific research into the areas of reading problems, spatial abilities, early play and literacy. It also identifies gaps in the areas of previous research that may be covered by this study.

Chapter three covers the methodology used in this research that is dealt with in two parts, firstly, a case study of five children covering a period of ten years from their primary years to their teenage years.

In Chapter four the five individual case study findings are dealt with separately with commentary from the researcher on her findings over the period. Chapter five deals with the analysis of the issues that were highlighted during these case studies.

Chapter six deals with the findings of the College Survey, analysis of the factual questionnaires, drawings and computer-generated tests. Finally, Chapter seven brings the thesis to a close with a discussion, conclusions and recommendations for future research.

LITERATURE REVIEW

Introduction

An important part of any research is the extent to which it is related to existing research and to theoretical perspectives (Birley & Moreland, 1998). Before embarking on the study little evidence had been found to support compensatory strengths and deficits within the infant classroom. In fact the opposite appeared to be the case, whereby psychology research had focused on the question of deficit rather than looking particularly at different strengths of any kind (Fawcett, as cited in Wearmouth, 2004).

At the start of the literature review four distinct search areas were identified for investigation; a) spatial ability (particularly relating to three dimensional understanding and mental rotation abilities), b) young children's art and technology expertise, c) children's reading problems and d) children's motivation and interest in learning to read. These four areas were seen as significant because they encapsulated what had been observed from my classroom teaching of infants. That was, children who did not seem particularly motivated towards reading and who found reading and writing difficult, yet who found drawing, technology and creativity easier and seemingly more fulfilling.

From these four research areas sub-divisions of specific areas were established and searches made of various electronic journals including The Australian Education Index, The British Education Index, ERIC and other textbooks within the area.

A methodical search of the available journals from the start date of each journal was made using notebooks in which I recorded all relevant entries in tabulated columns. I found that the number of articles relating to the area of reading problems and spatial strengths totaled three (Winner, Karolyi, Malinsky, French, Seliger, Ross and Weber, 2001; Karolyi, Winner, Gray and Sherman, 2002). These related to the testing of University students who had dyslexia and aimed at establishing what particular spatial ability they had, if any. I could find no research that examined strength and deficit in relation to spatial ability and reading, which related specifically either to infants, primary school children or upper school pupils. I acknowledge that whilst my search was carefully conducted there may well be other

research in the area that I have not been able to discover. Equally, it is of note that in the last five years (as the literature review will show) more research is being conducted into looking at children's creativity and how this can be used in the classroom context and this will also be shown in this chapter.

The following shows the specific areas searched within the electronic journals and resulted in several notebooks of tabulated references to be followed up.

Spatial ability and young children's ability with art and technology.

Spatial ability and young children

<i>Spatial ability and theoretical concepts</i>	<i>26 articles</i>
<i>Spatial ability and drawing in three dimension</i>	<i>none</i>
<i>Spatial ability and drawing in perspective</i>	<i>none</i>
<i>Spatial ability and play</i>	<i>919 articles</i>
<i>Spatial ability and intelligence</i>	<i>48 articles</i>
<i>Spatial ability and visualisation</i>	<i>33 articles</i>
<i>Spatial ability and early learners</i>	<i>none</i>
<i>Spatial ability and construction play</i>	<i>339 articles</i>
<i>Spatial ability and hand/eye co-ordination</i>	<i>360 articles</i>

Art and young children

<i>Theory of art and children's drawings</i>	<i>82 articles</i>
<i>Children drawing in three dimension</i>	<i>1 article</i>
<i>Children's drawings</i>	<i>4612 articles</i>
<i>Children's drawing ability</i>	<i>50 articles</i>

Children who are at risk of not learning to read but are good spatially

<i>Young at risk readers who are good spatially</i>	<i>none</i>
<i>Dyslexic students with enhanced spatial ability</i>	<i>20 articles</i>

Children's motivation for learning to read

<i>Motivating young children to read</i>	<i>1 article</i>
<i>Motivation in learning to read in the primary school</i>	<i>14 articles</i>
<i>Motivation and learning to read</i>	<i>3742 articles</i>
<i>Children at risk of not learning to read</i>	<i>20007 articles</i>

I scanned all of the articles above and found that the majority of the literature in all areas 80% referred to children above the early years age range. As each article was scanned those articles deemed relevant to the study were highlighted to return to and read after the initial trawl of data. The review resulted in five relevant areas of literature that will be examined.

The literature review is as follows:

Spatial Ability

- Theories of spatial ability
- Art and spatial ability in the primary years
- Technology and spatial ability in the primary years
- Spatial ability, creativity and potential for learning in school
- Spatial ability and its role in UK Education
- Early years foundation stage

Identification of the reading problems

- Historical perspective on reading problems
- Specific reading difficulties/dyslexia

Self-esteem and reading and motivation in learning to read

Reading difficulties and spatial abilities

- Dyslexia and visual-spatial talents. Compensation versus deficit model. Winner, Karolyi, Malinsky, French, Seliger, Ross, & Weber (2001).
- Dyslexia linked to talent: Global visual-spatial ability. Karolyi, Winner, Gray & Sherman (2002). West (1991); Silverman (1993) and others

Summary and identification of gaps in the area of research.

- Other research in the area
- Further reading

Conclusions

Spatial ability

Theories of spatial ability

'Spatial ability has an important part to play in learning mathematics and science subjects that are among some of the most important in today's competitive work environment' Yilmaz (2009). Ironically these words echo Ian MacFarlane Smith (1964) in his work and book 'Spatial Ability'. Despite this, the important role spatial ability plays both in the way problems are solved and in the technological work has been underestimated (Clausen-May & Smith, 1998) and as a result children who have strong spatial ability may have been disadvantaged at the expense of an education system which has relied heavily on success in the development and use of verbal and numerical skills as a prerequisite for educational success (Smith, 1992).

An important part of the research was the question of what constituted the particular spatial ability I was observing in the infant classroom. The infants were able to draw and design in three dimensions at a mature level and at a variance with many of their peers. A rigorous search of the electronic journals and relevant texts into spatial ability and art and technology, showed that in relation to young children and these particular skills there was little research available to show that this area had been researched, what research existed focussed on art and drawing skills. The search of the literature also indicated that the observed skills crossed two areas, art and drawing skills and design and spatial skills.

Initially, it was essential to look at the two areas, design and spatial ability and art and drawing from a historical perspective, to establish how these particular skills had been identified. The area of spatial ability has moved through stages of recognition but has its roots firmly in factor analysis and the importance placed in education general intelligence (g). This refers to the work of Spearman (1904, 1923 and 1927) who found various relationships among different sensory tasks and academic subject matter (Gardner, Kornhaber & Wake, 1996). Spearman claimed that mental ability could be analysed into factors:

A general factor (g)

Specific sub-factors (S^1 , S^2 and S^3).

S¹ is the ability to recognize the identity of an object when it is seen from different angles.

S² is the ability to imagine the movement or intended displacement among the parts of a configuration, mechanical movement or surface development.

S³ represents the ability to think about those spatial relations in which the body orientation of the observer is an essential part of the problem. Thurstone (1938) surmised that kinaesthetic imaging might somehow be involved in this third 'S' factor.

He believed that for any one individual (g) was a measure of the mind's ability to understand relevant relationships between ideas or to deduce correlates corresponding to a given relation (Smith, 1964). This has become verbal reasoning and the means by which children in English schools were assessed for secondary education following the Education Act (1944) up until the evolution of the Comprehensive System. However, today the 11+ examination remains as a predictor of performance in several English counties, e.g. Kent and Buckinghamshire.

While Spearman's view of mental ability relied heavily on the presence of good verbal ability, a contrasting position was put forward by Thurstone (1938) who claimed that intelligence consisted of a small number of independent abilities. Thurstone proposed an alternative theory to Spearman and identified separate and unique mental abilities, which he termed primary mental abilities (Gardner, Kornhaber & Wake, 1996). He used factor analytical methods on the results of a battery of 56 diverse tests given to a sample of 240 Chicago College Students. This resulted in a correlation matrix and he found 8 independent primary abilities, which he claimed explained intellectual functioning better than a general factor.

These were,

Verbal Fluency

Verbal Comprehension

Number

Memory

Perceptual Speed

Rote memory

Inductive reasoning

Deductive reasoning

However, both Spearman and Thurstones' theories rely on inter-correlations found in the performance on a variety of intelligence tests (Anderson, 1992).

Following the Second-World-War, Vernon (1950) administered a wide range of psychological tests to army recruits and statistically analysed the way in which scores on the tests interrelated. From the results he claimed that there was a general intelligence factor (g), which accounted for the largest source of the variance of intelligence. However below 'g' were several major minor and specific group factors. The two groups were verbal/numerical thinking and spatial/mechanical/practical thinking. Discussing this Smith (1992) stated that educational attainment tests fell mainly into the first group and as a result was named v:ed. The second group was named k:m and claimed to have relevance for various manual and mechanical pursuits.

Work by French (1951) described three types of factors for spatial ability: SR-O = Spatial Relations and orientations, Vz = Visualisation and K = Kinesthetic imagery. Today these are still recognised but not normally referred to as such. SR-O was thought to be the ability to comprehend the nature of the arrangement of elements within a visual stimulus pattern primarily with respect to the examinees body as the frame of reference

Visualisation 'Vz' was about mental manipulation of visual objects involving a specific sequence of movements whereby objects are rotated turned and twisted. There was an implicit need for the pupil/student to be able to understand or recognize a new position, location or changed appearance as a result of the manipulation.

Kinaesthetic 'K' imagery was to become confusing with regard to factor analysis in that originally it was thought to represent a left-right discrimination with respect to the location of the human body. In practical terms this meant determining in which two directions the bolt has to be turned if it is to be screwed into a piece of wood (Smith, 1964) p.91.

The work with factor analysis proved to be inconsistent and as a result caused confusion (McGee, 1979) because of the inconsistency and confusion concerning the structure of spatial ability, its investigators were inconsistent when naming the factors. In his own study

McGee concludes that there are two main factors, Spatial Visualisation (Vz) and Spatial Orientation (SO). Visualisation remains very much the factor identified by French as the ability to mentally rotate objects from memory. Spatial Orientation, McGee claimed, was the individual's ability to imagine the appearance of an object from different perspectives. Later Lohman (1988, as cited in Yilmaz, 2009) would put forward the case for three major spatial ability factors:

Spatial Visualisation (Vz) the most general factor, which contain complex moves such as rotation, reflection of folding complex figures.

Spatial Orientation (SO) whereby problems can be solved by mental rotation.

Speeded Rotation (SR) defined by tests of a two-dimension nature that require the subject to determine whether a given stimulus is a rotated version of a two dimensional target (i.e. a card game) or is a rotated and reflected version of it. This sort of test would provoke instant recall answers.

The biggest problem with the outcomes of factor analysis depended on the appropriateness of the tests used in the analysis in the first place. Vandenberg (as cited in Eliot & Salkind, 1975) claimed that the 'problems with identifying any type of spatial ability was that the precise nature and limits of spatial ability are not clearly understood'. This is because researchers tend to use the term spatial to describe features of tests that use geometric figures but which only require a minimal degree of visualization and mental manipulation of two or three-dimensional objects, an example of this is Ravens Progressive Matrices[®] (1967) tasks using mazes and the Kohs[®] Block Design Test (1923).

Results of the interviews, observations together with the longitudinal aspect of the five case studies would, it was envisaged, provide rich qualitative in depth data about the children's early lives, spatial skills and reading problems. By contrast, the college survey would afford the researcher the opportunity to collect data from a much wider group of participants using standardized verbal and non-verbal tests with a strong spatial element and a separate spatial drawing test aimed at establishing students ability to draw, from memory in three-dimensions.

It is recognised that traditionally spatial abilities have been measured using four different types of tests: Performance tests, paper and pencil tests, verbal tests and film or dynamic computer-based tests and that each of these have their own limitations (Lohman, 1993).

Performance tests that comprise form board, block manipulation and paper folding tests can be criticised because they show moderate correlations with other measures of spatial abilities (Lorenz & Neisser, 1986). Paper and pencil tests have implicit factor analysis within them and verbal tests are rarely used (according to Lohman) but are very relevant because they often show high correlations with other spatial tests and other criterion measures (Guildford & Lacy, 1947). On the question of computer-based tests Lohman presents positivity stating that the work of Pellegrino and Hunt (1989) produced several computer administered tests of dynamic spatial abilities, the results of which showed that individual differences in the ability to predict object trajectories could be reliably measured.

Eliot and Hauptman (1981) state that in the literature, researchers refer to spatial ability in such a variety of different ways that it is often difficult to be precise about the meaning ascribed to the term and as such it has become ambiguous. This was disappointing because it meant that there were no clear guidelines in which to place the specific skills that I was observing. However, linking the early work of Smith (1964) to the later work of Lohman (1993) it was possible to identify two particular areas in relation to these skills, that of spatial visualisation and visual realism, that matched what I was observing in the classroom.

Spatial Visualisation (Vz). This, from either the early perspective of French (1951) or the more recent perspective of Lohman (1993) is the ability to mentally rotate objects from memory in three-dimension and is regarded as being a spatial ability. This particular skill would be needed by children to be able to build with Lego[®] or equivalent building kits, objects and buildings in three-dimensions. Equally the children with reading problems who could construct models in three-dimensions from cards (Appendix 1) would also need this particular skill.

Visual realism. This is the ability to draw in three-dimensions and is an area which overlaps two others, that of spatial ability and art. In his work 'Spatial Ability', Smith (1964), was struck by the fact that many science and technology students failed to be able to reproduce drawings of common objects from memory, with their dimensions in correct proportions. He

considered this to be a 'special aptitude' lacking in many students but essential for those embarking on scientific or technological careers. He called this special aptitude 'the ability to perceive and reproduce shapes correctly,' i.e. with their dimensions and their relations in due proportion.

Today spatial ability is concerned with the ability of students to be able to recognise and draw objects in three-dimensions and to understand three-dimensional constructs, particularly the ability to understand mental rotation. This has particular interest and application for University students who are studying science, technology and engineering and it remains a skill many studying these subjects find difficult (Mitchelmore, 1980; Huk, 2006; Potter, Merwe, Kaufman & Delacourt, 2006). For the sciences, in particular cell biology, molecular science, mathematics and geometry, there is a perceived need for students to be able to read, understand and reproduce three-dimensional drawings and models and use mental rotation skills from memory. However, my reading showed that students entering Universities on courses that demand them did not always understand these skills.

While I had identified the two areas of spatial ability in which the observed skills could lie, my reading also showed me that finding research into how young children work and design technologically, would be very difficult because little research has been done in this area in early years learning technology (Anning, 1994).

Work by Solomon and Hall (1996) showed that a significant factor in working successfully in technology contexts is children's spatial abilities and cite the work of Eliot and Hauptman (1981). They claim that two forms of spatial ability are evident during technology related activities firstly children's ability to think in terms of space and shape and secondly children need to be able to work in three dimensions. They need to understand how flat shapes can be bent or folded so that they can make space-filling objects.

To do this Solomon and Hall (1996) claim children need to be able to think in terms of a series of mental operations, or processes. So they need to be able to think about what they are going to make a bridge for example and to know what the end product will look like after they have begun construction. They need to understand its purpose and the forces it will have to sustain. This is, they said, complex mature thinking.

This was my exact interpretation of the drawing and modelling I observed as an infant teacher. I considered these stages of thought not only interesting but very mature and at a variance with many adult capabilities. Piaget for instance believed that young children before the age of about nine years were not able to draw with realism, and more recently the work of Cox (1991) found that young children are not able to easily draw in three dimensions, and says that adults often have difficulty in this task. Therefore for six-year old children to do this is something special, a point substantiated by Fleer (2000), who found that young children could produce 2-D designs yet fail to convert those into recognisable models.

Art and spatial ability in the primary years

The ability of young children to draw in three dimensions again proved to be an area where little research existed. Journals were scanned for research into the specific area of art and spatial ability, early years and primary years and children with reading problems. The results showed no specific articles about three-dimensional drawing and early years reading problems. There were however, articles about children with reading problems and creativity and art, which will be reviewed later. I could find no journal articles that referred to spatial ability and technology or construction, but there were some articles that dealt with the way in which children chose play activities that involve technology and construction, and these will be reviewed after this section on art. This is not to say that these do not exist merely that despite a rigorous search I could not find any.

Despite the fact that I found no articles that related to art/spatial ability and reading problems in the early and primary years, in order to understand what is understood about the way young children use art seemed to be worthwhile to this study, because it may be relevant to the outcome and conclusion of the research, and illuminate the results of the interviews in both parts of the study.

I found that the tradition of collecting and analysing children's drawing has historically been dominated in the field of developmental psychology (Ring, 2006). This has, for the most part involved cross-sectional analysis in order to develop stage theories of drawing development (Kellogg, 1969; Lowenfield & Brittain, 1982). Equally, the analysis of children's drawings has laid great emphasis on examining children's early figure drawings for example, in an attempt to make links between the content of such drawings and intelligence (Goodenough, 1926).

Initially the concept of a structured linear progression of significant aspects of children's drawings, linked to the chronological stages of a child's life proved to be important and to the forefront of studies of children's artwork (Fawson, 2009). This fascination with progression was initiated in an influential study by Luquet (1913, as cited in Cox, 1991) whose longitudinal study based on the work of his daughter resulted in the identification of five stages of drawing in early childhood.

Scribbling (age 0 - 2 years)-when child just makes a mark on the page.

Pre-schematic stage (age 2½ years – 3½years) – where a child makes marks and there is an accidental resemblance to an object.

Failed realism (age 3½ - 5 years) when children try to draw a picture that looks like the real thing and fails.

Schematic Stage (age 5 – 8 years) where a child attempts to draw reality but draws what she/he knows not what he/she sees.

Visual Realism (age 8 years onwards) where a child begins to draw depth in their pictures.

The work of Piaget and Inhelder (1958) drew on Luquet's work coming to the same conclusions about the stages of drawing in children's development, and further claiming that, before the age of 9 years children were unable to draw with realism or understand another perspective. Thomas and Silk (1990 p.29) make the point that the study of children's drawings was never central to the study of Piaget's theory, nor did they offer crucial tests of his propositions. His interest in children's drawings only emerged in relation to the child's understanding of space (Fawson, 2009).

More recently work by Newcombe and Huttenlocher (2000) has made the suggestion that spatial ability develops earlier than Piaget proposed. They claim that in fact children do understand distance information from particular landmarks and that as a result are able to understand locations which seem to be related to the maturation of the brain by the time that they are two years old. This is a big difference from Piaget's understanding that children do not reach this stage until they are nine or ten years old.

Psychology researchers have looked at children's drawings to measure intelligence and Goodenough (1926) introduced a Draw a Man test as a means to measure intelligence. This

was developed and used by Harris (1963) but criticism of the reliability and validity of the test was raised on the grounds that it was based upon only one drawing when assessing a child's knowledge and understanding (Thomas & Silk, 1990).

The implications from these early works were that from the point of view of drawing, children are rarely able to draw realistically until the age of nine or ten years. However, the picture below (Figure 5) drawn by a six-year old boy shows that children can show realism in their pictures at a young age.

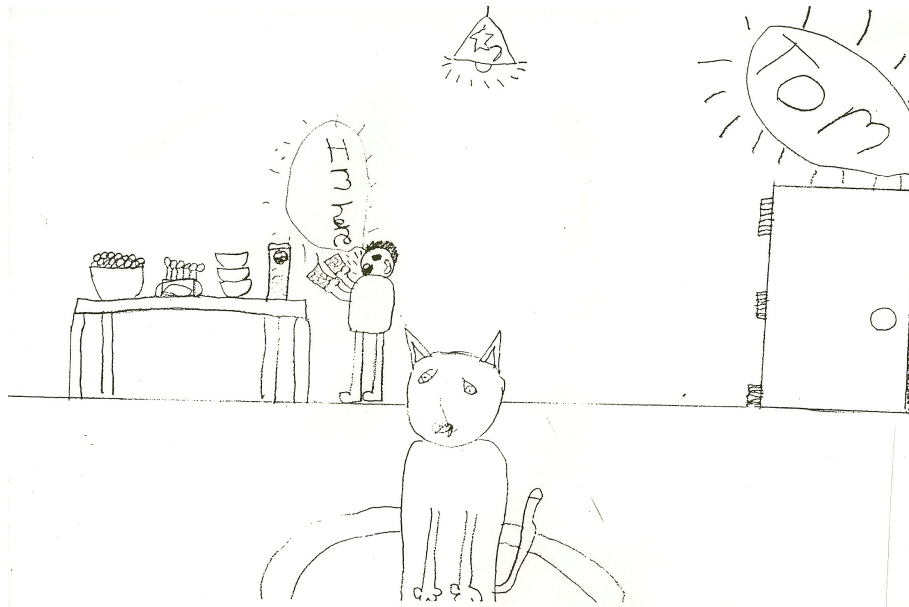


Figure 5: Drawing by child C.

The concept of linear progression drew for its theoretical perspective on cognitive developmental stage theory. Fawson (2009) points out that today developmental stage theories have attracted a great deal of criticism and as a result the legitimacy of such a hypotheses linked to drawing skills has resulted in new debates. Work by Newcombe and Huttenlocher (2000) for example have made the suggestion that spatial ability develops earlier than Piaget proposed. They claim that children understand distance information from

particular landmarks and that as a result are able to understand locations that seems to be related to the maturation of the brain by the time that they are two years old.

A large study of children's drawings, carried out by Kellogg between the years 1948 and 1966, involved her collecting about one million drawings from young children aged between 2 and 8 years old. The drawings were collected from nursery schools in San Francisco, teachers sending in work and work sent from other continents. These were examined and resulted in Kellogg proposing 20 basic scribble patterns suggesting a developmental sequence of children's drawings based upon basic shapes, the combining of these shapes and the use of them to symbolise humans or objects (Fawson, 2009).

Similarly the work of Goodenough (1926) resulted in the Draw-a-Man test (still used in some schools today) whereby a child is asked to draw a picture of a man and for each part of the body he/she includes in their drawings they are awarded a point. It was introduced as a test of intelligence but has been criticised because it only allows one drawing to assess the child's knowledge and understanding (Thomas & Silk, 1990).

Later Burns and Kaufman (1970) produced Kinetic Family Drawings that were aimed at finding out the complexities of children's emotions, whether they were happy/sad/frightened? Again criticism was directed at these on the grounds that the results were open to interpretation, and asked whether or not it would be better to gain the knowledge from child observation (Cox, 2005).

Rigorous review of the literature found little evidence to show researchers had examined children's drawings for their ability to draw from memory in three-dimensions. This is because historically, research into the way in which children draw has focused mainly on several areas including the internal structure and visual realism of children's depictions (Cox, 1985, 1992), the perceptual, cognitive and motor processes involved in producing a drawing (Freeman, 1980), the reliability and validity of the interpretations of children's drawing developments (Dowling, 1994) and the reliance of cultural and social factors (Matthews, 2003, as cited in Fawson, 2009).

A study by Cherney, Seiwert, Dickey and Flichtbeil, (2006) looked at the drawings of one hundred and nine, 5 – 13 year olds to establish whether their drawings were a mirror

representational development. Were children able to depict spatial elements from their environment through an understanding of where an object is located in comparison with other objects? This, the authors considered, was an important aspect of geometry, geography and graphic design. By asking the children in their study to draw pictures of the family and pictures of their school, they aimed to establish how the representations might correlate with the children's working memory capacity.

The authors pointed to the fact that drawing skills involve fine motor skills and good hand-eye co-ordination, but that these may not need to be mature in order for even very young children to be able to make representations on paper. In other words children do not need drawing skills as such to produce simple pictures. Their study did not consider that very young children would be able to draw from memory very realistic pictures, but rather focused on the work of others namely Braine, Schauble, Kugelmass and Winter (1993) who claimed like Piaget and Inhelder (1958) that children's drawings only show dramatic gains in organization, detail and representation of depth during middle childhood, when some depth cues, such as perspective e.g. making distant objects smaller than near ones, begin to appear.

The conclusions of the study into children's drawing ability and spatial realism by Cherney et al., (2006) supported overall the hypothesis that, with increasing age, children are able to create more complex drawings. This was particularly noticeable in the way primary school children represented buildings between the early ages 5 - 9 years where they produced a frontal perspective. As they got older they were more able to take on the concept of an aerial position, this very much aligns with the work of Piaget and Inhelder (1958) and Cox (1991). On the subject of the manipulation of spatial components, the study found that these were influenced by three variables, the capacity of children to look at the appearance of objects, away from what they think an object should look like. Firstly, drawing what they see rather than what they think they see (Cox, 1991). Secondly, the ability to recall figural configurations and to hold them in working memory that could link to the work of Schneps, Rose and Fisher (2007) and their theory of central vision and memory recall. Thirdly, the effects of fine motor control which they allude to as the ability to put more detail into drawings of buildings and objects, particularly girls thus implying that sex differences may impound the findings.

That study has importance for this research because it is one study that does look particularly at the way children draw and the detail they put into their drawing and that it offers another aspect to spatial thinking. The authors conclude that their results show the way forward for additional research to examine the question of spatial perspective and thinking in relation to how children view things, for example maps and graphic representation, space and computer graphics. They say that in this area it is crucial to provide children with spatial training that will enable them to represent space from a different perspective and children's drawings may be a key to this process.

What their study did not do was to look at children's drawings from the perspective of those who were poor readers and those who were not. In fact, in all the literature except for the work of Winner, et al. (2001) this particular phenomenon was not represented. This work will be discussed and reviewed in the section 'other research in the area.'

More recently however, there has been research not into children's ability to draw in three-dimensions or maturity but instead focussing on the way in which drawing is used in school, the way in which family impacts on children's desire to draw and the way children are able to draw what they see from memory. Two of these areas were seen as being of use to this study and its outcomes, because the longitudinal aspect of the case studies would hopefully show whether the children had continued with art throughout their school life and whether the family had had a part to play in their artistic interests. In the last area the way in which children draw from memory at first seemed relevant to the research, particularly the work of McCloskey (1995) because he based his work Smith (1964) and the way children perceived three-dimensional shapes. However, closer examination revealed that in fact the study was related to sides of objects and how they were drawn and was not in fact exactly the area of interest.

Work by Hall (2009) highlighted the important findings of my literature review, firstly the lack of research concerning art and young children, and secondly the fact that the role of art in early education within the policy documents sends out mixed messages about the importance placed on art in early education. Hall was specifically discussing the value of drawing in early education and points to the fact that the current English curriculum documents, namely the *Practice Guidance for the Early Years Foundation Stage (EYFS)* (Department for Education and Skills (DfES) (2008a) and *Key Stage 1 of the National*

Curriculum Handbook for Primary Teachers in England (Department for Education and Employment (DfEE) Qualifications and Curriculum Authority (QCA) (1999), present contradictory views about the role and value of drawing in early education.

On the one hand the policy encourages children in early education to explore and communicate their ideas, feelings and experiences through a range of means including drawing. Conversely, while acknowledging that drawing is a pre-writing skill that helps with early motor control, it is considered only necessary until the child can write words. Reviewing the Early Years Foundation Stage documentation the role of art is again acknowledged under a separate heading or section, but only as a means of encouraging children to draw and paint to foster awareness of their surroundings, but not as an assessment tool which could be cross-linked to other curriculum areas. This is not to say that some pre-school environments do not, as part of their child profiling, make connections across curriculum areas, but this is not implicit in assessment as far as could be gauged.

Fisher (2003) makes the point that art is very much seen as a 'cross-curricular' area especially in the early years and this is not particularly helpful as the classification is limiting rather than liberating. As the teacher of those children in the case studies and as a teacher of an infant class for several years, I considered that art drawing and design was an important 'global skill' that should be encouraged, a point borne out by Edwards (1994) who considered it not only an important pre-cursor to writing but also as a skill that has many applications, to support ideas and build on concepts particularly in primary teaching. Given the fact that as far as I could ascertain from the reviewing the literature there was little to be found in art and early years education, it will be interesting to establish through the case studies and the college survey whether the children and college students viewed art in their education as an important element?

Research by Ring (2006) raised interesting issues about the way in which mother's everyday routines and rituals impact on their children's use of drawings. Again, Ring acknowledged that there was very little research into children's drawings and their artwork. Basing her work on the socio-cultural theory of art, drawing and young children, originating from the work of Vygotsky (1978) and developed by Bruner (1996) which emphasised the social origins of mental functioning, she points out the importance of how the way young children think is

modelled in their social relations and activities, before it becomes internalized and available for more mental thought.

Ring looked at seven pre-school children between the ages of 3 and 5 years old and their mothers. Using Dyson's (1993, as cited in Ring, 2006) analysis of children's use of symbolic systems whereby it is theorised that that from birth to six years children's drawing passes through a continuum of children's use of symbol systems, see Figure 1, Ring compared the drawing techniques of the seven children, four boys and three girls, to see whether a pattern of meaning, making and drawing which is sequential, cumulative and culturally shaped.

The results found that the mother's attitude and tolerance, allowing their children to develop their creative ideas was paramount. They allowed what Pahl (1999) refers to as 'purposeful mess.' As a result the children were willing to have a go and take risks. Equally, the mothers in the study who allowed their children to have space, opportunity and availability of resources to make a mess enabled their children to use drawings as a range of modes for bringing meaning to their everyday lives. This was seen by the researcher to be of paramount importance to the child's ability to thrive creatively and developed their independence. Ring admits the study was small scale only using seven children but her results showed that the three girls progressed steadily through the continuum of the symbol system, and that once they went to school they were able to connect their experiences at school with their previous home experiences, and that these supported their early writing.

In the case of the four boys the study found that the development of drawing as a symbol system was influenced by their preference for three-dimensional activities such as construction kits. Development drawing remained a background activity, dependent upon its modelling by a significant male. The researcher points out that in most of the home visits it was some form of three-dimensional construction activity which took priority in joint involvement episodes between father and son. The article was less clear about what happened in respect of their drawing and ability or their construction skills when the seven children started school except to point out that in the case of the boys most of the mothers involved their sons in practising letter writing in readiness for school.

Technology and spatial ability in the primary years

The results of the journal search for this area showed a dearth of available literature. There was nothing as far as I could ascertain about children who were able to design realistic working 3-D models easily and who also had reading problems. I limited my search to looking particularly at the way young children play with construction kits or use modeling resources to produce realistic three-dimensional models. Literature about this was also difficult to find, but as Anning (1994) discussing technology as part of the early years curriculum in Australia says, 'technology is very much a new teaching area'. I found this to be true of research in the journals taken from work in English schools either pre-school, early years or primary schools. However, that is not to say that researchers have not previously recognised the need to analyse children's knowledge and understanding of 'making' activities and of construction kit components (Siraj-Blatchford & Siraj-Blatchford, 2002). In a study which drew upon previously unpublished qualitative data collected through interviews and triad elicitation (Kelly, 1955, as cited in Smith, 1964) with 54 five year olds in London, they found that young children could achieve a great deal when instruction was provided but that simple access to and encouragement with construction sets were unlikely to support them in the development of understanding, capability or positive learning dispositions in science and technology.

This study examined the question of what young children could do technologically, both from a scientific and a design and technology point of view and was, to a certain extent, looking at these areas in relation to the science curriculum and young children's curriculum guidance materials that continue to emphasise the importance of children learning observation and exploration skills in isolation, rather than from a holistic perspective. However, in relation to my study it had relevance from the point of view that, a) It revealed interesting outcomes in relation to adult support and b) the recognition that young children could understand the advantages and limitations of a mechanism such as an axle, at an early age.

This, the researchers claimed, demonstrated a significant capability in design technology. In this study these would be crucial elements and provided support for me as the researcher, in that firstly the skills I was observing in my infant classrooms were worthy or further consideration. Secondly, that the influence of adults or significant others to support children with this ability was essential to the development of their technological skills. It was

assumed that the interviews in both the case studies and to a certain extent in the college survey, would demonstrate whether or not adult support had helped and encouraged the children to develop their spatial ability skills through technological application.

Additionally, two more journal articles stood out as being relevant to the study. One was by Marilyn Fler (2000) called *Working Technologically: Investigations into how young children design and make during technology education*, and the second article by MacDonald, Gustafson and Gentilini (2007) entitled *Enhancing children's drawing in design technology planning and making*. The first article referred particularly to early years education and the second one to the 8 - 10 years age range.

The article by Fler was of interest to this study because it built on the work of Eliot and Hauptman (1981) in linking technology expertise to spatial ability in young children. Eliot and Hauptman say that two forms of spatial ability are evident during technology education: firstly, children need to be able to think in terms of space and shape, and as a result need to be able to work in three-dimensions and secondly, children working successfully with technology need to be able to carry out a series of mental operations in their heads.

Solomon and Hall (1996) pursue this angle further by saying that working in technology children, "need to be able to design in their heads, and then on paper, especially if they are looking at how an artifact is constructed to serve a purpose such as withstanding force in any direction or, if it has moving parts, how these can operate without knocking into the stationary parts (Solomon & Hall, 1996, pp.265). This latter skill is seen as an important skill for drawing objects from a range of different perspectives, in addition to visualizing the mechanisms associated with motion and rotation.

These skills would have been the ones identified from my observations in the infant classroom, and support particular spatial abilities as being identifiable in technology and young children.

The focus of Fleers' (2000) work evaluated activities of 16 white Anglo-Saxon children from a middle class background between the ages of 3 years 10 months and 5 years 3 months, engaged in technology activities in the pre-school years. It aimed to establish whether children as young as this could plan, design and produce animals and homes for the animals,

using available construction materials such as junk paper products. An Australian-based project it acknowledged from the outset that for Australia technology was a newly defined curriculum area, and that relevant research in this area was scarce worldwide, although in the previous ten years had become more prolific (Anning, 1997; Siraj-Blatchford, 1997).

The findings of the research showed that children as young as three years old can engage in oral and visual planning as part of the process of making things from materials. That their planning involved the use of lists and designs for what they intended to make, and that most of the children in the study were able to make the 'leap' from oral planning to 2-D designing. When children were asked to draw plans before the design most of the children found this difficult, something highlighted previously in the 'introduction' from my own classroom observations. However, like the Siraj-Blatchford (2002) research that identified the same phenomena this skill is present in pre-school and infant classes and supports my own observations.

The study also found that a number of children had drawn designs which could not easily be made, because the materials selected were either difficult to join, or the children did not have enough technical knowledge or how to join different types of materials or shaped materials. I found this also happened in my infant class although some children for whom this applied were able to use more advanced materials, for example dowelling, wooden wheels, saws and strong fixative materials, with the help of an adult. I found that they knew what to do but needed the strength and supervision of an adult to produce a moving model.

The Fler study identified the role of adults to support technology learning particularly with young children, again something that the findings from this research should substantiate.

As discussed, the literature in the area of technology and spatial ability was not prolific. At the outset I had wrongly assumed that research would have looked at early play activities in schools and pre-schools, particularly in relation to construction and model making. These had been features of the National Curriculum Science in Key Stage One, where infants as assessed on areas such as 'forces' that requires them to construct moving models. On the subject of early play I found two articles that related directly to this area.

Research by Gmitrova, Podhajecká, & Gmitrov (2009) found that construction play allows children to be 'instructively' creative builders. They have no inhibitions in this type of play and that the manipulation of the building blocks etc. enhances fine motor control. This type of play requires children to make 'controlled' use of their hands and finger muscles and importantly, helps to develop good hand-eye coordination skills. The authors make the point that this type of play supports learning about gravity, stability and patterning. The study also investigated the different types of play young children engaged in and outlined four specific play areas: play without rules, child directed play, construction play and dramatic play. They found that the most popular play scenario for the children in their study was play without rules where children had been left to develop their own ideas. These findings may well be of significance in this study because two of the case study children who were taught by the researcher as infants certainly enjoyed the opportunity of play without rules and both were able at construction and modeling tasks. The interviews would reveal if these were traits that continued away from the classroom.

Spatial ability, creativity and potential for learning in school

As the literature around spatial ability and what constituted spatial ability was reviewed, more and more articles emerged that discussed creativity and spatial ability and the importance of understanding the 'nature' of spatial ability to assess it, and to improve instruction by teaching for creativity, as well as teaching students to think creatively (Sternberg, 2006).

The outcomes of the interviews in both parts of this study may indicate the way in which participants viewed their abilities and how they saw them in relation to their progress both in and out of school. A review of this area therefore seemed to be a necessary part of this literature review.

The classical view of intelligence that holds intelligence as a unitary capacity for logical reasoning, a view which has been exemplified by mathematicians and scientists, historically, may not, my reading showed have held the key to what constitutes all areas of intelligence and understanding (Gardner, Karnhaber, & Wake, 1996). Acknowledging the work of Thurstone (1938) who asserted that the human intellect encompasses several mental abilities (Gardner, 1993b) put forward the theory for 'multiple intelligences'. He proposed

that individuals could possess several relatively autonomous intelligences comprising (linguistic, logico-mathematical, musical-rhythmic, visual spatial, bodily-kinesthetic, interpersonal and intrapersonal) and the degree to which each develops is dependent on many variables. The most important of these is freedom to pursue the intelligences (Hearne & Stone, 1995). This could imply that context (the way in which a child for example has the opportunity to express their spatial ability) as well as the attributes of the individual is important in establishing whether or not individual children have the environmental opportunities to pursue their particular skills (Sternberg, 2006).

In discussing the nature of creativity Sternberg acknowledges the importance of improving instruction by teaching for creativity as well as teaching students to think creatively. Individual differences can only be fulfilled under certain circumstances. Sternberg and his colleagues put forward a convincing argument for *The investment theory of creativity* (Sternberg, Kaufman & Pretz, 2001) in which they claim that according to investment theory, creativity requires a confluence of six distinct but interrelated resources: intellectual abilities, knowledge, styles of thinking, personality, motivation and environment.

Intellectual ability is seen by Sternberg in three areas,

- a) The ability to see problems in a new way, and to escape the bounds of conventional thinking.
- b) The analytical skill to recognise good ideas worth pursuing.
- c) The ability to promote those ideas with others.

Knowledge - the ability to have enough knowledge and understanding of an area to move it forward.

Thinking styles - where the skill of 'global' thinking is important or the ability to look outside the box.

Personality - which Sternberg says is the ability to take risks, defying the crowd and being willing to stand up to convention.

Motivation - which is intrinsic and is essential to creativity citing the work of Amabile (1983) Sternberg says that people rarely do truly creative work in an area unless they really love what they are doing and focus on the work rather than on the rewards.

Environment - to be creative one needs an environment, which is supportive and rewarding of creative ideas.

This investment theory may well be of importance to the outcomes of the interviews, which will aim to establish whether or not these six interrelated resources were present during the children's education.

Further reading in the area about creativity with particular reference to how creativity can manifest itself in children in a classroom context found a lot had been written by teachers of their own classroom experiences teaching children who were creative, particularly in relation to art and design (Wilson, 2009; Kim, 2008).

The reading showed that while early identification of creative ability could be critical to the way in which children learnt and enjoyed school, there was a tendency by educators (in early education) to be hesitant about identifying the ability (Barbour & Shaklee, 1998). Lai (2009) established this in research, which looked at the Reggio Emilia Approach to learning. Some educators feel that acceleration is harmful to children's social and emotional development (Gross, 1999 as cited in Lai, 2009). Equally the 'age old belief that giftedness cannot be reliably measured and that early manifestations are likely unstable because of rapid change in early childhood' was also present as a prevention from identifying creative ability in the early years.

Nonetheless literature and research into this area of creativity and the way it can be assessed and used to promote learning is becoming more and more prolific since the 1980's (Burrows & Wolf, 1983; Peterson-Weill, 1987; Olshansky, 2006; Dunn, 2009). Work like that of Olshansky is as a direct response to her own teaching, and introduction of real artists materials into a writing workshop to promote motivation for writing in children who struggled with literacy yet, responded to art and writing. It was apparent from reading this literature that there was a perceived need on the part of the practitioners to 'understand' children's individual needs and learning styles (Dunn, 2009). It would interesting to establish through interviews whether the children and older students in the research, felt that their individual needs were understood and if so how (their) perceived strengths were fostered during their time in school.

Further reading in this area led me to reading about the Reggio Emilia Approach to Early Childhood Education. Started in Italy after the Second World War it aims to support children's special interests laying particular emphasis in the context of a project-orientated curriculum and takes its ideas from thinkers such as Piaget, Vygotsky and Dewey. The environment is regarded as the third teacher and as a result teachers take care to create an inviting environment to foster an independent and active learner role. Within this learning environment teachers do not teach as much as document the learning process (e.g., they describe what children say while engaging on a project, collect their work in progress, interpret what the children are learning and thinking and share the documentation with the children, their parents and the wider community. Finally, all instruction and assessment is reported back to each other, so that learning informs future teaching and teachers 'construct' knowledge of what children are thinking and learning (Lai, 2009). To a certain extent the project forms the curriculum in this environment, the children becoming in charge of their learning and parental support within the wider context of family is essential.

To me as the researcher this concept resonates with the investment theory of creativity theorized by (Sternberg, 2006). As a whole my reading in this area lead me to realize that by acknowledging creativity in education and the way teaching can be improved by understanding individual differences, the work of Gardner (1983) and his concept of looking at other abilities children have and using these could be a way that children with spatial abilities, particularly relating to art and design, could be accommodated in English schools.

Spatial ability and its role in UK education

The Education Act, 1944 was a landmark piece of social and welfare legislation that aimed to address pupil's personal and academic development. The Act took in the 'whole child' a feature it shares with the green paper, *Every Child Matters* (2003) and the children bill that is currently in parliament (Bell, 2004).

The Act required Local Education Authorities (LEA's) to provide state-funded education for pupils up to the age of 15 years. The Act states this should be "instruction and training as may be desirable in view of their different ages, abilities and aptitudes". As a result a tripartite system of education emerged in the United Kingdom when pupils moved to either a Grammar school, Secondary Modern or Secondary Technical schools after primary school. An 11+ examination that tested pupils on their ability in mathematics, English and non-verbal reasoning tests, meant success in these resulted in a Grammar school placement. Children who failed the 11+ examinations went either to Secondary Modern or a Secondary technical school. This type of tripartite education system may have benefitted children for whom practical technical ability was evident at a young age, by giving them access to a technical education. However as Bell (2004) was to point out, in practice the system that actually developed in the 1940's and 1950's, was largely bipartite, since few technical schools were actually created.

Secondary technical schools, which could have been highly successful in the emerging technical age of the 1950's and 1960's, aimed to train pupils who showed skill in practical and technical skills. Student's who may have become technicians and engineers, and those it was anticipated by some (Smith, 1964; McIntosh, 1962) who showed an aptitude towards understanding both spatial and technical concepts, the type of skills observed by me in my infant classes. However, the technical school were underdeveloped and few existed to meet the needs of pupils who found technical and practical skills easy. McIntosh (1962) was to observe that there was a considerable amount of un-trapped reserves of technical talent that ought to be developed, particularly in the area of science and technology. Later in his 2004 speech, Bell was to suggest that the greatest disappointment in the aftermath of the 1944 Act was the countries failure to develop technical schools as a viable option.

A proponent of technical schools and an authority on spatial ability, Smith (1964) believed strongly in the retention of all Technical schools, which he saw as a means of providing a good education for students who showed an aptitude for practical, technical and spatial skills. Smith understood the role of the tripartite system of education, and identified pupils who did well in tests of verbal intelligence, that is pupils who had a high level of 'g' and relatively high verbal ability. He stated that these pupils did well on tests that required written answers to examination questions (p.36).

However, Smith maintained that there existed a group of pupils whose ability lay in the ability to do the 'actual' job, whether involving an actual construction or its representation by means of drawing. Smith said, "The possession of high verbal ability confers no advantage." (p 36). During the 1950's and 1960's there was a perceived need by many researchers for the development of technical and practical skills in Education. Technological advances in the Space industry, and the emergence of the computer revolution, meant that technical and scientific expertise was crucial to the development of countries like America and Russia. Researchers like Smith and McIntosh saw these skills as essential to the development of the British economy as well.

During the early 1960's there was also recognition that there was a shortage of all grades of scientific and technical staff 'world-wide' (McCrensky, 1958 as cited in Smith, 1964). In a report by the Stationary Office (1956) it was estimated that this shortfall was considerable and that between the years 1956 - 1966 (to maintain an annual growth of 4% in industrial output) it would be necessary to increase the number of qualified scientists and engineers by 68% from 135,000 – 220,000. A later report by the Advisory Council for Scientific Policy in Britain (October, 1963) reported major shortages of mathematicians, electrical engineers, physicists and mechanical engineers.

The Cockcroft Report (1982) reported on the grave shortage of mathematics teachers, blaming those with qualifications entering industry, notably the computer industry, leaving schools short of a supply of mathematics teachers.

Others were identifying the considerable untapped reserves of talent in technical skills, and asking for consideration of the expansion of technical secondary schools (McIntosh, 1962, as cited in Smith, 1964). Smith (1964) correctly pointed out that any, "Discussion of the pool of

abilities and of the problem of identifying talent, necessarily requires some understanding of the structure of human abilities and of the techniques of their measurement.” One of the reasons for the demise of the technical secondary schools was a shortage of teachers following the end of the Second World War and mathematics teachers in particular (Cockcroft, 1961) and the fact that the number of mathematics graduates coming from University into teaching was far too low (Thwaites, 1961).

Throughout the 1950’s and early 1960’s the bipartite system of education remained dominant in the English education system with children being selected either for Grammar School or Secondary Modern School at the age of eleven years. This left the assessment of spatial and technical abilities in a void whereby those children who may have been more adept at technical or creative technical skills, and with good spatial ability at the mercy of an examination system that looked particularly at the ability of abstract thinking rather than at a particular spatial ability.

Discussing the need to re-evaluate the significance of spatial ability in education, and by implication, the justification of giving verbal ability a pre-eminent place in the assessment of intellectual ability Smith (1992) was critical of an education system which selected pupils for Grammar Schools by relying upon some combination of head teachers’ reports and tests of English, arithmetic and verbal reasoning, at the expense of recognition of other abilities, namely spatial skills.

Work by Pauline Smith (1986; 1992) into testing for spatial ability has continued over the past twenty five years, and she has worked for NFER Nelson towards this end, believing that spatial ability can no longer be dismissed as a narrow aspect of intelligence, which is only significant for certain manual or practical occupations. Instead she argues that it should be recognised as a fundamental part of intellectual functioning. This is because it could have influence of potential for achievement in many academic subjects such as mathematics, physics, geography, and technology and occupations such as architects, engineers, neurosurgeons and store managers. Particularly in the area of science, spatial thinking is essential according to Clements and Battista (1992). This is because it is used to represent and manipulate information in learning and problem solving, from a practical and scientific aspect.

The publication of the NACCCE report, 'All our Futures: Creativity, Culture and Education' (1999), coincided with the Governments' planned review of the National Curriculum and followed on from the white paper entitled Excellence in Schools (1997). The aim was to make recommendations to the Secretaries of State for Education and for Culture, Media and Sport for the creative and cultural development of young people through formal and informal education, taking stock of the then current provision in those areas and to make proposals for principles, policies and practices. The report advocated a radical change to the structure of the national curriculum and identified the need for this to be done over a proper timescale.

The report states that consultations suggested that opportunities to promote creative and cultural education in schools were being increasingly restricted by the cumulative effects of successive changes in structure, organisation and assessment since the introduction of the national curriculum, while acknowledging that it was increasingly difficult to gather hard evidence about this either from QCA or Ofsted.

However, the report is stringent in its recommendations that if a school system is to develop young peoples creative abilities, steps must be taken to create conditions in which this can be achieved. These would need to be explicit both in creative and cultural education policy statements and the development of future school curriculums, which would be far broader. This, the report states, would mean reducing existing levels of prescription and allowing schools greater flexibility in devising appropriate programmes of work.

The overwhelming thrust of the report acknowledges that all young people have different creative capacities, that it is important to identify these abilities, including helping them to find their creative strengths. The report identified the need to look at creativity from the early years upwards. In particular, in the appendix a7, it discusses design and technology and the importance of those skills but states, 'disappointingly overall achievement in this area remains lower than for other subjects with the exception of information technology' stating that, 'pupils skills in making things are often better than their ability to design'.

Interestingly, the report attributes this with teachers' lack of subject knowledge and expertise in those areas. While acknowledging that there was a pool of ability in the same way that McIntosh (1962) found, the situation in English schools remains the same, design,

technology and art are seen as low priority and this is summed up by the words of Professor Sir Harold Kroto (1996) Nobel Prize winner in chemistry, who said that, "It must be obvious from the plethora of serious problems facing the world today that the very survival of the twenty-first century will depend on a quantum leap in real understanding of science and technology by anyone in a position of any responsibility".

The impetus for developing creativity in pupils' following the publication of 'All our Futures' does not appear to have materialised and this was an opportunity missed for many pupils who excel creatively but who find other curriculum areas more difficult. One of the results of this can be assessed from the number of University students who are embarking on courses that require them to be able to interpret three-dimensional material, particularly in the areas of science, mathematics, architecture and medicine.

Reviewing current literature using electronic journals, the concept of spatial intelligence or ability has become an area of increasing interest particularly in the area of University courses and students ability to understand 3-D drawings, either in subjects such as cell biology (Huk, 2006) or engineering (Nagy-Kondor, 2007) or computer design software (Onyancha, Derov and Kinsey, 2009) and in girls spatial ability (Quiser-Pohl & Lehman, 2002). In the case of architecture students of there is interest in just how important spatial skills are and the ability to hold and externalise their thoughts and to mentally manipulate space (Roberts, 2007). These are skills considered crucial to planning and building structures. Studies of these kinds bear out the work of (Smith, 1992) and the importance it holds in English Education in acknowledging that those with spatial ability should be recognised,

Disappointingly however, the reason that interest in spatial ability lies to a large extent with University students is because students applying and gaining places on scientific, engineering and architecture courses are found to be 'wanting' in their ability to understand three-dimensional thinking and working. Research by Vekiri (2002) investigated the value of graphical displays in learning and found that it was necessary to understand learner characteristics in relation to the graphical display. Equally, understanding individual differences was an essential part of learning from graphical images that not everyone finds it an easy thing to do. Similarly Olkun (2003) looked at engineering and improving spatial abilities with university students, saying, 'spatial thinking is essential to scientific thought'. However, there can be a decrease in schools particularly with geometry and spatial relations,

in children's learning in years 7 and 8. Equally, Huk (2006) researched 3-D understanding and cell biology and found that University students with low spatial ability became overloaded by the presence of 3-D models at a direct variance with students with good spatial skills.

My reading showed that whereas the students on the university courses in these areas had an aptitude for their subjects, their knowledge of interpretation, understanding of specific spatial ability (like three-dimensions) was under-developed. Not all students possessed this skill inherently and that the teaching of these spatial skills before embarking on a University course was not widely known.

Three issues became apparent:

1. Were children taught to think and learn spatially?
2. Where were these opportunities in the English School Curriculum?
3. Were children with apparent good spatial skills assessed within the National Curriculum for these skills?

My reading shows that these issues tended to be implicit in the school system, rather than explicit. That there was an understanding of their relevance but no Government will to ensure they happened. This is shown particularly in the early years curriculum, both in the foundation stages and Key Stage 1. While in the early stages the curriculum shows that these areas need to be encouraged there is no provision to make observations about creativity and link them to all round learning, a point stressed in 'All our Futures' (1999).

Early years foundation stage

Today, schools are reliant on the National Curriculum that specifies what subjects should be taught to different age groups and tests for English, mathematics and Science at different stages in a child's school career, 10 years and 14 years. Art, technology, creativity or practical skills are not apparent as 'key' areas for learning even in today's technological age. Even in the Early Years Foundation Stage curriculum, which comprises six areas of learning and development, creative development comes last on the list. This is not just an English phenomenon as Sir Ken Robinson points out in his TED lecture (2006), 'art and creativity come at the bottom of all areas of learning and development in education worldwide'.

While technology skills do not necessarily come within the remit of creativity, art and design do, and just as in the 1960's researchers were pointing out the neglect of such areas, it appears that in England education still favours intellectual ability over verbal ability.

Identification of the reading problems

The historical perspective on reading problems

It has been recognised for over a century that illiteracy is not invariably the consequence of lack of education or low intelligence, because some children have great difficulty in learning to read and spell despite normal intelligence and adequate opportunity to learn (Bishop, 1990).

However, identifying reasons for specific reading difficulties has been problematic. Early accounts of difficulties adopted a variety of terminologies, which placed emphasis on the problem being a medical one: word blind (Kusmaul, 1877); congenital word-blindness (Hinshelwood, 1917); strephosymbolia (the twisting of signs and letters) (Orton, 1925); specific dyslexia (Hallgren, 1950); iconic eye movements (Stanley, 1975).

As a result terms such as specific dyslexia and developmental dyslexia were used to describe reading and spelling problems, in individuals who experience great difficulty with reading for no apparent reason (Martin, 1989).

The term 'development dyslexia' proved to be contentious from the outset, as the term implies a distinct syndrome with a known neurological etiology (Bishop, 1990). Traditionally education has been uneasy with terminology that places reading problems within a medical model (Snowling, 1987). The reason for this is two-fold, much of the evidence for dyslexia being a medical problem came from selected clinical samples of those already diagnosed with dyslexia and secondly the signs of dyslexia i.e. letter and word reversals, can also be seen in normal readers. Additionally, one of the most popular views is that dyslexia is to do with problems with phonological processing and in particular memory. This is difficult from the point of view that children perform everyday tasks which require use of memory with complete ease and success, so why is there a problem with memory for reading purposes (Martin, 1989)? For those who claim that dyslexia is a problem with decoding (Ehri, 1992),

there is also a realisation that learning to read is much more than being able to decode, children have to comprehend what they read, they need to acquire a word recognition system that uses knowledge of the quasi-regular nature English orthography and they need to develop reading fluency that in turn requires the automatic retrieval of word pronunciation from letter strings (Nation & Snowling, 2004). It is possible therefore for early readers to fail within any one of these areas or in some cases all of the areas.

In education the question of how to identify and support children with reading problems has not been without its difficulties, because of the terminology used in describing reading difficulties and the reluctance by Government and Local Education Authorities to allocate resources and funding to specific reading problems.

Plowden (1967) acknowledged that some children would have an acute and prolonged difficulty in learning to read, arising from a variety of causes and emphasized the important part parents played in their children's education. However, it fell short of actually laying out recommendations on how difficulties in reading should be addressed (how parents should help or how schools should resolve the problem). The Tizard Report (1972) concerning Children with Specific Reading Difficulties acknowledged that a debate existed around the term dyslexia, but said that the term was so loosely used as to make it valueless. While the report made clear that a number of children with severe reading difficulties, often accompanied by spelling, writing and number problems, met some of the criteria of specific developmental dyslexia, the report adopted the view that it would be better to use the more useful descriptive term of specific reading difficulties (Pumfrey & Reason, 1991).

To avoid some of the issues surrounding dyslexia, educational policy was initially guided by the results of several epidemiological studies (Snowling, 1987). The most influential of these was an epidemiological study by (Rutter & Yule, 1975) on the Isle of Wight. This study examined low reading levels in children who were failing (to read) and had general learning difficulties, and one of its main aims was to discuss whether or not it was useful to describe children with specific reading difficulties as 'dyslexic'. The study distinguished between specific 'reading retardation' and general 'reading backwardness' due to low intelligence. Dyslexic children being those identified as retarded readers.

Later the Warnock Report (1978) into special educational needs and the resulting Education Acts, 1981 radically changed the way in which learning difficulties were conceptualised in England (Cowne, 2001). Two important aims of the Warnock Report were to dissipate stigmatisation in special needs through labels of handicap, and to initiate change and to support the concept of inclusion for all children (Hegarty, 1993, p. 12.). Warnock 3.1 said, *'We consider the meaning of handicap in an educational context, and urge the merits of a more positive approach based on the concept of special educational need'*. In future Warnock said 3.26, *'all children with particular difficulties would be described as children with learning difficulties, and a problem could be described as specific as in the case of 'specific learning difficulties in reading'*.

However, the use of the term specific reading difficulties in reading quickly became absorbed into the term 'Specific Learning Difficulties'. This disadvantaged children with specific reading difficulties because their particular problems were considered and assessed, alongside children with Attention Deficit Disorder, Dyspraxia and Dyslexia. Montgomery (2007) makes the valid point that by shortening the term, children who had only reading and spelling problems were disadvantaged, both from the point of view of resources and provision.

The dyslexia lobby gained ground during the late 1960's through the 1970's. Important impetus from this came from a meeting of the Berkshire Education and Health Committee and the Reading and District Hospital Management Committee in 1967, entitled 'The Child With Reading Difficulties, Dyslexia Syndrome or Myth?' This asked the question, 'Was there a difference between dyslexia and reading difficulties?' Following this, parental influence forced the issue into the open because many parents were concerned that schools were not identifying their children's reading difficulties. The British Dyslexia Association was founded in 1972 placing the concept of dyslexia on a high platform of educational scrutiny.

Today controversy continues to exist around the term dyslexia and specific learning difficulties and it is not unusual for both to be seen within a continuum of specific learning difficulties, and the term co-morbidity is now used to describe the overlap between the specific learning difficulties (Reid, 2007 p.303). However this is not useful from the point of view of the child with reading problems and the assessment of the problems in school, because children who have reading and spelling problems need to have their problems

resolved with appropriate help for their specific problem, they do not need to be involved in the rhetoric, discussion and a false dichotomy between dyslexia and non-dyslexia (Elliott & Gibbs, 2008).

The literature review addressed the question of reading problems/dyslexia to determine whether it was possible to establish a definition of the specific reading problems and place that definition within a theoretical context.

Specific reading difficulties/dyslexia

Warnock (1973) used this term to specifically identify children who may need help at some time during their school life with reading. However the term quickly became enveloped in the all-encompassing term 'learning difficulties' and when the Education Act (1981) was introduced the population of pupils with all learning disabilities came under the 'umbrella term' of pupils with special educational needs (Cowne, 2000).

My reading showed me that specific reading difficulties, is now seen as part of a continuum of special learning difficulties (Reid, 2007). Within that dyslexia has come to represent children with reading and spelling problems, despite the fact that to date the term dyslexia defies definition (Snowling, 1997).

In using the term 'dyslexia' this review will look at the various models of what constitutes reading and dyslexia.

i) The medical model

Hemispheric laterisation.

Anatomically each hemisphere of the brain appears to be approximately a mirror image of the other (Springer & Deutsch, 1993). Whilst the two hemispheres appear symmetrical it is known that their functions are quite different (Bishop, 1990). The left hand side of the brain is used to process mainly language while the right hand side of the brain is specialised for non-verbal visuo-spatial functions.

The concept that 'unusual patterns' of cerebral lateralisation (i.e. the division of labour between left and right hemispheres of the brain) may have some connection with dyslexia is not new. Work on the modes of thought between the two hemispheres of the brain found that in general the right and left hemispheres are relatively specialized in their functions, operating in two different but complementary modes (West, 1991). Studies by Sperry and others in the 1950's and 1960's led to thinking about right and left brain thinkers. It was suggested that the right hand brain had a pre-disposition for creative and spatial thought processes, while the left hand brain was used mainly for language processes (Sperry, 1968). His work was, to an extent 'oversimplified', but has been developed through the work of Geschwind, a neurologist whose research has indicated that for most people the left-brain is dominant.

The work by Geschwind and Galaburda (1985) went further and claimed that the difficulties in processing the information shown by people with dyslexia are due to structural differences between the hemispheres and this is likely to develop in the prenatal period. This work has received considerable support from subsequent studies (Reid, 2007). Pioneering work by Hynd (2010) increased knowledge and better understanding of the neurobiological basis of childhood learning in the form of subtle variations in brain structures using MRI scans. He found subtle alterations in the region of the planum temporale and posterior perisylvian regions in the brains of children who have developmental dyslexia. In particular work by Knight and Hynd (2002) claim that misplaced cells may be present in some areas of the brain particularly the outer layer of the cortex, which is usually cell-free. According to Galaburda and Rosen (as cited in Reid, 2007) these misplaced cells are in the left hemisphere in areas associated with language. This may mean that children with dyslexia are more reliant on using strategies for reading that emanate from the right hand side of the brain, one usually associated with creativity.

However, this work remains exploratory and to date does not provide sufficient evidence that shows a link between the medical model and dyslexia that would improve the resources and teaching for children with reading problems in schools today. It may have implications for future study of children who have reading problems and are creative, and the way in which they could be taught, for example using right brain activities.

ii) *The discrepancy based model*

The discrepancy definition of dyslexia is still widely used, and is based on an unexpected discrepancy between cognitive abilities and literacy performance. A study by Rutter and Yule (1973) defined the group as part of a syndrome characterised by severe reading difficulties which were not accountable for in terms of low intelligence and which were not explicable in terms of the lower end of a normal distribution of reading skills (Pumphrey & Reason, 1991).

Its origins can be traced back to the Bullock Report (1975 p.268) where the term dyslexia was used to describe a small group of children whose difficulties in learning to read 'are not attributable to limited ability or emotional or extraneous factors'. Therefore children identified with specific reading problems might read at the same level as other children whose reading levels were expected from their lower cognitive abilities.

Some educationalists and dyslexia support groups today accept the discrepancy model and it is recognised that reading difficulties typically encountered by the 'dyslexic' individual apply across the intellectual spectrum (Elliott & Gibbs, 2008). As a result IQ tests are still widely used to differentiate between dyslexic and poor reading groups (Rice & Brooks, 2004). But as Frith (1985) points out this method of identification does not respond well to some groups of learners. It excludes children who, despite a specific deficit, manage to gain a normal score on a reading test by using effective compensatory strategies. Similarly it can falsely include children who fail for other reasons such as poor or erratic school attendance.

iii) *The biological model*

This refers to biological reasons for poor reading, such as genetic background, hemispheric symmetry, and gender differences.

Do dyslexic children have dyslexic parents? The evidence for this is far from conclusive. A number of authors have claimed a higher incidence of dyslexia amongst siblings, parents and other family members of dyslexic children (Hinshelwood, 1900; Orton, 1937; Doehring, 1968; Naidoo, 1972). Gilger, Pennington and DeFries (1991) estimated that the risk of a son being dyslexic if he has a dyslexic father is about 40%. The early studies tend to be suggestive and

the results obtained from anecdotal or reported data from parents rather than actually testing parents and siblings for levels of attainment (Thompson, 1990).

iv) *The cognitive developmental model*

This model puts forward the theory that dyslexia is a phenomenon in literate societies where the literacy difficulties from a behaviour level are analysed in terms of the interaction between biological, cognitive and behavioural levels and in interaction with the environmental factors (Frith, 1995). Within this framework a developmental disorder can be seen as a persistent failure to advance to the next step in the normal acquisition processes of learning to read (Frith, 1985). Frith describes this developmental dyslexia as 'developmental arrest.' It allows for the possibility that a child fails within certain stages of learning to read and as a result does not move forward in the way that normal readers do.

Frith outlines three stages of reading and spelling development that a child passes through before they become competent readers:

Stage one - The logographic skills stage

This refers to the instant recognition of familiar words. In this stage letter order is largely ignored and phonological factors are entirely secondary. So that an early reader will pronounce the word after he/she has recognised it, but if the child does not know the word he/she will usually not respond, but may be persuaded to guess on contextual grounds. This system is implicit in early readers in structured reading schemes. The child looks at the words and the pictures and says the word if he/she knows it and receives affirmative praise, but is reluctant to have a go or work it out if they do not know the word.

Stage two - The Alphabetic skills stage

This takes reading one step further forward because it refers to the child's knowledge and use of individual phonemes and graphemes and their correspondences. It means the early reader is learning to use analytical skills by this stage that engages a systematic approach which involves decoding grapheme by grapheme. In this stage the child shows that they are able to understand letter order and here their knowledge of phonics is important. It is at this

stage that the early reader starts to pronounce, although not necessarily correctly, new and sometimes nonsense words.

Stage three - The Orthographic Skills stage

This is the advanced stage of reading whereby a child will be able to instantly analyse words into orthographic units without having to actually sound the word out loud. Additionally within this stage there is an understanding of morphemes, the child is maturing in his/her reading skills to such an extent that he/she is able to understand what Frith calls abstract letter strings such as 'anything' or 'however', words that do not have particular phonological relevance.

This is a persuasive argument from the point of view of the class teacher because a child can fail during any one of these stages of reading. However, in the case of young children failing to learn to read it is commonly felt among those who support the concept of three developmental stages of reading that the stage at which they actually do fail to read is in the Logographic Stage. In this stage Children can recognise words as units but they may not be able to reproduce them accurately. As a result the child is unable to progress onto the Alphabetic stage, especially as during this stage it is necessary to have knowledge of sound/symbol correspondence.

Ehri (1995, 1999) in her research reading claimed that to become skilled readers children have to initially acquire knowledge of the alphabetic system, and that this is a process that can be very difficult for some early readers. Ehri (2005) also claims that learning to read involves two basic processes, one whereby a child learns to decipher print and the other learning the meaning of print. In the first stage, that of deciphering print Ehri goes further than Frith by claiming that children pass through *four* stages in the alphabetic stage, the *pre* alphabetic stage passing on to the *partial* alphabetic and then *full* alphabetic stage and finally the *consolidated* alphabetic stage.

In the pre-alphabetic stage early readers make connections in words and between some visual features which Ehri calls 'cues.' So that in the Oxford Reading Tree® reading scheme, words that appear repetitively from the beginning like, 'Biff and Chip' would be recognised through familiarity. However, it is also known that children recognise and say words out of

the context of books. For example many non-readers know the words 'MacDonalds'® and 'Smarties'® without knowing how to read them but by their salient features and the colour of the logos. These are cases where children have no alphabetic connection. Beech (2005) evaluating the work of Ehri makes the point that while he puts this kind of reading without alphabetic connection within the pre-alphabetic stage, in fact it may have been more appropriate to have called this a 'salient visual feature' phase.

During the partial alphabetic phase the child uses his/her ability to read some letters in words and then to attempt pronunciation, the first and final letters being the most important for this skill. Ehri (1995) called this 'phonic cue' reading so that some children might read bird for bear in a text or list of words.

From this stage follows the full alphabetic stage when the early reader uses all the letters and sounds to identify words and finally in the consolidated phase children are able to identify words as a whole or through rapid recognition of chunks of words. This latter stage according to Beech (2005) is equivalent to Frith's orthographic stage, with continuing practice at reading in this final phase when recurring letter patterns become consolidated or unitized. Now children may be able to read 'ch-est' in two chunks rather than 'ch-e-s-t' as in the full alphabetic stage.

Paramount to Ehri's theory of how children learn to read is the importance she attributes to children learning the full alphabet i.e. letters and sounds and applying that knowledge to learning graphemes such as *ch*, *sh* and *th* and *wh*. From this children need to develop awareness of phonemes and relate this to their graphemic knowledge so that early readers build on knowledge of sounds to learn words. Beech (2005) stated that Ehri believed that reading and spelling have an interactive reciprocal relationship with each other. This means that the process of memorising words in order to read also helps them to spell.

According to both Frith and Ehri the problems come with reading is when early readers become trapped in the logographic stage according to Frith and the pre-alphabetic and partial alphabetic stage according to Ehri.

However, others say that there is more to reading than de-coding and Nation and Snowling (2004) say that children 'have to be able to comprehend what they read', and that to become both accurate and efficient readers children need to acquire a word recognition system,

overall. This system needs to be able to understand the quasi-regular nature English orthography, so that early readers must be able to read regular words with systematic grapheme-phoneme correspondences. But they also need to learn words that do not conform to rules. The nature of the words that do not conform means that early readers 'have' to be able to read words in context and therefore need to understand what they are reading and how to make sense of text.

This moves the focus away slightly from the theories of Frith (1985) and Ehri (1995) that have focused on the contribution of decoding skills to the development of fluent word recognition, and underlying knowledge of phonology. Whilst these are important elements of children's early reading skills, there is a perceived need for children to read 'exception' words in the context in which they are written. Nation and Snowling (2004) give the example of the word 'bow' a homophone, the pronunciation of which can only be disambiguated by context, (he took a *bow* at the end of the performance/he took a *bow* and arrow from the bag).

Others have been more emphatic about the importance of meaning-based knowledge in early reading. Plaut, McClelland, Seidenberg and Patterson (1996) connectionist framework comprised a large study into understanding normal and impaired word reading. They came to the conclusion that early readers, both able and those with developmental dyslexia, need to be able to understand what they are reading in a wider context. Giving the example of Kennedy's assassination, Plaut et al., (1996) claim our understanding of the situation as adults can only be understood if we have periphery knowledge as well, and understand words like motorcade, rifles, spies etc. Similarly even children reading early reading scheme books need to be able to understand words in context like 'garden' or 'market', which need similar periphery knowledge of plants, flowers, stalls, produce etc. Children without such knowledge are disadvantaged from the outset and are set to fail with their reading.

Also, within the connectionist framework, Plaut et al., (1996) point out the importance of making links between reading regular and irregular words. The word '*sign*' for example can be lengthened to mean something else '*signature*' and as such this process of reading such irregular words that share morphemic segments with regular forms poses a problem for beginner readers.

The consensus therefore of what constitutes a specific description of reading difficulties is considerably varied, and because I could find no evidence in the literature review of dyslexia that identified slow reading, the reluctance to write without adult support and initial non-understanding of phonetics. It was not possible to say under what definition the readings problems (observed in my infant classrooms) came under.

Self-esteem and reading and motivation in learning to read.

One of the most important indicators of the individual's psychological wellbeing is global self-esteem, which is defined as the extent to which 'people feel positively about themselves' (Kavussanu & Harnish, 2000). However, what exactly constitutes low self-esteem is difficult to define. Miller and Daniel (2007) point out that in everyday speech there may be a sense in which we all share a common understanding of the term self-esteem, but when we come to define self-esteem it is not straightforward and in the research there is not a consensus view.

In the area of reading and self-esteem it would seem natural to assume that children who have reading problems have a lack of confidence, or what some would call poor self-esteem. Some even describe this as the 'hidden effects' of learning to read (Hales, 2001). But others say that the nature of any relationship between low self-esteem and dyslexia remains unclear (Terras, Thompson & Minnis, 2009). In the case of early readers it has been suggested that before the age of eight or nine years children are unable to judge for themselves whether they do in fact suffer from poor self esteem and are not aware of any problems in this area (Aalsvoort & Verheggen, 2004). The reason for this is that children of this young age are not able to accept controversial attributions about themselves (Lindsay & Dockerell, 2000).

While it may be true that individuals with reading problems exhibit more emotional and behavioural and internalising difficulties than those without reading problems, understanding the exact nature of this association remains limited (Terras et al., 2009). Some suggest that children with literacy problems are more predisposed to withdrawal, anxiety and depression than children without reading problems (Willcott & Pennington, 2000). Others in the field say not all individuals with reading problems exhibit behavioural problems and many adults and children show successful psychosocial adjustment (Burden & Burdett, 2007).

Success in reading is as a result of sustained and focused attention especially for successful word decoding and text comprehension (Poskiparta, Niemi, Lepola, Ahtola & Laine, 2003). This is true of any reading method used in schools from real books to systematic phonics to analytic phonics. Equally poor readers may end up not understanding the meaning of becoming literate because they are caught up in the process of trying to memorise phonics and content so that the meaning of the sentence is lost (Palinscar, 1998). This could have implications on their motivation to 'want' to read rather than a loss of self-esteem in not being able to read. A study by Poskiparta et al., (2003) looked specifically at the question of motivation and learning to read and found that early problems in learning to read and spell are related to motivational-emotional vulnerability in learning situations in school contexts.

As children grow older their inability to read on a par with their peers can have a disrupting influence on them and their classroom situation. The evidence for this is well documented, both in epidemiological and clinical samples (Carroll, Maughan, Goodman & Meltzer, 2005; Long, MacBlain & MacBlain, 2007). However this may not be as a result of low self-esteem, in fact for children who display anti-social behaviour within the classroom it could be argued that their behaviour actually shows a degree of self-confidence.

With young children there are certainly difficulties associated with examining their perceptions of themselves and their self-worth. They are rarely in the mature position of being able to describe their feelings, or to discuss their 'ideal self,' (how they would like to be) and are reliant on those around them, parents and teachers or significant others (Burns, 1982) to be able to make those decisions. Yet it is important that children who fail to learn to read are identified early because it is far easier to build self-confidence than to repair damaged self-esteem (Hinton, 1991 p.15).

It would appear that motivation and attitude towards learning to read are strong factors in helping children to become efficient readers. According to Logan and Johnston (2009) attitudes towards reading is an important factor that is likely to influence children's regularity of wider reading, their level of involvement in class and their enjoyment of reading and what they are able to achieve. Smith (1990) has described reading as a 'state of mind', accompanied by feelings of emotions that make reading more or less possible. For all children entering school where text and the written word have played a part in their lives,

and parents and siblings, who have had success with reading, should help beginner readers to have confidence and an understanding that reading is possible.

It is therefore seen as a combination of motivation and positive attitude that inspires young children to read. This relates back to Smith (1972) who claimed that reading difficulties were a result of the child not wanting to read.

However, this excludes the role that the school and the early years teachers play in this scenario. It also takes no account of speaking and listening in the early years to beginner readers. This point is made by Sage (2002) who showed how the role of a class teacher could have a huge bearing on how young children understand school. She says, 'Think for a moment about class talk. It is generally agreed that it is the teacher who does the talking usually in a monologue where he/she controls actions and speaks from a personal point of view'. Sage points out that if the class teacher is talking for three-quarters of class time then each child will average less than three minutes talk a day!

Contrast this with home life before school, where often the child is the one who initiates conversation and puts forward ideas. This is also applicable to the playgroup/school scene as well. When children start school they move from centre stage to side stage, some children will submit to this type of learning others will rebel. The situation will continue until teachers learn that they do not need to control discourse. Some claim that schools which value personal development together with academic skills score at least 20% above average grades and have far fewer behavioural problems (Teale, 2000 p. 49, as cited in Sage, 2002).

The actual role of the teacher has large implications for children who fail to read. In the early years classroom children need to feel valued for the skills that they can achieve (Poskiparta et al., 2003). They are not aware that the goals that they are working towards are Government imposed and that reading is highly valued by teachers and parents. Young children do not arrive in first school thinking that they will fail (Bissex, 1980), and equally they are not able to judge whether they have poor self-esteem.

Research into gender differences in reading ability and attitude (Logan & Johnston, 2009) found that boys took far longer to settle at listening tasks and reading tasks than girls. Additionally their study showed that girls had better reading ability, read more frequently

and had a more positive attitude towards reading and school altogether than boys, although the differences were small.

In a study of children with dyslexia in Upper School, Humphrey (2003) found that the influence of teachers particularly as 'significant others' was an important factor in low self-esteem. Remarks made by pupils like, 'they shout at you for not doing your work' and 'the head teacher didn't believe in dyslexia' were comments arising from interviews of some teenagers with reading problems.

Lawrence (2006) suggests that in order to have a positive effect on their pupils, teachers need to establish a warm relationship with them. A study by Long et al., (2007) goes further saying that there is a growing body of research to show that teachers need to identify and address the personal, social and emotional needs of young adolescent learners who have difficulties with literacy. The key to success with reading difficulties, teachers and learning lies very much in the motivational approach rather than trying to establish the exact nature of the lack of confidence or self-esteem (Poskiparta et al., 2003).

For young children who are early readers and who may not be aware of personal self-esteem or confidence, the role of the teacher's support and understanding is crucial. Shell and Eisenberg (1996) point out that young children, in particular, need two different kinds of support in the classroom which enhances their self-esteem, and enables them to become confident learners viz. a) indirect help, and b) direct help.

a) Indirect help occurs when the role of the competent adult assumes the role of partner to the child in the problem solving process, and the helper guides the child towards a viable solution.

b) Direct help by contrast occurs when the adult assumes primary responsibility for solving the child's problem, for example giving the child the answers. In applying this to reading it could mean reading the word to the child rather than allowing the child to work the word out for itself.

This reverts back to Vygotsky's (1978) concept of scaffolding, whereby a child is able to achieve with the help of an adult. Discussing year one children and writing in particular,

Alonso-Tapia and Pardo (2006) discuss the merits of scaffolding using a competent adult to correct written text. They claim that when young children first learn to read and write they need to be able to hear clearly the auditory segmentation of the 'voiced' word so that they are able to make the link between sounds that they hear and read and sounds that they put on the paper. This type of indirect help supports the child and improves their confidence in learning to read and write.

However, Nadler and Fisher (1986) point out the need for caution in supporting children with their work in order to promote their self-esteem. They claimed that the recipient's reactions to help varied from the point of view of whether the help was perceived as 'threatening' to self-esteem. They said that help that implies incompetence will elicit negative emotional reaction, and that if the pupil feels they have little personal control and outcome on the task then their self esteem will not be enhanced by the support.

Work by Burden and Burdett (2005) looks specifically at students with dyslexia and factors associated with successful learning in those pupils, they looked particularly at the 'voices' of fifty-nine boys with dyslexia aged between 11 and 16. The interest of the study was in the boys' attitudes towards learning and their sense of personal identity. The work was in contrast to that of Humphrey and Mullins (2002) who claimed that pupils with dyslexia in a range of settings, experience real challenges to their self-esteem.

The Burden and Burdett work found that the boys (in their study) thought positively about themselves as learners, realised that the future was up to them and the majority perceived themselves capable of achieving whatever goals they set themselves.

However, the study took place in an independent residential school for boys with dyslexia, that had a history of obtaining excellent grades in public examinations, and had been awarded both Beacon School and Sports Mark status. This implies huge investment by the school and staff to support those with dyslexia, a point reinforced in the study.

Nonetheless the fact that Sports Mark status awarded to the school resonates to this research where two of the case study children were excelling at ice hockey and drama.

Transition from pre-school to school

Children with high academic ability may have other strengths that are often neglected, the key is to find out what children are good at so that this will raise their confidence and self-esteem overall All Our Futures (1999). The report is not specific about when this should happen or how early in a child's schooling and who should establish their abilities. Whereas the recommendations of the report endorse the use of schools, parents and the wider community to encourage and support creativity the question remains at what stage in a child's life do we actually look for creative potential?

In this case it was relevant to the study to establish whether a) the case study children had successful transitions from pre-school to primary and upper school and b) at what stages were their spatial abilities recognised?

Today, transition from pre-school to school is considered to be a crucial time in a child's education. Understanding the variation in children's development and personal and family and background experiences that may impact on a child's adjustment to school, is seen as critical for developing policies related to early schooling (Rimm-Kauffman, Pianta & Cox, 2000). However discussion about early play shows that the issues may be complex (Margetts, as cited in Fabion, 2007). Adjusting to pre-school means that children have to adapt to an environment, which is unknown and may be daunting. Some say that difficulties at this stage persist into adulthood (Kienig, 2000) and that risk factors in early schooling increase a child's vulnerability for difficulties in the next ten to twelve years.

The problem with transition from babyhood to school life is that it involves everyone linked to the pre-school child, from parents to carers; to family; to friendships made before school; interactions between pre-school carers; parents and school. Links between home and school at this time and collaboration between parents and teachers is an integral part of the transition (Margetts, 2002).

There are three dominant issues that impact on transition implications for the child, for the parents or carers, and the role of the early years teacher. Unfortunately for the child they move from an environment where the concept of play is understood to a lesser or greater

extent, to an environment that emphasizes measuring achievement against predetermined outcomes (Dunlop & Fabion, 2007).

For parents the importance of their role during the transition period has been emphasised repeatedly since the early 1970's (Gordon, 1977; Dockett & Perry, 2004). In *Every Child Matters* (2006) the role of parents is highlighted as in the Early Years Foundation Stage parents need to be kept informed about schools' expectations and procedures primarily because this can reduce parental stress about the changes children will experience as they start pre-school (Dunlop & Fabion, 2007).

Equally the teachers need to be informed of any problems or issues that may have occurred in pre-school placements. This study reinforces the view that there is a need for teachers to understand a child's particular strengths on coming into school for the first time. Research in this area was non-existent during the time in which the case study pupils entered school as far as the can be ascertained. Today it could be argued that the Early Years Foundation Stage compensates for observation of learning strengths in early childhood education. With respect to drawing one of the skills observed in the pupils in the study *Practice and Guidance for the Early Years Foundation Stage* (Department for Education and Skills (DfES), (2008) and *Key Stage 1 of the National Curriculum Handbook for Primary Teachers in England* (Department for Education and Employment DfEE/Qualifications and Curriculum Authority (QCA), (2000) present different views about the value and role of drawing in early education. It is vague in its interpretation of what is expected and encourages teachers to involve pupils in exploring their ideas through a range of means including drawing.

By contrast *Practice and Guidance for the Early Years Foundation stage* offers more examples of providing opportunity for spatial learning within several areas:

- Exploration and Investigation
- Design and Making
- Creative Development

All make the point that spatial learning through play and creative development should be encouraged and that creativity is about taking risks and making connections (EYFS, 2007). However, it is how any observations are recorded and made known to the early years teacher in school that will be important for the strong spatial learning. This reverts back to the high value teachers place on identifying strengths in order to support weaknesses. It is

known that collaboration between Early Years settings; school and parents help with the transition period, and as a result ensure that children have a good start at school (Pianta & Nimitz, 1991). Equally early exposure to a curriculum built on observable and testable learning outcomes, such as the National Curriculum and to a certain extent the Early Years Foundation Stage document, which feeds into the National Curriculum, creates contexts in which children are potentially disempowered (Dunlop & Fabian, 2007).

Reading difficulties and spatial abilities

The review found that in the area of reading problems and dyslexia educational psychology has focussed heavily on deficit rather than looking at particular strengths. In more recent years, particularly from the mid-nineteen nineties to the present day, research into spatial ability has tended towards the workplace and as predictor for success in College or University subjects such as engineering, architecture, mathematics, cell biology and chemistry. The researcher has found no relevant research within the area of spatial ability and science and technology where other researchers were looking specifically at the ability to draw and construct in three-dimensions.

However, the researcher found work by Winner et al., (2001) and Karolyi et al., (2002) that look at the theory of compensatory spatial strengths and dyslexia responding to a call by dyslexia lobbyists Silverman, West, Parkinson and Davies that some students with literacy problems are strong visually.

In their study, supported by the International Dyslexia Association, Winner et al., (2001) carried out three studies to test the hypothesis that dyslexia is associated with superior visual-spatial skills. Their study was partly in response to theoretical and empirical reasoning that had been put forward to support the hypothesis that dyslexia is associated with enhancement of right hemisphere visual spatial skills. They were also interested to establish whether it was possible to identify a particular spatial ability in dyslexics, as dyslexia is often associated with those choosing spatial careers. The three studies examined spatial abilities using a wide range of standardised spatial tests and reading tests. The results found no conclusive evidence to support the hypothesis that dyslexics did have superior spatial ability. The tests will be discussed in the following section. Similarly, the subsequent study by Karolyi et al., (2003) that followed on from the Winner study looked at global spatial ability

and dyslexia. The results found that using impossible drawing tasks dyslexic students were able to complete the task far quicker than those who were non-dyslexic.

Dyslexia and Visual – Spatial Talents: Compensation versus Deficit Model.

Winner et al., (2001)

This study was in response to theoretical and empirical reasons that had been put forward to support the hypothesis that dyslexia is associated with enhancement of right hemisphere visual spatial skills supported by the International Dyslexia Association. The results of their study showed that individuals with dyslexia not only failed to show superiority in a range of visual spatial tasks and in fact demonstrated a deficit in many tasks.

The Winner study was particularly interested in the fact that in their words ‘dyslexia is over represented’ in certain visual spatial professions such as art engineering and architecture (Geschwind & Galaburda, 1985) but that, increasingly there is a growing view that dyslexia is associated with compensatory talents in the visual-spatial arena that allows individuals with dyslexia to do well in careers that capitalise on such strengths such as design and computer graphics (West, 1991).

The article emphasised those with what they call ‘indisputable spatial talents’ and who also may have been dyslexic including Edison, Leonardo da Vinci, Rodin, Faraday and Maxwell who have been documented by Aaron, Phillips & Larsen (1988) and West (1997). These references, as they themselves pointed out are anecdotal and as such do not constitute strong evidence for such as association. As Winner points out they rely on guesswork rather than clinical diagnosis. Equally such evidence fails to point out those with strong and indisputable spatial ability and no dyslexia or reading problems.

The research however, pointed to the highly regarded work by Galaburda, Sherman, Rosen, Aboitiz and Geschwind (1985) which identified by autopsy the brains of four dyslexic males, three of whom had been spatially gifted and whose professions were a sheet metal sculptor, an engineer and an athlete.

Using three independent studies with three different groups of students Winner looked systematically at possible spatial enhancement among individuals with dyslexia. They

included gender as a factor because, they said, of the possibility that cortical abnormalities in the female dyslexic brain are more bilaterally distributed than those in the male dyslexic brain. As a result their three separate studies looked for differences in either direction between spatial skills of male and female dyslexics.

Study one

Participants

A total of sixty undergraduate students of whom twenty-one had at some time in their lives been assessed as dyslexic, ten male and eleven female. Thirty-nine had no problems, sixteen of which were male and twenty-three were female. The dyslexic students were paid to take part in the tests, those with no problems were required to do the tests as part of their psychology major and as a result were not paid.

Materials and procedures

Reading tests

The study used two standardised reading tests the Diagnostic Assessment of Reading (DAR) that contains nine sub-sets: Print awareness, phonological awareness, letters and sounds, word recognition, word analysis, oral reading accuracy and fluency, silent reading comprehension, spelling and word meaning. The study did not include the word analysis part of the sub-tests. The Nelson-Denny Reading Test then assessed the reading rate.

Following the tests the students were asked orally whether they had had problems in the past and what these had been and whether they had received help in school.

The spatial tests used were:

The Vandenberg Test of Mental Rotation ability.

The Rey Osterrieth Complex Figure Test - a test of perceptual organisation and visual memory.

The Hidden Figures Test - a test of visual flexibility and closure. This involves searching a visual array in order to find five given hidden shapes. To succeed, the

participant needs to be able to isolate a shape in the mind and dis-embed it from a more complex array.

Results of tests

Reading tests.

DAR tests. The dyslexic group performed significantly worse than the control group on all sub-sets of the DAR.

Nelson-Denny, the dyslexics had slower reading rates.

Spatial tests

Vandenberg test

In this test of mental rotation the dyslexic students performed significantly worse than the non-dyslexics replicating previous findings that showed a male advantage on these tests (Linn & Peterson, 1985). The females performed worse than the males and this occurred irrespective of the presence of absence of dyslexia.

Rey-Osterrieth Complex Figure test

In this test the dyslexic and non-dyslexic groups performed equivalently.

Hidden figures test

In this test there was no difference in results and none on gender differences.

Questions asked verbally by researchers

Following the reading tests students were asked a set of questions about reading and reading related abilities. The results show fifteen dyslexic pupils from a total of twenty-one had difficulty learning to read. Additionally, eleven had difficulty learning to write, eight (out of the twenty-one) began to read after the first grade, this figure is low at any rate in comparison with English schools where dyslexia is often not identified until the child is nine years old.

Discussion

The study concluded by discussing the type of tests in that they were all pencil and paper tests and these may not reflect real world spatial ability. However this does not align with the concept of choosing psychology students who, for the most part, do use paper and pencil all the time. This argument would have held up if the students had been car mechanics, architects or artists.

Equally the authors concluded that as the tests were timed it could have disadvantaged the dyslexic pupils. But if the dyslexic participants were spatially able, they would have easily completed what to them would have been simple tasks, compared with verbal learners. Again this study will argue it was the particular psychology group they looked at not the task or the timing.

Study two

Participants

In this study the research increased both the number of verbal reading tests and the number of spatial tests. A different set of thirty-seven students participated, fifteen in grade 9 - 12 (diagnosed with dyslexia and from a school attended by pupils with language problems), twenty college undergraduates and two high school students. Here the age range was much wider and the study does not report the subjects studied by the undergraduates. The test times were increased for the dyslexic students if they wished from 2 to 3 hours.

Materials and procedures

Students were seen individually in a two-three hour session. Eight spatial tests were used alongside several measures of reading ability. The spatial tests included the three used in study one and five new ones, Archimedes Screw, Pyramid puzzle, Drawing task, spatial word problems, and K-bit Matrices. They were all administered without time restriction. The spatial abilities tested would be both in the areas of 2-D and 3-D as in the case of hidden figures, spatial word problems and K-bit Matrices and possibly the concept of the Archimedes Screw test.

Reading tests. The reading measures for this second test were far more wide ranging:

The Woodstock Reading Mastery Test.

The Nelson-Denny reading measures.

DAR spelling measures.

Auditory analysis test.

Rapid naming rate measures.

Spatial tests

Vandenberg test of mental rotation ability.

Rey-Osterrieth Complex Figure test.

Archimedes Screw.

Pyramid puzzle.

Drawing task. Participants were given a paper and pencil and asked to draw their own hand as accurately as possible. Drawings were classified independently by two judges as either showing some degree of talent, as average or as primitive.

Spatial word problems.

K-bit Matrices.

Hidden figures test.

Results of tests

Reading tests

Dyslexics performed worse in all sub-sets of the Woodstock reading mastery test.

The dyslexics had slower reading rates in the Nelson-Denny reading measures.

The dyslexic group performed significantly worse than the control group in the DAR spelling measure scores.

Dyslexics achieved lower scores in the auditory analysis test and in the rapid naming rate test the dyslexic group were significantly slower.

Spatial tests

Vandenberg test of mental rotation ability – the results replicated the findings of study one showing dyslexic participants achieved lower scores.

The dyslexic group had poorer organisation scores than the control group in the Rey-Osterrieth Complex Figure test but the difference did not quite reach significance.

In the Archimedes screw test both groups were identified as likely to recognise the function.

The pyramid puzzle proved to be impossible for both dyslexic and non-dyslexics.

In the drawing task 13% of the dyslexic group and 18% of the non-dyslexic group showed some artistic talent. Of the fifteen drawings classified by both judges as primitive, eight were dyslexic and seven were drawn by control participants. Therefore, 53% of the dyslexic drawings and 32% of the control drawings were classified as primitive. Chi-square tests revealed no differences between groups in terms of drawing abilities. The conclusion was made that despite their over-representation in art schools, individuals with dyslexia showed no more drawing ability than those without dyslexia.

Dyslexics had lower scores in the Spatial word problems there being no differential for either gender this also applied in the K-bit Matrices test.

In the hidden figures test the dyslexic group did not perform any better than the control group.

Discussion

The study found that despite using more real world tests administered without time constraints they were unable to demonstrate any consistent spatial advantages for individuals with dyslexia. They admitted that one of the reasons they found no superiority by the dyslexic group in the spatial tests was that the students were in High School and as a result had less test-taking experience than members of the control group who were College students. They also acknowledge that they may not have administered the right kinds of test of spatial skills in which dyslexics might excel.

Of particular interest to this study was the use of the drawing test. The drawing skills in dyslexic pupils in study two resembled those used in this research but there were two differences in the way in which their test was administered. They did not go far enough in the scoring process, in fact there was no scoring system in place. The researchers did use two independent art experts who scored the test result verbally by saying the pictures showed some degree of talent, average or primitive. The artists also disagreed between the pictures, which provided conflicting views. Additionally, participants were tasked to draw their hands, which they could obviously see, whereas in this study the students would be

recalling from memory four everyday objects, which the researcher considered a better indicator of three-dimensional understanding.

Of concern also are the use of the participants and the wide-ranging age group of students from grade 9 through to university. The study does not say whether the same students were used from the same university as in study one. This does not show consistency of either the control group or the pupils with dyslexia especially as these were much younger students and their maturity could be questioned in the application of the tasks.

Study three

Participants

In this study the researchers used sixty-three high school students from different schools for the dyslexic and control groups. Forty dyslexic pupils (twenty-eight males and twelve females) attended a school for students with language based learning difficulties. The control group consisted of twenty-three high school students (thirteen males and ten females) who had no previous diagnosis of dyslexia or any other type of learning disability. The dyslexic participants were paid \$30 (as in the previous two studies) but the non-dyslexic students were only paid \$10, due apparently to funding limitations!

Materials and procedures

None of the students were tested for reading ability, because the researchers said their schools had diagnosed all the dyslexic pupils.

Spatial tests

Spatial orientation. This involves the ability to imagine how an image will appear from another perspective. (Carroll, 1993). Three tests were administered to assess this ability: - The card rotation test, the Vandenberg test of mental rotation and the Boats test

Spatial visualisation. Involves the ability to apprehend, encode and mentally manipulate spatial forms. (Carroll, 1993).

The Form Board task. (Elkstrom, French, Harman with Dermen, 1976)

Figural flexibility. Involves the ability to come up with a variety of ways to solve a spatial problem. (Carroll, 1993). The storage task (Elkstrom et al, 1976) was administered to assess this capacity.

Closure speed. Involves the ability to unite an apparently disparate perceptual field into a unified concept. (Carroll, 1993). The Gestalt Completion test (Elkstrom et al, 1976) was administered to test this capacity.

Reference memory. This was assessed by the Morris Maze task (Waters & Begley, 1997).

Results of tests

In the card rotation test, the dyslexic group performed worse than the non-dyslexics and this was the case in the Vandenberg test of mental rotation and the Boats test.

The outcome of the Form Board task showed no significant interaction between the two groups.

The figural flexibility involving the ability to come up with a variety of ways to solve a spatial problem showed that dyslexic participants achieved lower scores but that there was no significant difference between the two groups.

The result of the Gestalt Completion test showed that dyslexic participants performed identically to non-dyslexics.

Reference memory. Dyslexic responses were twice as far off target as non-dyslexics.

Discussion

The study found that individuals with dyslexia performed worse than those non-dyslexics in all three spatial orientation tasks. Individuals with dyslexia performed equivalently to non-dyslexics in the spatial visualisation tasks and the two groups were equivalent in the closure speed tasks.

The results of this third study did not provide results which identified either dyslexic pupils as having particular spatial strengths or that a sub-group existed of those with strong spatial strengths and were also dyslexic. What the results showed was that the dyslexic students performed equivalently to those without dyslexia on the spatial visualization tasks and worse on the form board task when it was untimed. The two groups performed equivalently on the

closure speed task. As a result the total findings from their research found that individuals with dyslexia do not excel on visual-spatial tasks, but rather equivalently to individuals without dyslexia on such tasks.

One of the intentions of the study was to try and identify particular spatial abilities that may be indicative of why some dyslexics choose spatial professions. However, the research did not establish a particular spatial talent and as a result the researchers suggested that one possible explanation is that individuals with dyslexia choose spatial professions, not because of a spatial talent but by default, because verbal professions are closed to them.

Additionally, the researchers admitted that they might not have administered the correct spatial tests, saying that in the case of the Archimedes Screw dyslexics performed at a higher level. The Archimedes Screw test involves a visual two-dimensional representation of a water screw in which the participant has to solve a task by forming a mental image of the screw and then try turning it in each of two directions, all the time visualising in which direction the water inside the screw will move (up or down). While this is not an ordinary task that people confront in the real world, the skills required seem to be those that an inventor would use in imagining how a new device might actually work. They also say that any future tests should be more real life or have real world relevance and include three-dimensional hands-on spatial tasks. Finally, they said that there could be a spatial advantage in dyslexic pupils but this did not show up in such a small sample.

This study would argue that this could be the case and would criticise the number of spatial tests used and query their assessment of dyslexia, which relied (at least in the first two tests) on the admissions of the participants. Additionally the Winner study looked overall at spatial abilities and did not look at one particularly aspect of spatial talent.

Dyslexia linked to talent: Global visual-spatial ability - Karolyi, Winner, Gray & Sherman (2003).

A later study by Karolyi et al., (2003) made the case for dyslexia linked to Global visual-spatial ability. In this study the researchers attempted to 'differentiate' visual spatial processes following their conclusion that the previous research did not demonstrate superiority in

visual spatial processing associated with dyslexia because they did not administer the right kind of visual spatial task.

This time they used the line drawings and asked the participants, twenty-nine middle and high school students with dyslexia (seventeen male and twelve females) and thirty-five public school pupils with no dyslexia (eighteen males and seventeen females), to look at line drawings of figures and indicate which represented possible objects that could exist in three dimensional space and which represented impossible ones. They claim that only by scanning globally, participants are able to recognize that the parts conflict and that the figure is therefore impossible (Schacter, 1992). Lines create the impossible figure illusion with deceptive connections resulting in ambiguities such as whether a set of lines represents space or a plane. The artist Escher (1898-1972) produced art work that is representative of this type of thinking, one of the worlds most influential graphic artists whose work *Ascending and Descending* depicts an impossible staircase.

The Karolyi study found that the dyslexics were much faster at processing the information and deciding which objects were impossible, but not significantly less accurate. The study concluded that given the dyslexic students were probably much slower at reading by comparison on this task they were much quicker and as a result suggested that dyslexia should not be simply characterised by deficit but also by talent.

This was only one study and to draw inferences from such a relatively small sample may be too optimistic. However, it does leave the way open for further research into 'global visual-spatial ability.' And, in addition, it raises questions raised by Schenps et al., (2007) into peripheral vision and central vision and Smith (1964) and his concept of fixative and diffusive vision for reading.

The study holds more promise with regard to dyslexia linked to talent and in citing the Winner research they acknowledge that their findings conflicted stating that the source of inconsistency was likely to come from the variety of measures used to assess the visual spatial abilities. In the researchers own study this had been critical in the way she approached the research, convinced that in the past researchers had looked at too many different spatial measures in order to draw conclusions about spatial ability.

Similarly, the Karolyi study referred back to the Winner study claiming that ‘our failure to demonstrate a superiority in visual spatial processing associated with dyslexia might have been due to not having administered the right kind of visual – spatial task’. Taking into account their belief that dyslexia is linked to a left-hemisphere deficit and as a result dyslexics should excel at visual spatial tasks mediated by the right-hemisphere, the study compared adolescents with and without dyslexia on a ‘global visual spatial task’ that required holistic inspection.

To excel at the task used with the students called the Impossible Trident Illusion, the participants need to be able to scan the object globally to realise that the parts of the object conflict and as a result the figure is impossible (Schacter, 1992). The results of the study showed that the dyslexic students could recognise impossible figures more rapidly than their non-dyslexic counterparts, but no less accurately than those without dyslexia. As a result the study claimed individuals with dyslexia have superior global visual-spatial processing ability.

Similarly the study concluded that global processing skills of this type could underlie important real world activities like mechanical skills, carpentry, invention, visual artistry and surgery particularly that which involves interpreting X-rays. The study then refers to the openings for early learning in the discovery of talent associated with dyslexia may eventually lead to more effective educational strategies and help guide individuals with dyslexia to professions where they can excel. This was the rationale behind this research.

Summary and identification of gaps in the area of research.

Other research in the area

From the outset of this research it was anticipated that there would be little previous research in the area of compensatory strengths and reading problems, particularly relating to young children and their ability to draw and design in 3-D and mental rotation skills. This proved to be the case. Despite a rigorous review of the electronic data bases (ERIC, BEI EbSCO and The Australian Education Index, particularly in the areas of Educational Psychology, Mathematics, Technology, Art and Educational Psychology little research has been carried out in this specific area.

The review found that in the area of reading problems and dyslexia educational psychology has relied heavily on deficit rather than looking at particular strengths. In more recent years, particularly from the mid-nineteen nineties to the present day, research into spatial ability has tended to focus on competence in the workplace and as predictor for success in College or University subjects such as engineering, architecture, mathematics, cell biology, chemistry (Nagy-Kondor, 2007; Roberts, 2007; Kauffman, Schmalstieg & Wagner, 2000 and Shubbar, 1990).

The researcher found no previous published research within the area of spatial ability in either science or technology where researchers were looking specifically at the ability to draw in three dimensions, construct in this manner and reading problems. However, the work by Winner et al., (2001) and Karolyi et al., (2003), both of which looked at the theory of compensatory spatial strengths and dyslexia, tested the hypothesis that dyslexia is associated with superior visual-spatial skills.

Further Reading

The literature review found that the concept of compensatory strengths and reading deficit to be an area where little evidence exists. The study would argue that this area is vital to young children's success. It is important to recognise what children can do and not focus on what they cannot do. Therefore the study would recommend further reading in the following areas:

Young children's drawing from memory

This is an area that has not been examined as far as the researcher can ascertain. While Piaget and Inhelder (1958) were largely dismissive of children's ability to draw realistically from memory before the age of nine or ten years and the work of Cox (1991) also found that children of similar ages had great difficulty with this skill. In a more recent article (Fawson, 2009) claims young children's drawing skills need further investigation. Anning and Ring (2004) also endorse the concept that children's drawings, for a variety of purposes, should be accepted as a worthwhile activity. This progresses the importance of art and early childhood but there is also a necessity for the mechanics of drawing skills of young children to be examined, particularly their ability to draw in 3-D from memory.

Visual-spatial skills and reading

A recent study by Bacon, Simon, MacDonald and MacDonald (2007) examined evidence of individual differences and reasoning strategies in pupils who are dyslexic. The study researched the hypothesis that children with dyslexia are inclined to conceptualise information in a visual-spatial way, rather than a verbal way. The findings from the study that used undergraduates found that dyslexic students favoured a spatial approach to learning. However, the sample was small (n=39) and relied on students who were studying (mainly) psychology and not particularly in areas that demanded visual-spatial skills.

Implications for the design of text in children's big books

Reading is a highly visual task and clear, legible text is vital for competent reading. Hughes and Wilkins (2002) investigating design of text in children's big books' found that the text could be made easier to read by expanding the spacing between words and also increasing the size of print. This may have relevance to the work of Smith (1964; Schneps, Rose & Fischer, 2007) and fixative and diffusive attention span. The way in which young children examine or read whole sentences visually may be important in addressing their reading problems, particularly slow readers.

Recognising the implications of early creative, independent outdoor play as part of early years assessment procedure.

The Early Years Foundation Stage (2007) recommends that young children's creative ability should be recognized and encouraged during the pre-school years. However, these skills come at the end of a list of requirements after literacy and mathematics, creativity being the last. There may be strong indicators in children's early play of creativity as strengths to support learning and future study is required.

Conclusions

The following is a summary of the key points that arose from the literature review and outlines the aims of the study, the study design and justifies the reason for this research.

The literature review explored the hypothesis that young children with reading problems could have compensatory spatial abilities. The researcher found no research that linked these two concepts in respect of young children. The studies by Winner et al., (2001) and subsequently by Karolyi et al., (2003) researched the question of deficit and compensatory strengths by looking at dyslexia and visual spatial ability, but used either college students or high school pupils whose ages are obviously greater than the participants in this research.

Identifying the 'exact' spatial ability from the literature was equally difficult because of the way in which research into spatial ability has been identified during the past sixty-years, and is still being debated. Initially the factor structure of spatial ability dominated whereby research was attempting to reconcile a separate factor for spatial ability alongside (g), general ability (Smith, 1964). But those factors did not provide a clear picture of the underlying factors of the subject (Yilmaz, 2009). Confusion about spatial ability continues (Oliveira, 2004, as cited in Yilmaz, 2009) draws attention to the fact that spatial ability is included in most of the multiple aptitude test batteries, but points out that there are contradictions in the spatial domain literature which make the topic difficult to understand.

The diversity of understanding and the definition of particular spatial abilities is confusing, however, one factor of spatial ability that has remained a constant factor since is Spatial Visualisation (Vz) (Thurstone, 1938), an important characteristic of which is the inclusion of

mental rotation, reflection or folding of objects. This was considered the observable characteristic involved in young children's ability to construct in three dimensions.

Because the review of the area of spatial ability produced no information about young children and three-dimensional representation, this study reviewed the literature more widely around the area of play and the concept of space and manipulation of toys and playthings. The literature review found that independent, creative play and outdoor play which encouraged the development of motor skills, the understanding of space and manipulation skills, may have been a significant factor in identifying a particular spatial ability. The rationale for the study had arisen from classroom observations of children being able to successfully draw and manipulate objects and modeling equipment in three-dimensions. This led the researcher to believe that early play activities were important to the way in which spatial skills were developed.

Following on from this, the literature review found that play of this type fosters creativity in children and provides the opportunity for real life problem solving and decision making, both of which are indicative of mature play (Bilton, 2004).

The researcher then investigated 'transition' from playschool to school. This is a 'pivotal' time (Shields, 2009) where there is a need for young children to feel valued for what they can do at an early age in addition to understanding what they are unable to do at that age. The role of teachers at this time is paramount, as before school in their home and nursery environment children are not judged on their play activities (D'Arcy, 2002). This area of home/school transition and the involvement of the parents in the process was also reviewed because it was seen as an area where home and school could work together for the success of the child in the early years (Ring, 2006).

The nature of the reading problems led the researcher through the findings of the literature review to consider the question of specific reading difficulties and dyslexia, alongside early reading and the teaching of reading and how reading difficulties are identified in the classroom. Here the literature was as dominated by reading problems as a deficit and no literature could be found which looked at creativity or spatial ability and reading problems. The review of literature found that dyslexia had become a dominant force in the identification of reading problems and very little literature was found which described

specific reading problems. As Reid and Wearmouth (2003 p. 12) point out, one of the major tensions in dyslexia research has been the range of potentially conflicting viewpoints which research is trying to accommodate; from researchers, teachers, parents, schools, Local Education Authorities and educational psychologists. This has implications for funding and provision. The original aims of the Warnock Report (1978) was that Specific Reading Problems would be part of special needs education and provision, instead it has become part of a continuum of Dyslexia, ADHD and Dyspraxia.

To emerge from the literature review was the importance of cut-off points in the way children are identified as having reading problems, and whether or not reading problems should be placed on a continuum of difficulties.

The literature review about early reading established the important part motivation played in children learning to read. Poskiparta et al., (2003) made the point of vulnerability that occurs when young children make slower progress with reading than their peers. Additionally the study stressed that prior to school, children are seldom confronted by situations where their learning achievements are subject to systematic social comparison. This impacts on their willingness and attentiveness towards learning, and raises important issues for children who have reading problems but are capable in other areas that may not be identified by teachers.

These areas of spatial ability through mental rotation skills, play, transition and teachers identification of problems, reading problems and motivation towards reading are the areas that will be investigated in the study in an aim to establish whether some pupils with strong spatial skills and reading problems can be identified as a distinct group.

Using the findings from the literature review this study aims to establish whether it is possible to identify a sub-group of students with reading problems and strong spatial abilities and to address the question of whether early play, transition to school, and the identification of reading problems has an impact on the way in which children are motivated to learn? The study will also aim to establish whether particular spatial abilities are identifiable, and if so whether they could be used to compensate for poor literacy skills?

The research design aims to achieve this by using five individual case studies of children who had been identified as having reading problems and strong spatial abilities, and a Further

Education College Survey of post 16+ students who would be tested using a drawing test and standardized verbal and non-verbal spatial tests, in order to aim in establishing whether a sub-group existed who also had poor reading ability and strong spatial ability.

The justification of the study was linked to personal classroom teaching that indicated to the researcher that unless children with reading problems were identified early on in their schooling, there was likelihood that they would become de-motivated and disinterested in school. Teaching experience particularly in an inner city middle school, showed the researcher that children who failed to read felt humiliated, frustrated and could become deviant as a result of not having their literacy problems understood. Conversely, teaching children with reading problems in the same situation established that many of these children were practical and adept at learning through doing.

The literature review revealed no evidence do date of studies which looked at either the practical or spatial abilities of children with reading problems from the point of view of producing empirical results. Rather the evidence has been supportive of such children but largely anecdotal (West, 1991; Peterson-Weill, 1987; Davis, 1994). If pupils with specific strengths and particular deficits can be assessed early on in their school careers, then it may be possible for teachers and individual work programmes to work to promote the strengths, while at the same time identifying and supporting the weaknesses.

METHODOLOGY

Introduction

Educational research concerns systematic enquiry intended to result in new knowledge (Ernest, 1994). In this study, as the literature review showed, very little research has been completed into the area of strong spatial ability alongside reading problems. To establish if it was possible to identify a group of students who showed these characteristics a combined model methodology approach was used (Creswell, 1994) that incorporates five individual case studies and a Further Education College survey of age 16+ students. It will therefore aim to contribute towards new knowledge in the area.

Five individual case studies

The five individual case studies forming the qualitative element of the research entailed interviews with teenage students and their mothers. The researcher had taught five students when they were of primary school age. They all had reading problems and strong spatial skills. As such, the five case studies would be longitudinal and retrospective, and aim to provide data, which not only elicited information about their reading problems and their spatial ability, but also aimed to ascertain what career choices they were contemplating. At the time of the interviews the five children were in the process of selecting 'A' level, College or University Courses.

Participant observation provided an additional method. The researcher had retained her teaching notes from the time she taught the five children (now teenagers) and these would provide additional information about their reading problems and their spatial ability as understood by the researcher.

The College Survey

A quantitative methodology College survey would be used alongside the five case studies. This would comprise standardised tests that establish non-verbal English and mathematics skills together with verbal spatial tests that test student's abilities to understand three-

dimensional rotation from memory. A drawing test would also be used to ascertain the number of students who were able to draw realistically and in three dimensions. It was hoped that the results from these tests would establish a particular sub-group of students with reading problems who have an ability to draw and understand three-dimensional concepts.

Additionally, the students would be given two factual questionnaires to complete, which should provide information about their reading problems, qualifications obtained, favourite school subjects and out of school interests during their primary years.

Therefore, the College survey would allow the researcher to explore the issue of reading problems and spatial ability on a much wider scale with many more students. As such it would provide complementary information and insights into the issues of particular strengths and deficits in a much larger group of students from various socio-economic backgrounds. The five case studies were developed initially for this thesis and from an initial case study analysis the hypothesis will be tested using the results of the College Survey.

Equally, unlike the five children, the researcher had not taught any of the College students and knew nothing about their social backgrounds, their abilities or their interests in or out of school. This was considered to be good from the point of view of reliability of findings and avoiding issues of bias. The use of a combined method approach of data collection was seen as strengths to the research. As Keily and Hodgson (as cited in Robson, 1993) point out, the combination of the survey and the case studies (both institutional and individual) provide useful complementary information and give valuable insights into the issues.

One of the weaknesses of case study research can be the problem of achieving trustworthiness of results and avoiding bias. I had taught all five children at some stage during their primary school years. This could be seen as attracting bias but it was anticipated that every attempt to remain neutral and report findings from interviews carefully and accurately would be adhered to and is something Robson (1993) says helps to avoid bias, nonetheless the question of validity and trustworthiness had to be considered.

While the longitudinal case studies would provide insight over period of ten years, and establish knowledge about the five children and their school and out of school achievements, it can leave itself open as a methodology to idiographic interpretation, whereby there can be a tendency to interpret data ideographically (in terms of particulars of the case) rather than nomothetically that is in terms of law-like generalisations (Lincoln & Guba, 1985). In turn this can mean that any outcomes or findings would have only tentative application in making broader applications. As such it may be difficult to generalise findings.

However, by using both the College survey and the case studies it was hoped that this would be avoided. Robson (1993) says, in respect of case studies, 'the way to secure trustworthiness lies in the realm of common sense and establishing in the way the data is written up that a thorough and honest job has been carried out'.

The research questions

The research questions aimed to address the issue of whether strong spatial skills can be identified at an early age and used to support poor reading skills in the case of the five children. In the case of the College students the research questions would be addressed by the standardised tests used that aimed to identify students with poor reading skills and strong spatial skills. Additionally the question of motivational failure related to unrecognised potential would also be investigated, both in the case of the five children and the college students as far as possible. It was envisaged that the combination of results from both parts of the study would produce complementary evidence to support the case for strength versus deficit. The research questions are therefore:

In the case of the five case studies

- Was it possible for parents and children to identify spatial abilities at an early age and how did they manifest themselves?
- Were spatial strengths identified in school and used to support learning?
- Did spatial ability play a part in career choices?
- How and when were the reading problems of the five children identified?

- How important was motivation, self-esteem and decision-making to the participants?

In the case of the College Survey

- Was it possible to identify a sub-group of F.E. College students from a range of academic and vocational programmes that have strong spatial skills relating to spatial visualisation tasks and visual realism tasks, with poor reading skills?
- Is the proportion of students with literacy difficulties who have strong spatial abilities, greater than the proportion of students without literacy difficulties with strong spatial abilities?
- Are the patterns of their literacy difficulties and spatial strengths related to the courses they chose, and can this be traced back to childhood pursuits and interests?
- What part did motivation play in their learning in school?

These questions in both parts of the study show a 'linkage' between the two studies, although by necessity and time factors the case studies would provide much richer in depth interview data, but this would be counter balanced by the results from the tests and factual questionnaire in the College survey.

Methodological approach adopted

Having identified the area of research and the focus, it was necessary to choose an overall 'paradigm' for the study. A paradigm is rather a framework that functions as a map or guide for research communities within which theories are built that fundamentally influences how the world is viewed, determines perspective, and shapes understanding of how things are connected. Holding a particular world-view influences personal behaviour, professional practice, and ultimately the position taken with regard to the subject of research (Guba & Lincoln, 1994). Two dominant paradigms feature in Social Science research, the Scientific paradigm also known as the positivist or experimental paradigm, and the interpretative also related to the post modern perspective (Cresswell, 1994)

The preference of this study is to use both the scientific and the interpretative paradigms in a 'combined model' design outlined by Cresswell (1994). For small scale research some

argue that choosing a combined method for collecting data serves no one master, and is in fact a weakness in social research, and point to the fact that paradigms should not be mixed (Rossman & Wilson, 1985). However others see the combination of the two as strength and call such a union a 'hybrid strategy' falling between two ideal types (Robson, 1993). In such a combined strategy, particularly in an investigation or a survey, it allows for one or more case studies to be linked to such a survey and the results to support each other. It is understood that by conducting a series of case studies in the first instance the results may give sufficient confidence that the researcher knows what is going on and as a result is able to design an experiment properly to establish relationships (Robson, 1993. p 169). This is the aim of the combined methodology in this study.

It was anticipated that an in-depth element of the five teenage case studies would allow for the examination of individual characteristics that case study research demands (Cohen & Manion, 1994), particularly pertaining to early reading problems, early play and the recognition, particularly by parents, of early spatial ability. Case study methodology is qualitative in its content and as such is often seen as a relatively minor methodology (Silverman, 1993), compared to quantitative research discussed earlier. However, in the context of this research and for the purpose of this enquiry, the case study element will allow for the development and detailed intensive knowledge about a series of related cases (Robson, 1993), which it is envisaged will substantiate the findings from the College survey.

The five case studies follow up children identified in their early years as having strong spatial skills and poor literacy skills until their teenage years when their school life and outside interests are examined. The data collected will aim to give insight into possible reasons for strong spatial ability alongside reading problems because the nature of case studies is to typically examine the characteristics of individual units.

Central to case study as a research method will be the need to analyse findings carefully and Silverman (1993) says the quality of the analysis rather than the recruitment of the sample or the format of the interview is paramount to methodology in case studies. Traditionally, case study research has been viewed as the 'soft option' in research methodology (Robson, 1993). In the past, researchers have tended to be implicit rather than explicit in their case study research design, and the questions used in interviews have

been considered 'loose' because researchers have not been very focussed or explicit in the questions that they have asked. This has been seen as producing generalisations that have been considered untrustworthy. However, Robson (1993) points out the need for a 'trade-off' between looseness and selectivity and suggests that there is a need for the original design of the case study to be watertight. He argues that, 'the looser the original design, the less selective you can be in the data selection, and the more likelihood there is of supported generalisations'. If case studies traditionally were tolerated as a 'soft option', it was considered admissible as 'an exploratory precursor to some more hard-nosed experiment or survey' (Robson, 2002) or 'compensatory' to such approaches, but of dubious value by itself.

These opinions can be viewed as 'disadvantages' to case study and qualitative research in particular. Hammersley (2008) makes the point that the value of qualitative research has recently been called into question after many years during which it was accepted widely. He says this is due in part to 'external' criticism of educational research on the grounds that it does not serve evidence-based practice well because those opposed to qualitative research require quality criteria to judge its validity.

Hammersley (2008) points out that those who make that assumption assume that there are clearly defined criteria of quality available for quantitative research, and that explicit assessment criteria are needed. However, these are difficult points to address for the 'solitary' researcher in education who attempts to address social issues, as may be the case in this research. Bassey (1981) claims that for those having doubts about the validity of case study research using the term 'reliability' rather than 'generalisability' is more appropriate. In his view, case studies that are systematic and critical that are aimed at the improvement of education that produce reliable findings are crucial to increasing existing knowledge and they are therefore valid forms of Educational Research.

These five case studies will aim to show that they provide an effective basis for the reader to draw conclusions about other cases. The overall study shows that it is possible to combine case study work with a survey to provide some assessment of the typicality in relevant aspects of the cases that have been studied in depth (Gomm, Hammersley & Foster, 2000). However it is understood that the extent to which findings from these case

studies can be generalised to other examples depends on how far the case study examples are similar to others of its type (Denscombe, 1998).

Denscombe (1998) illustrates this point by saying that, 'the researcher must obtain data on the significant features' of other such students of the same age and in the same circumstances. This is the reason for using a survey of students in the College of Further Education because they would be of similar age to the five case studies (at the time of interviews) and additionally there would be a high number of students in the College who were pursuing courses that used spatial ability for success. It was anticipated that some of those students would have reading problems and therefore comparisons could be made about strength and deficit within the learning environment.

The College survey took place in 2008. The researcher had taken up a new position as a tutor in the College and the principal was keen for College students to take part in the research. Accessing primary schools for research of this type in the LEA in which the researcher worked would not have been easy in the current climate of school research and gaining access, parental approval and teaching time. Additionally as the researcher was working full time collecting data of this nature would have been impracticable.

Part 1 - Case Studies

Sample

The five children comprised three boys (children A, B and C) and two girls (children D and E) who at the time of the interviews were aged between 15 years and 18 years. Children A and C had been taught by the researcher as infants and at the after school club while children B, D and E were taught at the after school club that was for children with literacy problems run by the researcher and an LSA. Children A and C also attended the after school club.

It is acknowledged that the findings from the five case studies cannot easily be replicated and are generalised to a wider population, hence the combined method approach using a College Survey. It is also recognised that personal knowledge of the five children could impinge on the question of trustworthiness. In a small-scale study that looked at the pre-

school transition stage to school of her daughter, Shields (2009) faced the same problem. How could research involving her own daughter show a lack of bias and trustworthiness?

Addressing this issue she said that she hoped the trustworthiness of the results would 'come from careful presentation of a logical well-evidenced argument, and that it makes intelligible the reasons for the beliefs and attitudes, actions and outcomes recorded by the researcher'. This resonates with the ethos of this study.

The opportunities for a researcher to look at five individual case studies over a long period from infancy to choosing a career appear from my reading in the literature review to be rare. Equally, to have the benefit of interviewing five teenagers who were willing to take part in this research, together with their mothers, was seen as a beneficial opportunity, particularly when the research was focused on strengths and deficits in pupils' learning where there is little research that could be found in this area.

Finally, the age of the five teenagers was beneficial to the study as they were able to give their own consent and had a good understanding of what the research entailed. It was anticipated that when the research was submitted, they would all be of an age when they were in careers and this would provide conclusive, reliable evidence.

Background to the after school club and its pupils

In addition to my classroom teaching between the years 1995 and 2000 the researcher ran an after school literacy club for pupils who struggled in school with reading and writing, and who were referred for extra support. The club took place on the premises of a Local Education Authority (LEA) Primary School and had support within the LEA. The aim of the club was for the pupils to improve spelling and writing skills in an informal atmosphere, which encouraged learning by small group work, games and writing workshops. Learning support assistants supported the learning. Each child attended the club after school each week for one hour. The club was open two evenings a week from 4 – 6 p.m. and in each session six children were taught. This meant each week twenty-four children attended the club. Individual teaching records were kept for each child and a structured multi-sensory phonics programme was used, the Alpha – Omega programme by Beve Hornsby. As a

result children learnt new spellings and grammar skills each week and these were practised at home with parents.

Records were kept and reports of progress sent to parents and to the children's schools each term. As far as possible links between the literacy club and the schools were made and maintained, and often schools were happy to receive the teaching reports to add to their own class records. This worked for the majority of pupils. The literacy club attracted mostly pupils from LEA schools, although over the five-year period that I was involved with the club two pupils from independent schools also attended. The children came from a wide geographical area and included children from village, town and city schools. Some of the children attended the primary school I worked in as an infant teacher.

In the introduction to this study I established the reason for the research was because my classroom observations as an infant teacher revealed that a small proportion of infants could draw and design in three dimensions at a variance with other pupils, and that these pupils also had reading problems. Whilst this represented only a small percentage of pupils in my classes, I considered it of importance and worthy of further investigation. I also noted (and recorded in teaching records) this phenomenon occurred with some of the pupils in the after school literacy club. Some pupils at the club showed strong spatial talents, which they pursued in out of school activities, of their own (not their parents) choosing, while struggling with literacy.

Table 1 shows the number of pupils attending the after school club in the academic year 1997. The groupings show the age ranges of the students and those marked with an asterix had strong spatial abilities. It should be stressed that this was only my opinion but they all benefitted from a multi-sensory structured teaching method. However, whilst not all pupils chose spatial careers of the seventeen pupils listed I was able to ascertain (in 2010) that eight of them had chosen careers that required a degree of spatial visualisation skills.

Table 1: After school literacy club – Academic Year 1997.

Group 1 Ages 11-12 years	Child 1* Child B Carpenter Floor layer	Child 2* Child D Beautician	Child 3 Career unknown	Child 4* Child E Policewoman	Child 5 Career Sports science
Group 2 Ages 9-10 years	Child 6* Art degree	Child 7 Degree in anthropology	Child 8* Carpenter	Child 9* Plumber	Child 10 Children's nanny
Group 3 Age range 7-8 years	Child 11 Career unknown	Child 12* National tennis player. Career in sports science	Child 13 Geography degree.		
Group 4 Age 6 years	Child 14* Electrician	Child 15 Career unknown	Child 16 Career unknown	Child 17 Career unknown	

The five children featured in this study were identified for three reasons: they were of an age when interviewed when they could understand the reason for the research and were able to give their own consent for the interviews. They all pursued out of school pursuits that had a strong spatial element and they all had similar literacy problems when they were first identified as requiring extra support. The five children came from different socio-economic backgrounds. Three boys were chosen and two girls, again the dominant issue was their age and ability to understand the nature of the study, and a willingness by them and their mothers to contribute towards the research. Two of the pupils I had taught as infants and three had not attended the primary school at which I had taught.

The choice of these students should not be seen as 'cherry picking', that is they were not chosen because I had the notion that they would fit my criteria for this study. The five were chosen because they were all at ages whereby they would be choosing careers and able to understand the ethos behind the research. This has been outlined earlier. Therefore, the age criteria and the time of their life was the crucial part of the choice. Other pupils at the club were younger, therefore still in their primary schools or in years 7 and 8 at Upper School.

The five cameos below (Table 2) outline the five children who were identified at school and followed up to when they were in the process of taking GCSE 'A' levels or were at

College, whose age ranges were between 15 and 19 years at the time of the interviews. They had all had reading problems in their primary school years, while at the same time pursuing outside interests that were heavily dependent on either the specific spatial ability that used three-dimensional understanding or the ability to mentally rotate objects in their minds. These were Child A - Art with emphasis on construction art. Child B - Ice hockey with emphasis on mental ability to rotate your body, and an additional interest in model making using three-dimensional construction. Child C - Art and Design Technology. Child D - Dance and drama. Child E - Music and music notation.

The individual choice of out of school pursuits was not unusual for any pupil with or without Specific Learning Difficulties. However in the case of the five selected for this study, the difference lay in the fact that they had made their own choices to pursue the pastimes without coaxing or encouragement from their parents or peers. At the same time they were reaching high levels of attainment in those pursuits, independent of tuition or guidance. This was important to the study because it showed that pupils could excel at spatial pursuits alongside reading problems, and would allow the study to investigate the possibility of whether the students themselves were sub-consciously choosing outside of school pursuits that challenged their spatial ability, and thus compensate from the point of view of self-esteem their poor reading ability in school. Conversely, did they just enjoy the activities and pursued them for this reason? The longitudinal aspect of the study, that is the researchers knowledge of the pupils in their early years at school and meeting them and interviewing them at a time when they were making career choices was seen as beneficial to the study, because an overall perspective of strength and deficit could be clearly defined.

It is also recognised that ideally the sample should have comprised an equal number of boys and girls, however this was not practical because at the time of the interview collection these five pupils were the only ones around the ages considered suitable for the study. The children in the out-of-school club were all younger at the time the interviews took place. Equally it was seen as essential to rule out as much bias as possible because the researcher had not had any contact with the students in the previous three or four years and therefore came to the interviews from an interest point of view rather than a knowledge point of view.

Table 2: Case study participants

Child A (Male)

Researcher first met Child A when he became part of her year 2 class in 1991. He was a pupil in the class for one year. During that time he was identified as being a slow reader, reluctant to write and unable to use phonics in spelling or reading. Conversely he was able to draw and construct in three-dimensions at a variance with his reading able peers. He was a shy caring child, with friends and able to converse with adults. He enjoyed stories and he understood their meaning. He was able to retell stories and he had a good imagination. He was not afraid to speak out in class or to ask questions. The researcher taught child A in school for one year and out of school for two and a half years and was interviewed in 2002 as part of this research when he was eighteen years old.

Child B (Male)

The researcher first met Child B when his mother approached her to teach him after school on a one-to-one basis for one hour a week in 1996. He was nine years old and three years behind with both reading and spelling. He did not attend the primary school the researcher worked at. He was able to converse with adults; he was also able to understand that he needed help with his reading and writing. He disliked school but was excelling at ice hockey, which he found both exciting and interest consuming. He was attentive, somewhat shy, but had a great distrust of school, particularly teachers. He had a kind and understanding nature particularly towards his family who he adored. He was willing to have support with reading but tended to be lazy and not that willing to do the set homework. His one-to-one support for reading with the researcher lasted for three years. The researcher interviewed Child B in 2002 as part of this research when he was fifteen years old.

Child C (Male)

First met Child C when he became a member of her year 2 class in 1993 for one year and

then out of school on a one-to-one basis for reading and spelling problems for a further two years. Child C was outwardly happy child in class and he had good friends, was always willing to learn and could converse with adults. He enjoyed listening to stories, and could understand stories from the point of view of content. He would not write unless he had an adult sitting next to him. He could sometimes be a bit of a dreamer. Child C excelled at model making compared with his peers and understood how to make working models from kits and from junk modelling. When the researcher interviewed Child C in 2002 as part of this research he had just entered his sixteenth year.

Child D (Female)

The researcher first met Child D when approached by her mother for extra one-to-one tuition outside school in 1995. She did not attend the school in which the researcher taught. She was a bubbly talkative nine year old at the time who was slow at reading and behind with spelling. She appeared confident especially talking with adults and at the time was excelling at dance outside of school. The researcher interviewed Child D in 2002 as part of this research when she was fifteen years old.

Child E Female

The researcher met Child E when approached by her mother in 1996 when asked to provide extra one-to-one tuition outside school. Although she attended the school in which the researcher taught she was not in the same building and at the time was a year five pupil. Child E was a shy slightly introverted child with only one friend in the school. At the time the researcher started to teach Child E she had just moved school from an outer city school and was having some problems adjusting to her new school. Her class teacher had told the parents that their child had special educational needs which may never be corrected as a result of this the parents were devastated and sought extra help outside of school. Child E was later interviewed for part of this research in 2002.

Strengths and weaknesses of case study methodology

This study was both retrospective and longitudinal in its composition and as such provided information about five individual children over a ten-year period. Additionally, the

interviews will offer the opportunity to gather rich data about the children's early home and school lives. However, the opportunity to gather data about individuals carries with it risks particularly of bias of reporting and making generalisations from just a small number of people (Robson, 1993). Robson points out that the 'key' to case study analysis is how can you persuade the reader that the findings of the study are worth taking account of, or what makes the study believable?

The obvious weakness in this particular study was the fact that I would be interviewing mothers and children that I had known previously. As Robson says, bias is possible if preceding skills are negated if they are simply used to substantiate a preconceived position. It would be necessary therefore to be 'open' to contrary findings. It was anticipated that by adhering to clear and honest method of writing up the interview notes it would show the trustworthiness of the data collected. Lincoln and Guba (1985 p.290) discuss the difficulties of case study research and say that there are four questions that must be addressed in any systematic social enquiry: truth value, applicability, consistency and neutrality.

By using a College survey of 133 students that were unknown to the researcher was seen not only as a complementary research tool, but an opportunity to see whether the results from the five case studies could, in fact be replicated.

This is very much linked to the concept of 'consistency' of findings and as such makes the survey element of the research very important. As such the College survey would provide a much larger quantitative element and would, as a result, strengthen the findings from the five children. As Kelly and Hodgson (1990 as cited in Robson, 2002) point out, the combination of a survey with case studies (both institutional and individual) provide complementary information and should give valuable insights.

Data collection methods – case studies

Introduction

Four data collection methods were used.

Participant observation.
Teaching records.
Semi-structured interviews.
Factual questionnaires.

The case studies were to a certain extent 'exploratory' in establishing what was going on in the area of interest (Robson, 2002). The researcher was aware when she taught the five children of their individual reading problems and because she taught them, had teaching records of those problems. She was also aware of their spatial abilities but not fully aware of how the reading problems had exhibited themselves in early childhood or how their spatial skills had manifested themselves in early childhood. Answers to these questions would be found in the semi-structured interviews. Factual questionnaires would be used to establish family details, parents' jobs or professions, relationships in the family, early health problems and ages of maturation, for example walking and talking.

Participant Observation

Participant observation was the reason for the initiation of the research. As their teacher the researcher was a participant member of an observed group (Robson, 2002). As such she was a physical presence who shared their life experiences, but additionally had access to their social and symbolic world through learning their social conventions. This has implications on two fronts, by explaining the meaning of the experiences of the observed through the experience of being their tutor, it is anticipated could give reliability, validity and objectivity to the study. However, it was also clearly understood that these observations could hold a threat to validity but previous research in other primary schools in the same LEA into art and young children, found that infants were also showing spatial strengths and reading problems. Whilst that study was on smaller scale it gave the impetus for this research.

Equally as the tutor the researcher becomes the research instrument (Lincoln & Guba, 1985), who as such, needs to use both personal skills and sensitivity to the participants in order that the recorded observations are a true reflection of the children's abilities and understanding, which in turn provides a reliable honest account of the teaching at the time.

Cohen and Manion (1994) point to the advantages of the researcher as a participant observer working alongside children in school because you can gather information as you go along as was the case in this study. The disadvantage of this kind of participant observation is that the observer might actually affect the situation that is being observed and thus produce biased findings. The researcher responds to this by taking the view that the pupils were used to her presence as their tutor supporting their learning that the participant observation records and her lesson plans made at the time are an honest reflection of where each child was in their literacy and the improvements they made. Notes also show how they were responding in out-of-school activities. These records (Appendix 4) were made before the research commenced and as such were a true account of how the researcher saw and recorded progress for each child.

Teaching records

It was established practice at the after-school literacy club to keep weekly ongoing written records of children's progress.

These comprised:

- On the spot observations during teaching. (Appendix 5)
- Lesson plans. (Appendix 6)
- Test results. (Appendix 7)

In addition it was general practice to record:

- Initial meeting information.
- Initial tests and results.
- Teaching plans and weekly teaching records.
- Tests given at the end of each term and reports sent to the parents on progress
- Individual strengths of the pupils.
- Any school records that may have been given to the researcher as the pupil's tutor.
- Portfolio of evidence of work done.

The researcher has retained all these records for the five pupils as evidence for this research.

Semi-structured interviews

Semi-structured interviews were used to interview both mother and child in the case of the five case studies and as a research method it is a flexible and adaptable way of finding things out (Robson, 2002). The researcher had not seen any of the children for a period of time prior to the interviews, more than 10 years had elapsed in the case of child A, 8 years in the case of child C, 6 years in the case of Child E, 5 years in the case of child B and 4 years in the case of Child D. This was seen as an advantage because the researcher was unaware of their progress relating to their reading in Upper School and she did not know how far out of school spatial pursuits had developed. The aim was to avoid bias in reporting and as she had had no contact with the participants for those years it was seen as advantageous to the findings in that there was no way of knowing where their learning had taken them.

The interview questions focused on five areas that looked at particular strengths relating to spatial ability and particular deficits relating to the reading problems, including early socialization skills, early play, early reading skills, spatial skills, self-esteem and confidence. A copy of the interview schedule is included at Appendix 8.

The design of the interview schedule took into account the five areas above. At the top of the interview schedule was the assurance that each interview would be completely anonymous in line with advice from Robson (1993). There are fourteen questions on the schedule and they were designed to try and ascertain as much information about early play (was it for example particularly spatial), school and reading problems, confidence and self-esteem. The aim was to make the questions short but straightforward whilst at the same time give freedom to the researcher for the sequence of the way in which the questions are asked. It was understood that some answers might take up more time than others. However, it was anticipated that the fourteen questions could be answered in the one-hour allocated for the interviews. Equally the questions could be addressed both to the child or the mother, as the aim had been to make them as simple as possible. It was important not to give clues about what the researcher was particularly looking for, so in

the case of question one the researcher wanted the mother and child to answer the question as fully as possible. The question was not, 'Can you remember you/your child playing with Lego®, Meccano®, painting, drawing, dressing up, musical instruments?' because this type of questioning would have 'lead the interviewee in a particular way or down a particular road'. The researcher did not want this to happen, rather that the responses were rich and illuminating (Robson, 2002). Additionally it was essential that as far as possible the information collected from the mothers substantiated the information collected from the children, for example did they remember the situations in the same way? Therefore leaving the questions structured but loose and not leading the participants in any way in their responses, seemed to the researcher to make for much more intuitive data.

Interviews took place over a three-month period due to the intervention of Christmas, the researcher's teaching commitments and the commitments of the families. The interviews would take place after school both for the convenience of the families and the researcher and each participant would be interviewed in their homes. The mother would be interviewed first and while the child was being interviewed the mothers would complete the factual questionnaires. All parties had agreed to be interviewed using a tape recorder.

Robson (2002) points out that there is no right way to analyse qualitative data but encourages the use of a structured procedure to ensure that findings are analysed methodically. As such he suggests the following steps should be taken:

- Analysis should start as soon after the interviews have taken place as possible.
- The researcher should use an indexing system to record information obtained from which themes and a coding system can be generated.
- Use analytical memos to help with sorting the data.
- Have a coherent filing system.

This proved to be invaluable advice for the research. The timescale of three months for the data collection meant that the researcher allocated time to replay the transcripts of the interview recordings and type up the responses during the day following each of the interviews. Appendix 9 shows a typewritten transcript of the interview with Child D and her mother.

This then allowed for the researcher to divide the interview responses into five categories; early play, early school, reading problems, spatial abilities and self-esteem. Using a cut and paste system and making sure that all transcripts were anonymous the researcher found that the five categories of responses from each mother and child were pasted onto five large pieces of paper. From this it was possible to see similarities and differences of responses. In each case a coding system operated using the code Child A and Child A (M) = mother.

The analysis of similarities and differences was tabulated and from these graphical representations were made that are discussed in Chapter 5.

Table 3: Similarities in the Children's responses to Reading and Spelling.

Reading is creative	Child A C D and E
Loved listening to stories	Child A B C D and E
Reading made me angry and frustrated	Child A B C D and E
Hated reading out aloud	Child B D and E
Spelling frustrated had to get right	Child B C D and E
Hated spelling tests	Child B C D and E

Table 4: Differences in the Children's responses to Reading and Spelling.

I had so many ideas in my head but could not put them on paper	Child A and Child C
The rest of the class was quick I was slow	Child D
Reading is about expanding your mind	Child A
Hated going out of class to read	Child B and D
Remembering spellings for test but not again	Child C
Mixing up letters p q b d	Child C

Table 5: Similarities of Mothers responses about reading and school.

Their children loved listening to stories	Mothers A B C D and E
Their children were read to nearly every night	Mothers A B C D and E
Could not define the real problem with reading and spelling but compared the standard reached with their siblings.	Mothers A B C D and E
Agreed that their child got frustrated	Mothers A B C D and E
Tried to get their child to phonetically sound out words as they did not grasp the concept of real books	Mothers B C D and E
Frustrated because no help given at school	Mothers B C and D

Table 6: Differences of responses of Mothers.

Considered that the teaching of reading was not structured enough	Child B and D
Particularly worried about writing	Child E
Felt her child was good at making up words or guessing	Child B
Concerned spellings never made sense	Child B and E
Wanted schools carry out further assessment	Child D
Fed up with their child struggling to read	Child B and D

Table 7: Children's responses to what they considered their strengths relating to spatial ability.

Good hand eye co-ordination	Child A B C D and E
Good motor control	Child A B C D and E
Good memory for sequences	Child D and E
Good visual memory (I can see things in my mind before I put them on paper)	Child A and C
Good reaction times	Child B
Good visual imagination	Child A C D and E

Table 8: Mothers responses to what they considered their children's strengths were relating to spatial ability.

Good hand eye co-ordination	Mothers of Child A B C D and E
Good motor control	Mothers of Child A B and D
Good memory for patterns	Mothers of Child A B C D
Good imagination for creativity	Mothers A C and D
Good reaction times	Mother B

Factual Questionnaires

The case study will use factual structured questionnaires that would be given to the mothers only for completion at the time of the interviews. Information would be gathered on their child's background, date of birth, place in family, father and mother's occupations, birth details etc. (Appendix 10) From this information it would be possible to ascertain whether the child had any physical problems or problems with ears/eyes of which the researcher would have had no prior knowledge. The questionnaire may also provide additional information, for example birth problems or children who walked and talked earlier or later than normal. It was envisaged that the mothers would complete the

questionnaires while the researcher was interviewing the child as this would save time and avoid a separate visit.

The questionnaire format followed the advice of Bell (1999) in that the more structured the question the easier it will be to answer and as a result should present fewer problems when analyzing. Equally the wording of the questionnaire was considered carefully so as not to cause any ambiguity. The researcher followed the specific rules for questionnaires outlined by Bell. To type the questionnaire, type an introduction and make the instructions clear, take care in the order of the questions starting with the easier questions first. However, the researcher felt the content of the questionnaires was not going to prove difficult or controversial for the mothers to complete, because the factual nature of the content meant that they were giving fairly routine answers about their children and it was anticipated that the questionnaires would be routine.

Ethical issues

The overall ethical consideration for the study on a personal level was to present a clear, honest and trustworthy account of the research undertaken and submitted, and to include ones own sincerity as the researcher.

The ethical dilemma faced from the outset was the reluctance on the part of the researcher to embark upon research that involved either testing or asking difficult questions of willing participants. It took many months to consider whether the research would require too much soul-searching, whether the ends would justify the means, and whether the end result would in any way help pupils and students who were desperately in need of support. This reverts back to the aims of the research and the Robson (2002) question, 'Does the research have relevance?' However the essence of research ethics is about being clear about the nature of the agreement you have entered into with your research contacts (Bell, 1999). This had been dealt with in a clear and honest matter and all the parties were willing to become involved in the process.

As a result the ethical dilemma that resulted from the five case studies was the difficulty of striking a balance between the demands placed on the researcher as a professional scientist in pursuit of truth (Cohen & Manion, 1994) and the rights and values of those

interviewed. This has been the 'costs/benefits ratio' (Frankfort-Nachimas & Nachimas, 1992 as cited in Robson, 1993).

The dilemma was that all the subjects had been known to the researcher over a number of years and it was necessary to be aware of the need for diplomacy, to avoid affronts to dignity, embarrassment, loss of trust and reduction in self-esteem. It was essential to put the interviewees at their ease, while at the same time securing truthful, honest responses.

Three factors played a part here. Firstly, all the interviews would take place in the participants own homes, at times dictated by them. This meant that, to a certain extent they had ownership on the structure of the interviews and an interest in the outcome (Robson, 2002). Secondly, all the parents had been keen to support the study. Finally, all had children who needed extra support and all had seen the benefits of extra support that was displayed in their children's confidence and in improved literacy skills. They had an invested interest in the outcome, something Frankfort-Nachimas & Nachimas (1992) refer to as 'benefits.'

The risks were to the invasion of their private thoughts and the researcher needed understanding of this. This was reduced by being clear about the nature of the agreement they would be entering into from the beginning (Bell, 1999). From the outset of the research and the initial telephone calls to the parents it was made quite clear what the intentions were and letters outlined the research aims. (Appendix 11)

At each interview it would be made clear that the participants would be able to withdraw at any time and given clear indications of what would happen to the final results (Bell, 1999). A promise would be made to let them see the results and to comment on the content if they so wished. Experience at school parents meetings and with the after school club helped with this situation because the researcher was aware how necessary it was to reassure and to keep parents completely in the picture about all issues relating to the teaching and well being of their offspring. The researcher would draw on this knowledge to try to ensure supportive, informal interview situations, which achieve the relaxing interview situation whereby interviewees allow in-depth questioning so that 'rich' interview data can be obtained, while at the same time not upsetting them. At the outset, during the initial telephone conversations with the parents and before the

commencement of each interview the participants were asked whether they would be prepared for data that had been collected during the children's early years be incorporated into the study findings. All agreed wholeheartedly.

Procedures

The question of access is essentially a question of persuading the parents and the children to let the researcher in (Burns, 2000). Two of the children were under the age of sixteen and therefore parental consent for them to take part in the interview procedure was required.

In the first instance each mother was contacted by telephone and given an outline of the research. It was explained that if they gave their consent verbally, a letter of explanation would be sent that included a return slip for their signature stating that they agreed to take part. (Appendix 11) The researcher also made it clear to both the parents and the children that they could withdraw from the procedure at any time. The intention was that all parties should be encouraged to make a responsible decision about the interviews and to have the opportunity to refuse participation if they so wished.

Within two weeks of the initial calls, signed consent forms were received from all the parents and children. Appointments were made by telephone when it was made clear that each interview would last one hour for the mother and one hour for the child. This would be time-consuming as the interviews were concurrent but it was felt undesirable for a gap between each interview because the researcher considered that any conversation between them might influence the purity of the data.

Tape recordings would be made that would have to be transcribed directly afterwards. It had previously been explained that this would be used and no objections were raised. The interviews would by necessity take place at the home of the respondents, in the early evenings, because this was the most practical time to meet, there being minimal distractions.

The procedure to be adopted for each interview record would be as follows: the interviews would all take place in the evening and would be tape-recorded. The interview

schedule would last one hour for each participant. In all cases the mothers will be interviewed before the child. As well as listening to the responses, notes would also be taken in case of mechanical breakdown for whatever reason. After the two-hour interview sessions it was intended that there would be no follow up conversation of any kind.

Part 2 - Further Education College survey

This took place in 2008 when the researcher was a tutor at a College of Further Education and was given the opportunity to test five groups of students for the purposes of this study. The students who took part in the test were not students taught by the researcher as her role was teaching on a Foundation Degree Course for adults training to become teachers. The students in the College were taken from four groups of vocational courses, Motor Mechanics, Electrical Engineers, Art Students and 'A' level Students.

Sample

A purposive sample of students who attended a rural College of Further Education was selected for the survey. A purposive sample is one that draws on the interest of the study, in this case one that had students doing diverse FE courses and where some would be expected to have experienced literacy difficulties at school. The College had a wide socio-economic mix due to its location in a large town adjacent to a cosmopolitan city as a result the students came from wide cultural backgrounds. The principle of selection for this kind of purposive sampling was to find students who satisfied the needs of the research. It was assumed that students studying in a College of Further Education would fit the criteria needed for the study whereby there would exist students who were strong spatially and who were or had been poor readers.

Another reason for the choice of a Further Education College was convenience of data collection because at the time the researcher was employed teaching a Foundation Degree for Learning Support Assistants at the College. The college supported students from a wide range of socio-economic backgrounds and from all ethnic backgrounds. It is based on three sites geographically some distance apart and this had additional implications for access and the researchers teaching timetable. As a result the students

that took part in the survey were all located on the same site as the researcher although, none were known personally to the researcher. All the students on all the courses took part unless on the day of the tests they were absent.

One hundred and thirty-three post 16+ College of Further Education students actually took part in the College Survey from four vocational groups shown in Table 9 below.

Table 9: Course groups represented in sample.

Vocational Group	Number in group	Males	Females
Motor Mechanics	29	28	1
Electrical Engineers	10	10	0
Art Students	36	6	30
'A' level	58	27	31
	133	71	62

The choice of the particular groups was reliant on several factors: the availability of the groups for taking part in the tests, the researchers timetable, the willingness on the part of the various tutors to allow students to be withdrawn from tutorial time to take part in the survey, and importantly the range of academic to vocational type courses.

The essential point for the researcher was to elicit as many students who were pursuing curriculum paths that required a certain amount of spatial ability i.e. electrical engineers, motor mechanics and art students and to compare their spatial skills and reading problems against those of students who were studying subjects with little spatial input such as 'A' levels in English, History and Sociology.

Gaining Access

Permission from the Principal and the Higher Management team was seen as the essential first stage. An interview with the Principal following an introductory letter (Appendix 12) found her friendly and supportive. It was made clear at this interview that at the time there appeared to be little research to support the hypothesis and that the concept of strength versus deficit was not an area that had been highly developed in research terms. The usefulness of the study to the College was also discussed from the point of view that it might give deeper insight into the needs of the students in the future and raise awareness of specific learning difficulties and spatial ability. Bell (1999) points out that there is a need when collecting data to point out the usefulness of the research to a given institution but not to claim more than the investigation merits. This is important and was illustrated by the researcher admitting to the fact that little was known in the area of interest and by assuring the Principal that the time needed to meet with the students would be kept to a minimal, so as not to impede their studies. At the conclusion of the meeting the Principal said that she, as Head of College was willing for the research to go ahead and that she would inform her staff accordingly. She gauged that providing they were willing to release students and importantly the students were willing to take part, that the maximum time that should be allowed was two separate visits of one hour each which would ideally be in the students tutorial time.

Following discussion with the Principal it was necessary to contact the Line Managers and Course Leaders. Initially contact was made by email and then meetings were arranged with the line managers for each of the five areas. The need to draw on 'interpersonal resources and strategies' (Hammersley & Atkinson, 1991) was paramount in gaining their support and subsequent access to the students. It was envisaged that this would take two or three terms, from the point of view of room allocation for the computer tests, and because there would be reluctance on the part of the tutors to let their students lose two tutorial sessions in one term.

The research and the data collection needs were carefully explained to each individual tutor and a genuine interest in the research aim was found and in the majority of cases a willingness on the part of the tutors to help with the administration of the tests. This help was gratefully received. However, as envisaged, the tutors were unwilling for their

students to lose two tutorial sessions in one term. It was made clear at the time of the initial interviews with the tutors that their students would be asked to take part, but that it was not compulsory and equally it was made clear that the students would be given the opportunity to withdraw at any time during the course of the tests.

Threats to validity from the College Survey

To come up with trustworthy answers, the analysis has to treat the evidence fairly and without bias, and the conclusions must be compelling (Robson, 1993). In the case of the College survey the results encompassed standardized tests and a drawing test to accompany a factual questionnaire. The shortage of time allocated to the students to complete all the tests would be very short and because the one-hour time limit set for each test would use all available time, there would be little opportunity for them to copy one another's work or ask questions.

Tutors had volunteered to accompany the researcher during both sets of tests to help oversee them and to support any student who might need help reading the questions or writing answers (in the case of the factual questionnaires). The results of the standardised tests, which uses a computer programme, can only be accessed via a password and each students result goes directly to NFER Nelson so that there are no opportunities for students to change answers or spoil result sheets. As such this would indicate that the results achieved using these tests would be treated fairly and rule out alternative interpretations.

Following completion of the drawing test and accompanying factual questionnaires, the papers would be collected and the information collated as described in the methodology. The papers will be retained by the researcher together with the results of the FERT tests and these would be available for examination by any interested party in the future. Equally while the drawing test and the computer tests were taking place the presence of the group tutors would be another test of trustworthiness.

Data collection methods

The data collection for the students comprised:

- Standardized tests of attainment and performance, which measured spatial ability (in particular mental rotation skills and figure analogies), verbal reasoning tests and quantitative reasoning tests.
- Drawing tests, which measure the ability of the pupils to reproduce objects from memory in three-dimensions.
- Factual Questionnaires.
- Interviews.

Areas of spatial ability and testing

In the literature review the work of Winner et al., (2001) and Karolyi et al., (2003) were reviewed. The Winner study used eight tests of spatial ability:

1. Vandenberg Test of Mental Rotation, version B (Vandenberg & Kuse, 1988).*
2. The Rey-Osterrieth complex figure test. (Osterrieth, 1944; Rey, 1941).*
3. A hidden figures test. (Ekstrom, French, Harman with Dermen, 1976).*
4. Archimedes screw test.
5. Pyramid puzzle.
6. Drawing test.
7. Spatial word problem test. (Hermelin & O'Connor, 1986).*
8. K-bit Matrice test. (Kaufman & Kaufman, 1990).*

* As cited in Winner et al., (2001).

In addition, the later study by Karolyi et al., (2003) used the impossible figure test.

Except in the case of the impossible figure test (which was not identified in this study until 2009) the studies found no relationship between dyslexia and spatial ability. Given the findings of these studies and spatial abilities of the five case studies, it was decided to examine only drawing skills and mental rotation and manipulation skills from memory. To do this standardized tests of mental rotation were used alongside a drawing test accompanied by a factual questionnaire.

The literature review and the work of Lohman (1993) in particular showed the need to be cautious when using tests of spatial ability. With a large number of students it was

essential to find tests that would be easy to administer, and which could be completed in a limited time of one hour, thus the selection of standardized tests. The drawing test would be easier to administer and could be done as a whole class with tutor guidance. By comparison the standardized tests would have to be completed independently, would have time restrictions and some students may need help accessing the information and instructions.

The standardized tests selected were Further Education Reasoning Test (FERT), published by NfER Nelson (now GL assessment) (2007). The FERT CAT3 test assesses individual ability to reason with and manipulate different types of symbols. These computer-based tests were chosen with caution but in the knowledge that they should provide reliable measurement of individual differences (Lohman, 1993). This was re-iterated by (P. Smith, personal communication, May, 2003) as being the best tests available to test both verbal and non-verbal ability of 16+ students and particularly suited to testing mental rotation skills.

The test is based on the assumption that there are three types of symbol that play a role in human thought, that are:

- Words
- Quantities
- Spatial, geometric or figural patterns

In the FERT test separate batteries of subtests are provided to assess competence in working with each of the three types of symbol.

- Verbal Battery
- Quantitative Battery
- Non-verbal Battery

The main emphasis of the CAT3 tests places emphasis on 'relational thinking'. Throughout each subset the basic elements are kept simple, clear and appropriate to the ages of students who take the tests. All the tests comprised multiple-choice questions, a format many of the students at the College would have been accustomed. The CAT 3 envisages that all students exposed to modern cultural influences should have an opportunity to acquire the background knowledge needed to answer the questions. The CAT 3

instructions also reinforced the concept that all the questions were evaluated to minimize or eliminate sex or ethnic bias.

The FERT test measured 'developed' rather than innate abilities again relevant to this study. As 'developed' ability is influenced by both in-school and out-of-school experiences, these tests were considered completely relevant to students attending the College whose background experiences and school experiences would be diverse.

The verbal battery of tests comprised two subsets:

- Sentence completion
- Verbal Analogies

The verbal battery was designed to assess relational thinking when the relationships are formulated in verbal terms. This is relevant to an education system where verbal symbols play a large part.

The quantitative battery also comprised two subsets:

- Number analogies
- Number series

The solution of the problems assumed that every student stores quantitative concepts and additionally all the questions called for perception of relationships among concepts. None of the questions required an ability to read therefore poor literacy skills would not affect the individual student's performance.

Similarly the Non-verbal battery of tests comprise two subsets:

- Figure Analogies
- Figure Analysis

The questions in this battery would not involve numbers or words and the shapes and figures represented bear little relationship to the formal school curriculum. The first subset assesses student's ability to identify the relationship between two figures and find the option that has the same relationship to the third figure. This test was a suitable test to use in this study because it evaluated students' ability to identify relationships between

designs and then mentally manipulate new designs using these relationships. Key to this test for the area of research is the testing of visual manipulation. This was the exact spatial skill the study wished to examine.

The second subtest would be a Figure Analysis test, which assessed spatial ability, the specific ability to create, maintain and manipulate visual-spatial images. The study considered using the Vandenberg test of mental rotation but was persuaded that this test is a) inclusive in the battery of tests and b) provides the same opportunity of outcome for mental rotation ability.

The non-verbal battery measured 'fluid intelligence,' particularly suitable to this study because fluid intelligence is an ability to reason that is not strongly influenced by cultural and educational backgrounds. As the students in the College would come from all social and economic background and would include students from Eastern Europe this type of test was considered very appropriate not only to the objectives of the study but also to the needs of the students, relying as it did for the main part in non-verbal reasoning.

Psychometric information from the CAT3 standardisation

The design of the tests

The CAT3 is based on the Cognitive Abilities Test (CogAT™). The design was based on the theoretical framework for the construction of CogAT™ based on a concept drawn from two theoretical models of human abilities Vernons' (1961) hierarchical model and Cattells (1987) fluid crystallised abilities model (as cited in Lohman, Hagen & Thorndike, 2007).

Validation of the tests

Validation is provided by 2 main points of validity evidence:

1. Pattern of the inter-relationship between the various tests and batteries within CAT3. This is evaluated first by examining the inter-correlation tables for the subtests and batteries, then by analysing the factorial structure of all the tests that comprise the CAT3.

2. The other source of evidence is that of concurrent validity as shown by the correlations between CAT3 scores and other evidence of intellectual ability.

(Appendix 21)

Sample size

Between 216 - 312 schools took part across four age groups. The samples were stratified at school level by school performance in the National Key Stage 2 (KS2) or Key Stage 3 (KS3) assessments.

How do the tests relate to other variables performance and work setting

The tests are suitable for use for students up to the age of 18 and as such are suited to Further Education College Students. The indicators of performance are based on current levels of performance at the end of GCSE tests and indicate strong probability of obtaining five or more GCSE grades A-C. It is also possible to plot CAT scores and GCSE/GNVQ results.

The researcher spent a great deal of time looking for standardized tests which would measure the particular ability to draw and mentally rotate objects in three dimensions. This proved very difficult because as well as the specific nature of the spatial tests they had to be age appropriate; the market was found lacking in such tests. The spatial ability section of the literature review showed how divided research and science is in the area of defining exactly what spatial ability is and as a result what should researchers be measuring. In reality Winner et al., (2001) and Karolyi (2003) provided a consensus of tests that they found responded or did not respond to spatial ability and dyslexia.

This proved to be fortunate for this study as the results of the tests of Winner et al., (2001) found that more practical tests may be more beneficial for testing spatial ability and dyslexia. Correspondence with Dr. Pauline Smith of NfER Nelson, herself a researcher in spatial ability and older students, showed the way forward by using the CAT3 tests which she advised would test students ability to rotate objects mentally in three dimensions through test 2 the spatial figure analysis test.

The study will use all of these tests because the nature of the CAT3 tests is that it is not possible to do the tests in isolation. The students would be using a computer-generated tests, each would have to be completed before the next one is commenced. The test descriptions from the technical manual are detailed at Appendix 21.

Three-dimensional spatial test – drawing task

While Winner et al., (2001) had used a drawing test in one of their series of three tests to test spatial ability, for reasons they did not point out they required students to draw their own hands. The researcher in this study did not think this type of test would elicit the correct information about whether the students were able to draw everyday objects from memory. Equally, a rigorous search of the electronic databases produced no research evidence about assessing the drawing of everyday objects by students or pupils since the drawing tests of Smith (1964). In his book 'Spatial Ability' he recorded how he attempted to measure a particular spatial aptitude in Grammar School pupils, the ability to perceive and reproduce shapes correctly from memory, that is with their dimensions and their relations in due proportion. He used a battery of spatial tests to establish this and included in this battery a drawing test. This test required pupils to draw pictures of eight familiar objects of standard shape such as a Bunsen burner, milk bottle and phials from memory. The drawings were marked for the correct representation of proportion. Unfortunately the researcher could find no record anywhere of his marking system. The spatial tests he used were constructed largely on the same principle that is that the tests should depend critically on the perception of the correct proportions of a figure of pattern.

Smith (1964) considered this particular skill to be paramount to students working in the area of technology and technical expertise, particularly in the areas of science and engineering. He also believed that such students might not always be the ones who excelled at reading. However his concern was that all pupils should be taught to their strengths and that students who were technically adept should be encouraged to attain their full potential.

Using the principles of a drawing test originally devised by Smith with Grammar School pupils to establish a measure for visual memory for visual or spatial form, this study used a similar drawing test for the college students. Using his ideas of drawing everyday objects, this test would be replicated with the students in the Further Education College. The students would be asked to draw from memory four groups of everyday objects that they would see in College. These objects were not chosen randomly but with the advice of an independent art teacher, who provided insight and understanding on the implications of drawing in three dimensions.

The spatial drawing tests

The art specialist

Because the researcher had no knowledge or specialisation in the field of art, and because she could find no record of the way in which Ian MacFarlane Smith scored his drawings, she employed the services of an LEA art teacher. Two meetings took place between the art teacher and the researcher. The first established common ground about the aims of the data collection and established a method of scoring. The second meeting took place after all the drawings had been collected, the aim of which was for the artist to ensure that the way in which the researcher had scored the pictures was in accordance with the principles discussed at their earlier meeting. At this second meeting the art teacher validated 10% of the drawings (Appendix 23).

At the initial meeting the researcher outlined the research aims and in particular the objective to get the students to produce drawings that showed three-dimensional expertise. In his 1960's tests Smith had used 8 objects for his pupils to draw. However this was not feasible for this study because of the time factor. As the college had allowed the researcher only two separate tutorial sessions of forty-five minutes each, the artist considered that four objects would be the optimum number that could successfully be achieved in the time available, as there would be insufficient enough time for the students to draw eight objects.

This would allow four minutes for each drawing and given that the students were adults the artist considered that this timescale would provide them the opportunity to produce

good representational drawings with adequate time for shading and surfaces to be added. He stated that those students who were easily able to draw maturely would do so within this timeframe, while the others would just doodle or sit back and wait for the time to end.

The objects to be drawn

The next question was to decide on the subject of each drawing. These needed to give the students the opportunity to draw with maturity and possibly in three dimensions. This, the artist considered, meant that the students should be required to draw 'objects' rather than 'scenes'. Four objects were therefore needed that all the students would see in the normal course of their college day as this would ensure, as far as possible, that no student would be disadvantaged either culturally or socially, because they would all have had equal familiarity with the objects.

The objects finally chosen were:

- A mug and a teaspoon
- A computer and a mouse
- A bag, pencil and book
- A mobile phone on a table.

It should be noted that the college canteen used mugs and spoons and all the students worked in classrooms where there were computers for all their lessons. By asking the students to draw two objects, one larger than the other the students had the opportunity to draw them in direct proportion, this the artist explained would allow them to understand scale, proportion and to include shading which could show perspective.

The objects: -

- Would be seen by the students each day they were in college. Thus not disadvantaging any students.
- Had a three dimensional aspect.
- Gave the opportunity for the students to not only draw in 3-D but to add shading to their drawings.

- With the exception of the mobile phone would be drawn to scale with each other. (For example when the students drew the mug and the teaspoon, the mug should be taller than the teaspoon).
- Should be immediately recognizable to the person scoring the objects after the completion of the tests.

The materials to be used

The artist suggested that the students be restricted to using just pencil for their work and all the students should be given an HB pencil and an eraser. They would be given one sheet of white plain A4 paper and be asked to fold it in order to draw two drawings on one side and two on the other. Thus, the drawings all appear on one piece of paper but at the same time with enough space, half a page for each drawing, to show maturity in the drawings. For example the artist said that in the past when he met new pupils/students and got them to draw something on a new piece of paper from memory, they would invariably draw something small or in one of the corners of the paper because the paper he had given them was too large. To avoid this he considered that the students at the College would feel less inhibited by a smaller piece of paper and they would be more likely to make a better representation of the objects in the time. The students would be given the opportunity to start again if they felt that made a mistake and given another sheet of paper, but the artist advised against this as far as possible and suggested that this should be made clear to them at the beginning of the task. The drawing materials were all provided by the researcher, which meant that no one was disadvantaged and spare materials were also available for emergencies.

Providing all the materials for the drawing task proved advantageous both from the point of view of ease of administration and because some of the students did not have the necessary materials with them, for example a pencil and eraser, because the majority used pen to write with.

The researcher would use a stop watch to time the drawing process and the students would be asked to stop and put their pencils down after four minutes whether the picture was completed or not.

Scoring of the pictures

The artist suggested a scoring method for the drawings as follows:

For each drawing the score could be a maximum of 2 points for each of the five sections.

- Section 1. Does it look right?
 - 1 point for this and an extra point if it showed maturity.
- Section 2. Is it the right height/size?
 - 1 point for height and 1 point for size.
- Section 3. Does it have form?
 - 1 point if it showed an ellipse, 1 point for any shading.
- Section 4. Is it drawn with confidence?
 - 1 point if the lines were complete and 1 point for good formation of shape.
- Section 5. Is it technically correct?
 - 1 point for good use of the paper, i.e. the picture should be in the centre of the paper; 1 point for showing a surface.

Factual Questionnaires

Factual self-completed questionnaires were designed for all the students in the study, (Appendix 13). These were used to ascertain who had had literacy difficulties throughout their schooling and what those difficulties were. There was also a section on the questionnaire to find out whether they had been formerly identified/diagnosed as dyslexic. This information could not be obtained from College Records because of a reluctance to release this information about individual students. At the bottom of the factual questionnaires there was a signed consent slip that all the students would have to complete before they handed in their drawings and the factual questionnaires.

The design of the questionnaires used graphical representation as much as possible for ease of completion by the students, as for some students, completing written questionnaires and doing tests could have been something that would have caused them unease and distress. It was the intention for all the students to take part in the research

with enthusiasm and support, so therefore it was necessary to reduce any undue pressure on them. Equally if the tutors were happy to help the students complete the questionnaires they needed to be simple for everyone to understand. There was only one hour available for the completion of both the drawing tests and the factual questionnaires.

The advantage of using self-completion questionnaires is that the respondents fill them in themselves. In this case the questionnaires could all be completed on the day of the test. One of the disadvantages of this type of questionnaire is that the responses may be 'superficial' (Robson, 2002). However, in this case there would be time for me to talk with the students as they completed the questionnaires, and equally their tutors who knew them well would be present. Robson says that for the results to be meaningful then any questionnaire of this type needs to be painstakingly constructed. This was the thinking behind the production of this questionnaire.

By providing students with boxes in which to tick several of their responses, and by using pictorial representation for the main body of the questionnaire it was hoped that this would prove beneficial to all students and that they would be able to spend more time on writing about their learning difficulties. It was envisaged that the presentation would also be appealing to the students and would prove to be less daunting to them when they completed the questionnaire.

It was envisaged that another questionnaire would be completed during the CAT3 tests, to establish early childhood interests and specific learning difficulties. (Appendix 13a) This could not be designed at the outset, until the first set of questionnaires had been completed, it would however be a questionnaire that was:

Clear

Easy to fill in

With its contents arranged to maximize co-operation (In other words one with a similar presentation to the first one).

Interviews

Due to time constraints in the test procedure the completion of these questions was not possible.

Data analysis

Analysis of the CAT3 tests

NfER Nelson had provided a spreadsheet of the student's names (in alphabetical order) before the tests were taken. Because the students would be taking the tests electronically, in the first instance NfER analysed the results. These results would be sent back to the researcher in a format that could be given to each individual student whose anonymity was retained throughout (Appendix 24).

Immediately after the completion of the drawing tests and factual questionnaires the results were analysed. A table would be designed for each vocational group. (Appendix 15) This would provide the basis for adding more variables to the master spreadsheet that would be sent from NfER Nelson showing the results of their tests. Later this data will be inserted in to the Statistical Package for the Social Sciences (SPSS) for statistical analysis.

At the commencement of the tests students were given instruction in the use of the computer programme (Appendix 16). The results went directly to NfER Nelson who analysed the data and provided graphs and 'scattergrams' of results electronically to the researcher. These results were then used with descriptive and inferential statistical tests provided by SPSS, which is particularly suited for the correlation of quantitative data analysis (Robson, 1993).

Analysis of drawing tests

The drawing tests were analysed separately using the scoring criteria. Initially it was envisaged that charts would be developed to record the results of each student in each group. This would consist of a number and code for anonymity for example the first student in the first group would be known as 01 MV1 which stands for first student in the Motor Vehicle group 1. Whereas the information from the CAT3 tests would automatically go into data sets, the drawing data would be recorded on a chart, the format intended for use can be seen in Appendix 15. This format shows clearly what each student scored for each drawing and his/her total score. From this it was possible to develop further charts to show the scores of each student, the group they were in and whether or not they had

particular reading, writing, spelling or other problems. From this it would be easy to correlate findings from the FERT tests and to gain an overall score. Each of the headings in the remaining boxes referred to scoring of the pictures and a score was given for each picture. A refers to the mug and spoon, B to the computer and the mouse, C to the bag book and pencil and D to the mobile phone. The total score would be recorded on the far right of the chart. The results of these would provide individual analysis and data to use alone and with the CAT3 tests.

Analysis of factual questionnaires

The chart (Appendix 15) would accommodate all the information taken from the factual questionnaires. This information would provide the basis for variables for the SPSS data sheet and subsequent analysis, e.g. drawing scores could be entered as well and any reading, writing and spelling problems. These would then be correlated to establish relationships between reading problems and spatial ability.

Ethical issues

The ethical issues of working with students, some of who might have severe learning problems did not apply to any of the students in this research, a fact that was established with each group tutor before the onset of the data collection. To ensure that the study was ethically correct at all times the following ethical guidelines outlined by Denscombe (2002) were addressed.

- Will the research avoid misrepresentations and deception?
- Will the interests and identification of those involved be protected?
- Is it possible to guarantee the confidentiality of the information given to the researcher?

As researcher the ethical responses were formulated as follows; firstly, in order to avoid misrepresentations and deception, time was spent with all the tutors before the testing took place in order to explain the reasons for the research. Then similar time was taken to explain the outline of the research study to the students, before they actually did the drawing tests, making it clear that they were free to withdraw at any time before or during

the time of completing the drawing tests. At this initial meeting they were asked to complete the consent slip at the bottom of the factual questionnaire. It was explained to them that their interests and identification would be protected because although they needed to access the computer tests by using their own names, the results would not be recorded in an individual format but as a group or college format. Additionally the College itself was not to be identified in the study. It was explained that although each of their names was on questionnaires when the results were recorded names would become numbers and they would therefore be anonymous.

Throughout the data collection process the students would be reassured about confidentiality and it was explained that they would be free to read the completed research. Equally I explained that they would receive copies of their test results. It had been arranged to visit the students after the data had been completed to explain the results of the drawing tests and to give them back their CAT3 scores as they would not be able access these themselves after they had finished the tests.

These ethical considerations were in accordance with Denscombe (2002), who advocates that people should not be misrepresented or deceived, that identities would be protected and confidentiality guaranteed.

Informed consent

Concerns about collecting data and testing young children for this study did not apply in the case of the survey. [A personal dislike](#) for testing young children was one of the prime ethical considerations for collecting data from older students. In the case of this survey the students were old enough to give their own consent, providing that this was well informed by the researcher.

Denscombe (2002) outlined three criteria that were abided by in this research regarding the research that asked the following:

- Does it avoid misrepresentation/deception?
- Will the interests and identities of those involved be protected?

- Is it possible to guarantee the confidentiality of the information given to the researcher?

Firstly, before any group of students start the drawing tests it will be explained what the aims of the research are. It is anticipated that at all these sessions the group tutors will be present. It will be made quite clear at each session and with each group of students that they are free to withdraw from the project at any time.

Secondly, it will be explained that their identities will be protected. They will have to access the computer tests using their own names, but no one outside the University and the researcher would use their individual names and the resulting data would not be on an individual basis but on a college basis.

Finally, if any of the students were later interviewed on an individual basis their identities would remain anonymous.

Procedures

Having gained permission from the relevant heads of departments a timetable of testing had to be established. The diversity of the courses, the timetables of the students and the commitments already in place meant that the actual testing would take far longer than originally envisaged.

The Drawing tests

Dates for the administration of the drawing tests with the five different groups was arranged to fit in with their tutorial sessions and the researchers teaching commitments. The only resource needed for the first test would be a room that the students usually used for their timetabled tutorials. The researcher provided all the materials.

The drawing tests would be completed first. These would be the easiest to administer from the point of view of accommodation, because the students were in their usual rooms/bases at their normal timetabled times of the week. The tutorial times for each group of students were at different times of the day.

For each of the drawing tests the individual group tutors were happy to be present and help students who were less able readers to complete the factual written questionnaires. Each session lasted one hour. There was no leeway on the question of time. Each of the seven groups had to leave their tutorial rooms and be in different parts of the college to resume taught sessions, the timing of the tests and answering of the questionnaires had to be completed in the hour. The plan for each session for the drawing test was as follows:

Timetable for administration of drawing tests

One-hour duration.

1. Explain to the students the reason for the research 10 minutes.
2. Ask them to take part (allowing for any one of them to withdraw) and the completion of the factual questionnaires 10 minutes.
3. Start by getting them to draw the four objects (4 minutes allowed for each drawing). Total 20 minutes.
4. Collect drawing tests. 5 minutes.
5. Plenary session for collection of results and any questions 8 minutes.
6. Time to get to next lesson 2 - 5 minutes.

The verbal and non-verbal computer tests

Using the same timetabled tutorial sessions as the drawing tests but one term later the CAT3 computer tests will be completed. The use of the room will be more difficult from a location point of view as all the students will have to move to a different part of the College to physically take the tests. Time has to be allocated for this and means that in order for the students to take the computer tests they will have to overlap other taught sessions. This could prove to be a logistical problem, as well as interrupting the teaching time of colleagues. During the administration of the computer cognitive tests there was no requirement for the tutors to be present, so theoretically they had a free session. It was hoped this compensated for students turning up later than planned for their next sessions.

CASE STUDY FINDINGS

Introduction

The case study findings are organised case-by-case analysing data from different sources including teacher notes made for children A and C at the time when they were in primary school, notes made when the children attended an out of school literacy class and other school data obtained from parents together with outcome derived from the interviews.

The results of the interviews during their teenage years showed that all the children recalled being happy toddlers and pre-schoolers. The mother's recollections at the time their children started primary school was that their children were ready for school and the children were happy to go to school.

Before school all the children had enjoyed either physical or creative outdoor play more than traditional indoor play that involved gender related activities like dolls and toy cars and action men. All the children attended pre-school play provision playgroups or nursery settings. All of the families lived near family and friends and reported having a strong network of friends in the communities in which they lived. The mothers all worked in a part-time capacity in order to accommodate their children coming home from school and the school holidays. The fathers were all in full-time work. All of the children had older siblings and no problems with sibling rivalry were reported.

The following shows the results of each interview with each mother and child. Table 10 shows the results of the factual questionnaires.

Child A

Male Age 19

Status at time of interview: Second year student at studying 'A' levels.

I first met child A when he became part of my year 2 class in 1991. He was a pupil in the class for one year. I found that although he was outwardly confident and happy to talk in front of the class during carpet time and when asked to show a piece of his work, he was a slow reader, had no understanding of phonics and reluctant to write without adult support. He was a child who had lots of ideas for story writing but needed the class teacher or the LSA to copy write his work for him. This was at a variance with other children in the same class who were quite happy to draw a picture and write a story using scribble writing and then emergent writing. As his class teacher it was impossible to understand why writing (or having a go at writing) was so difficult but equally there was a realisation that he produced good coherent stories with adult support.

Conversely he was able to draw and construct in three dimensions at a variance with his reading able peers. He was a shy caring child, with friends and able to converse with adults. He enjoyed stories and he understood their meaning. He was able to retell stories and he had a good imagination. He was not afraid to speak out in class or to ask questions. The researcher taught child A in school for one year and out of school for two and a half years. Child A was interviewed in 2002 as part of this research when he was eighteen years old.

Table 10: Child A

Mother	Father	Brothers	Sisters	Normal birth	Happy baby	Walked	Talked	Early ailments
Part time nurse	Architect	2 older	0	Yes	Yes	1 year	18 months	None

Playgroup	Nursery	Happy	Played with indoors	Play outdoors	Started school	Friends	Upper School	Extra help school
Mornings only	No	Yes. Happy at playgroup.	Lego Paints Drawing	Building models using tools, bikes, adventure play	Village school aged 5 years	Yes, good friendship group	Comp.	Yes

School history: Attended a village primary school, then rural upper school followed by an art foundation degree course. Not on a special needs register, had extra support from year 2 until year 5 with literacy (outside school). Had plenty of ideas for writing but unable to write alone. Poor spelling skills from the outset and with no understanding of phonics.

Personality: Shy and sensitive, had school friends, caring nature, observant of the world about him.

Playgroup: In village hall - only started at age 3 part time (3 mornings a week) increased to 5 mornings a week by 5 years old.

Literacy Problems

- He was slow to read, when he joined the class Child A was reading at level 1 on the Oxford Reading Tree Books compared with the majority of the class who were reading at level 2 and above.
- He was unwilling to have a go at emergent writing unless the teacher or Learning Support Assistant (LSA) sat beside him and acted as scribe or wrote his story/journal/science out for him for him to copy.
- He was a perfectionist with his writing, every letter and word had to look even. He took a great deal of care with the actual writing.

- He lost his place easily when reading and would become distracted and look into space.
- He had no phonic understanding, he could recite the alphabet but unlike the majority of other children in the class he did not know and could not remember the phonic-meaning of the letters.
- He did not seem unduly concerned that he could not read like the other children, and never got frustrated when he had not written as much as the others.
- He was good at sharing and telling stories and accounts on the carpet. He did not mind speaking out in front of the class and he was able to orally explain all his ideas in every area of the curriculum.
- He did not have any problems in year 2 understanding or recording either mathematics or science. Most of the work in both areas was practical and this suited him.

Towards the middle of year 2 the researcher became concerned that Child A was not making progress with his reading compared with the rest of his peers and despite the fact that his very supportive mother was reading with him every night, both reading scheme books and story books. Mother was also concerned that he seemed to be unable to read and it was agreed that he should be given extra support for this in school and for work on spelling. There was also a reluctance on his part to not scribble write but to draw very mature, usually three dimensional drawings, before writing that related to what he wanted to say, but then to sit and stare into space or out of the window.

This resulted in the researcher writing down what he told her and child A copy-write the words. However, while this type of scaffolding was positive reinforcement and provided encouragement, it meant that child A usually only finished writing half of the story he had told the teacher because of time constraints. This must have had a detrimental effect on his literacy because he never finished a task. Additionally he was not prepared to reduce what he wanted to say. Another method of getting children to write is to get them to write their story in cartoon form, by dividing the paper into rectangles and asking them to draw a picture in each rectangle and write a few words underneath each picture, so that

eventually a whole story is written. This method did not work for child A because he wanted to write the whole story in his own words himself. This posed a predicament for the researcher as the class teacher, because she did not wish to stifle his creativity but at the same time he needed to be able to finish written tasks.

The biggest stumbling block to his writing appeared to be a mismatch of his ability to use mature words in his describing what he wanted to write and his inability to spell words that went past consonant-vowel-consonant words i.e 'c-a-t'. The following is an example of the type of language child A was using for his writing at the age of 6 year, 'and suddenly I saw a bright light in the distance and then I saw it was a wizard with an extraordinary lamp'.

The disparity between what he could achieve verbally through his good imagination and poor writing skills continued throughout his second year in school. At the end of this period his mother approached the researcher and asked if he could have out-of-school support with his writing and spelling. At the beginning of year 2 he was not achieving a score on the Schonell reading and spelling tests. By the end of year two he was scoring the following:

Schonell Reading Age	7.0 years
Schonell Spelling Age	6.2 years
Chronological Age	6.11 years

During his out-of-school tuition the researcher concentrated on his creative writing ability, spellings, grammar and comprehension exercises. These improved his writing ability and the speed at which he could write and as a result he began to be able to finish written work in school.

Child A continued with his love for art and design outside school and was given every encouragement in the home to use tools and materials and paint whenever he wanted to.

In primary school a different creative talent developed in year 4 when it became apparent to his then class teacher that he had a real skill for drama. His shyness disappeared and in year 5 he took the lead role in the schools production of 'Joseph and his Amazing Technicolour Dream Coat®'. He had no inhibitions about performing and portrayed Joseph

through the role of Elvis Presley. From this performance his primary school teacher developed his talents further by encouraging him to write and direct small plays that the rest of the school could watch during the end of week assemblies.

By the time he was eight years old he had no more need of extra out-of-school support. He continued being a caring but individual member of the school until he went to Upper School when the researcher lost touch with him.

Analysis of teenage stage interviews with child A and mother.

Child A could remember a happy early childhood. His family were 'stable' supported by family and friends, and he had brothers and local friends to play with. By his own affirmation he enjoyed outdoor and creative play having had the opportunity for both. His father was restoring their house and as an architect he encouraged his three sons to be creative by letting them use tools and constructing models both in and outside in the garden. As a result both house and garden provided opportunity for creativity. The garden led out into the countryside, which meant that he had more freedom beyond the boundaries of the house.

Play, using construction toys formed a large part of early childhood, by his own admission when he was aged 18, child A still enjoyed using Lego[®] to make models. Freedom of mind and spirit was also important to him from an early age. The ability to make his own decisions about outcomes and the length of time he could spend completing a task were, according to child A, always important. He said, "I can remember from a really early age, say 8 years old, realising how important it was to make your own decisions about how you worked at a task. I also used to get frustrated if I did not have enough time to finish a task, I could not see why we were not given enough time, to finish things like art, stories and technology."

The interviews with child A and his mother showed that from an early age he was very creative and had an imbedded need to produce drawings and construct objects. Duffy (as cited in Moyles, 2005) says that children are being creative when they use materials in new ways or combine new materials and when they make discoveries that are new to them. These were important aspects to child A's early childhood. Until he started school

and entered the infant department, the ability to create, explore and discover were opportunities open to him each day his mother said. Child A said that he remembered freedom of opportunity and the opportunity to make and construct models was something that was encouraged positively at home all the time. Entry into a structured infant class may have changed that and meant that his freedom to explore his own world was taken away. Anning and Ring (2004) found that boys use of drawing for meaning was unacknowledged by practitioners until they were at a stage of visual realism. In Child A's case this may have impacted on his willingness to be motivated towards school, if what he could do easily was not recognised by the early years teacher, he may have become disinterested in work that he found difficult.

Child A said he remembered that playgroup provided a happy environment for there was a lot of opportunity for structural play and climbing equipment and outdoor play. He said, "I did not remember any problems and I enjoyed my time there." The unstructured learning and social environment suited him, he said and he got on with the other children most of whom he knew from playing in his village. Bilton (2004) stresses the importance of outdoor play and claims the naturalness of the environment offers freedom to develop ideas and make decisions that cannot always be replicated indoors. For Child A this would have been an important factor in his childhood before school where he was given a great deal of space and encouraged to use real world tools and equipment and to be creative. The classroom may have been stifling for his natural creativity.

Child A's mother said that she had no concerns about her son starting school. His older brother was already in year 3 at the same school and he had friends at playgroup who were starting school at the same time. Links between playgroup and the school had been made before he had started school. The Year 1 teacher visited the play group and met new children who were coming into school for the first time and child A, his mother said, went on a visit to the school for a day before he started. Neither of them could remember any worries about him starting school although mother did say that she was concerned that the year 1 teacher was fierce and expected the children to work all the time. But she said, "I did not think that my son would not be able to cope because he was so confident and creative at home and at playgroup and he had lots of friends."

For the first two terms his mother said, "I had no concerns, he was starting to learn to read the early reading scheme books and he seemed happy." Child A confirmed this saying that he thought the infant class was fine. However, mother said by the end of the second term she became concerned that he was not reading as rapidly as her first son. She said, "At the first parents evening I voiced my concerns with the class teacher but she reassured me saying that his reading would improve with maturity." The researcher asked mother if she was concerned about his writing and she said, "No, he seemed fine and the class teacher did not say anything about writing." Equally mother said the teacher did not mention anything about his drawings which were good for his age, or his vivid imagination for stories."

At the end of his first year in school child A was still on the first level of the Oxford Reading Tree Reading scheme books. At the end of the first term of his second year in school, mother visited the researcher in school who was also concerned that his reading was not improving, and importantly despite being able to draw freely and in three dimensions was not willing to have a go at 'emergent writing', unless an adult sat next to him and wrote all the words on a piece of paper.

He was assessed in school using the Schonell Reading and Spelling tests and the results were no scores for either reading or writing despite the fact that his chronological age was 6 years 1 month.

The result of this initial assessment was the introduction of an Individual Education Plan (IEP) and support in school on a one-to-one basis for one hour a week, and out of school support also for one hour a week, in the form of literacy support lessons. In both situations this used a structured phonics approach, Alpha to Omega, which encouraged the use of tactile and practical learning of phonics through wooden alphabet letters and actually drawing the sounds while sounding them out. This visual approach meant that child A was using his visual strengths to support his reading and spelling. This structured teaching method was maintained in school until the age of 8 years when one-to-one support was withdrawn, and out of school until he reached the age of 10 years. By then child A was able to keep abreast of his contemporaries in written work, although spelling remained an issue throughout school and University, and he continued to have a need to get everything he wrote on paper to be accurate the first time.

The results of Child A's reading and spelling scores at the age of 10.3 years were:

Schonell Reading Age	11.1 years
Schonell Spelling Age	10.0 years
Chronological Age	10.3 years

At the year 2 parents meeting the researcher established that child A's father had had similar reading and spelling problems when he was at school. Gilger et al., (1991) estimate that the risk of a son being dyslexic if he has a dyslexic father is about 40%. He was able to understand his sons' problems, while at the same time appreciating the importance of creativity as a means of conveying understanding. In his work as an architect he said that he had used his creative ability to compensate for his literacy difficulties by becoming involved in art and design at an early age.

When he was interviewed child A remembered clearly his difficulties with reading and writing. He said, " When I was little and I wanted to write a story or something I remember I had all these ideas in my head which I wanted to make an exciting story out of but because I could not write and spell well I got turned off and impatient." He went on, "I can remember how miserable it was to be able to visualize things in your head but not to be able to do anything about it, so then it got boring and you did not do it." When asked about his problem with reading he said, "I remember I found it hard and I was slower to learn to read than my older brother, but I can't remember why I was like that." His mother confirmed what child A said saying, "I thought that there was a problem when he could not read at the end of year one in school. His brother had been able to do that and we did read with him most nights at home with the home school diary." Mother too could not define the problem saying, "He just seemed not to understand the relationship between the phonic sound and the words on the page, he could not sound out the words." Child A remembers that he realised that he was not particularly bothered that he could not read but thought that from his mothers' point of view she just wanted him to be able to read like everyone else. However, both mother and child said that as soon as he received individual support both in and out of school the problem of reading improved and he was able to use the beginning knowledge of phonics to support his reading.

With extra support his writing improved both in school and with out of school help. Both used their knowledge of his love of construction toys and art to support his writing so that

he was encouraged to write about things that he had made or adventures he had had. His class teachers supported this and also encouraged his creative side. In year five when Child A played the lead part of Joseph in the school production of Joseph and his Amazing Technicolour Dream Coat® the researcher watched the performance and the energy and vitality and skill that Child A used in the production was evident throughout, showing that he had strong spatial skills for drama at an early age.

Child A admitted that throughout his school life his spelling had not been good 'only passable' and this was confirmed by his mother. Reid (2007) says 'many children with dyslexia find spelling more difficult than reading, and this can persist well into adulthood'. Importantly because child A was encouraged by both his parents and his schools to fulfil his potential using his strengths, he did not therefore suffer poor self-esteem and lack of success many dyslexic pupils encounter (Montgomery, 2007).

From the point of view of creativity and the arts the contrary view applied to child A. At the time of interviews he was in his second year as an A-level student and was in the process of applying to Universities for a place to study art. His first choice was Central St. Martins' college of Art and Design, London (where he completed his degree in art). He had become a confident mature student, who was able to talk maturely about his love and experience of art.

Studying art, technology and drama at A-level, child A was able to intuitively explain his reasons why he liked the subjects. When asked why he liked drama he said, "I like creating stuff, especially with art you don't have to question, you don't have to have a particular answer. In the area of art you are not forced to do anything against your will you can be a free spirit." He admitted, "Like at primary school when I did Joseph. At the moment I am in the middle of a new drama production, 'Dracula' and I ended up with the lead with solo songs to do." Asked if it made him nervous or inhibited he replied, "No, I love watching physical things and doing them, there are so many different things you can do and every individual expresses himself or herself differently."

The researcher pursued the question of child A being able to 'do his own thing,' by asking about the role of the director? He responded by saying, "I do have respect for the director but at the end of the day I will do my own thing and bring my interpretation to the

production. The good thing about drama is that people in two different rooms can come up with two different ideas and yet it is the same thing (the production), each one is different and no two ideas are the same.”

When discussing art, he said, “I like the opportunity to be an individual, for example for my year 1 art A-level project I wrapped one of the school trees completely up in cling film.” He continued, “I am a great fan of the Tate Modern and the interpretation of life in many different ways, I guess I tend to see things differently from a lot of people.” When asked what skills he thought he needed to be artistic and whether he considered that he had good spatial strengths he said that he thought that he had good hand/eye coordination (mother confirmed this), and he thought that he had a good ability to ‘capture’ things from a different perspective.

The researcher asked what he meant by this, and he alluded back to the ‘tree’ he wrapped in cling film, but went on to say that maybe his future lay in photography. He talked about a school trip he had been on the previous year to Madagascar when one of his responsibilities on the trip had been as the group photographer. The researcher was shown the photographs, which for a seventeen year old were very mature. In many of them he had concentrated on the Madagascan people capturing a different perspective. The photographs showed an inner understanding on his part of the lives of those individuals, their work and living situations, they were very intuitive. Child A said, “I was very annoying on the trip with the other kids because I had to get my photographs ‘just right.’” However, he added, “It gave me the opportunity to enjoy photography, it made me look at things and people in particular. In fact I really like the idea of becoming a famous photographer who just photographs people - you can tell a lot about people from their faces.” When asked, “Do you mean personalities?” He said, “Yes, for a lot of the time, but you have to realise that people’s personalities change, for example my personality has changed, I used to be really quiet as a young child but I’m not now. I have an idea of what I want to do and I want to do things quickly, I don’t have time any more to hang around.”

On the subject of technology he reiterated his need for freedom of choice and admitted that the choice between art and technology was a difficult one because he liked both areas. At the time of the interview his technology assignment was to design something for

carrying things. He said, "I can be an individual so I am inventing a bag for sports people that they can carry anywhere and not just to the gym. There will be two crossover poles that can be folded in so there is nothing in there and it will be part of your clothes that are suitable for skiing and cycling." He went on, "I always find that I never have enough time in my life and if I was cycling then I need to be there in a hurry, so there would also be a drink in the back and an inbuilt straw - brilliant." Asked why he was so excited about the new project he said, "I know the finished product will be good and I like the idea of showing what I have done to the others in the class."

Child A's mother confirmed that her son was really doing very well with art in school. She said he had taken her on several occasions with him on trips to art galleries. Talking about the Tate Modern in particular, which she confirmed was his favourite place, she said, "I never understood or appreciated modern art until my son took me to the Tate and explained why the artists had drawn and sculpted in the way that they had. I have always been interested in art, but learning through (*name*) has changed my whole perspective on modern art and made me aware of how sensitive his work is and the work of others."

There were several factors therefore which impinged on child A's early schooling which may have impacted on the way he took on meaning and learning in a very structured early school environment? By his own admission even at an early age he placed great emphasis on being allowed to be creative, to take learning at his own pace and to not want to be pushed into activities that he did not see as relevant. His first teacher did not understand how important play was to child A and his learning. Child A's mother concurred with this but also said, "I think it is important that by the age of five or six children start to settle down to learn."

Figure 6: Strengths and weaknesses

Child A	Strengths	Mother A	Strengths
	Trying new things		Confidence
	Trying lots of new experiences		Popular
	Knowing that everyone is different, my trip to Madagascara was important here.		Someone who is able to talk about his feelings
	Meeting people and enjoying their company		Understanding of other peoples feelings

Listening to people	Someone who works well with other people
Knowing what you want to do - like being a photographer	Someone who is mature
The ability to see things from different angles	He was able to use good hand eye co-ordination to make extraordinary pictures
Good hand eye co-ordination	
Weaknesses	
I tend to always be in a hurry	That he was very messy
I need to get everything just right	

The researchers view

The researcher first met child A when he was a member of her year 2 class. He was shy and sensitive and had an extremely caring disposition towards other children and a great deal of patience listening to other children in the classroom and on the playground. The researcher considered him to be very observant as he would spend time looking at objects before he started a task, whether it was a story, art or technology. This was detrimental from the point of view of writing stories because he was almost the last child to start a story. However, by his own admission in the transcript of my interview with him, he had plenty of ideas but could not get them down onto the paper.

If he were tackling a piece of art he would turn the paper and stand and look at what he was going to paint for a long time. He enjoyed using construction toys and kits like Lego® and was able to construct sophisticated bridges out of kits with spans and supports and three dimensional kit houses, he could also draw in three dimensions.

Career choice

Attended Central St Martins College of Art and Design and obtained an arts degree. He is now a self-employed artist in London and recently featured as one of the six artists chosen by The Saatchi Gallery to produce art for an exhibition in 2010 at The Hermitage Museum, St. Petersburg. He is a happy and contented adult who has retained his close family links. His outside interests apart from his art is photography.

Child B

Male Age 16

Status at time of interview: Still at school doing GCSE's.

The researcher first met child B when approached by his mother to teach him after school on a one-to-one basis for one hour a week in 1996. He was nine years old and three years behind with both reading and spelling. He did not attend the primary school the researcher worked at. He was able to converse with adults; he was also able to understand that he needed help with his reading and writing. He disliked school but was excelling at ice hockey, which he found both exciting and interest consuming. He was attentive, somewhat shy, but had a great distrust of school, particularly teachers. He had a kind and understanding nature particularly towards his family who he adored. He was willing to have support with reading but tended to be lazy and not that willing to do the set homework. His one-to-one support for reading with the researcher lasted three years. The researcher later interviewed child B in 2002 as part of this research when he was fifteen years old.

Table 11: Child B

Mother	Father	Brothers	Sisters	Normal birth	Happy baby	Walked	Talked	Early ailments
Part time secretary	Self-employed floor layer	1 older	1 younger	Yes Tongue tied at birth	Yes	13 months	2 years	None

Playgroup	Nursery	Happy	Played with indoors	Play outdoors	Started school	Friends	Upper School	Extra help school
Mornings only	No	Yes	Lego Duplex Puzzles	Gardening. Helping Dad with carpentry. Bikes	Village school for 2 months before 5 years then city school.	Yes	LEA Comp.	Yes. Upper school years 7 – 10

School history: Attended an urban primary school and rural upper school. Intending to leave school at 16 to do a NVQ Level 1 carpentry course. On the special needs register, identified by upper school as dyslexic. Received additional support within and outside school.

Personality: Shy and sensitive to the needs of others. Dry sense of humour, played sport at County level and on selection list to represent Country. Popular with other school friends.

Playgroup: Village hall - started at age 3 part time (3 mornings) increased to 5 mornings a week by 5 years old.

Literacy problems

Child B stayed at the village primary school for only six months and the family moved to the city. He attended an outer city primary school with a multi-cultural catchment area. Despite the rocky start on the first day he had made reasonable progress with reading and writing at the first primary school. His mother said, "By the time we moved to the city school (name) could read three or four words on the pages of The Oxford Reading Tree Books. I did not have any thoughts that (name) would not be able to read in the same way as his brother."

By the time of the first parents evening at child B's second primary school his mother was concerned about his reading. In the nine months he had been at the school she said his reading was no further forward than when he left the village school. Mother said that she explained to the class teacher that when child B left his village primary school he could read a few words on the page of the early readers. However, the new class teacher was, according to Mum, 'confrontational', saying child B, "Could not read at all." Mother said she felt deflated, and that successive teachers in the school were disinterested in the lack of her sons' progress. Pugh, De'ath and Smith (1994) claim that 'parental confidence is the key to much of children's success, and that parents need to be informed and encouraged about the nature of the curriculum for their children'. They point out that, 'sharing information demands a shared understanding of what children are learning'.

For child B's mother this was not the case throughout the primary years. There was a negative response to his needs B until he reached Secondary School. His parents approached the researcher when he was reaching ten years of age to help with after-school tuition. As a matter of course the researcher approached the primary school teacher and asked if a meeting could be arranged to plan the best way forward for him. At the time his reading and spelling ages were as follows:

Schonell reading age 6.10 years

Schonell spelling age 7.0 years

Chronological age 9.6 years

The response was good and there was a realisation on the part of the school that help was needed. The school did not use any structured reading and spelling schemes, which made it difficult to work in tandem with the teacher in improving child B's reading and spelling ages. However, good links were made with the secondary school that was outside the catchment area of the primary school he was leaving.

Immediately he arrived at his new secondary school he was given intervention help through the school's special needs unit and one-to-one help. The support continued throughout the next four years of his upper school and according to both mother and child helped him become more confident. His individual out of school support also continued for three of those years so that by the time the researcher stopped teaching him his reading age and spelling ages were as follows:

Schonell Reading Age 11.3

Schonell Spelling Age 9.8

Chronological Age 12.9

Child B attended the after school club for four years from the age of 8 years until he was 12 years old. The programme he embarked upon meant that his learning in literacy went back to basics and with a lot of one-to-one tuition he learnt the phonic alphabet in the first instance and then using the structured spelling scheme Alpha to Omega from which he learnt how to spell and apply this knowledge to his school work.

Progress was slow but by the time he entered upper school his reading age had improved to the following:

Schonell reading Age	8.2 years
Schonell spelling Age	8.0 years
Chronological Age	10.9 years

By this time his parents had ensured that the transition from his inner city primary school to his rural upper school was as smooth as possible and they made sure that the school was aware of the fact that their son had needed support before he started at the school. He did not have a LEA statement of Educational Needs, but the school made contact with the primary school before he left to get an assessment of needs. As a result, when he started in the upper school, he was allocated time in the school's literacy support unit where he built a good relationship with the units tutor. She also met with the researcher and between the two systems of support both within and outside school child B made good progress in his first two years of upper school.

Analysis of teenage stage interviews with Child B and mother.

Of the five case studies it is the researchers opinion that child B's literacy problems were the most difficult to remediate. He had problems with recalling from memory letter strings and blends. He was willing to co-operate with out of school help but seemed demotivated and believed that he was unable to actually succeed with literacy. He had poor motor control with his handwriting as a result of an accident when he was a toddler. It was certainly true of his writing that was uncontrolled and as a result he could not write quickly, which in turn was difficult in the classroom.

Child B did not have a particularly good imagination when it came to writing and ideas for writing; this too was a hindrance to progress. However, the researcher was inclined to believe it had to do with lack of success and praise for his efforts in the primary school. He had reached a point when he failed to see the relevance of reading and spelling. By his own admission at the age of twelve he said to the researcher, "When I leave school I shall work with my Dad either as a floor layer or working with wood." This links directly to the work of Poskiparta et al., (2003) who found that children understood

that learning to read is highly valued by both teachers and parents and that if a child makes slower progress than his/her classmates he/she becomes easily exposed to a cycle of repeated failures that increases their vulnerability within the school system.

This may have meant that child B saw no particular reason to respond to school. His nature was easy going and caring of his family. He understood that if he just stayed on course then he would leave school and have a job that he would enjoy. Equally, he and his family could have suffered with the concept of 'making do', which (Devereux & Miller, 2003) point out exists when children have to abide by one stated version of what the curriculum should contain. There is no flexibility in the curriculum to adapt the contents to meet the individual needs of the child.

Equally, child B did not really understand from the outset what was expected of him in school. According to him he 'hated school' and 'could not understand why the teachers could not understand that every child could not read and write easily'. In a study by Southgate-Booth (1986) into the reading strategies to teach reading used in schools, they found that common practice involved the teacher hearing a child read for about fifteen seconds a day whilst managing behaviour at the same time for the rest of the class. In child B's case this was an overestimation, because the scheme used in his multicultural primary school was according, to child B, his parents and the interview the researcher had with the school quite different. Here the school employed a 'paired' reading scheme, where older children listened to reading in the school during a reading time of thirty minutes a day. The older child (not the class teacher) would write in the child's reading diary for home/school links. The teacher would hear individual children read perhaps once every two weeks.

The school had taken on the concept of 'real books' endorsed by Smith (1972) that encouraged children to read books that interested them. Whilst a colour-coded scheme was available too, the books that came home from school for him to read were 'haphazard' according to mum. This was borne out by the researcher who, when she first met child B found that his parents had bought readers from a bookstore which were too advanced for his reading age. This was because, as mum said, "We had no idea what books he should have been reading." The look and say method of reading which places emphasis on meaning obviously did not work for child B, because he was unable to read

and equally he was unable to anticipate or predict what could occur both in meaning and language structure, something which (Clay, 1979) found that good readers could do easily.

Interviewing child B the researcher started off with questions about early play. He said, "I remembered playing with bikes and that playing in the garden was really important because it offered freedom." He could also remember helping and playing with wood and materials in dad's workshop at an early age. He said, "Dad was always letting both my brother and me have a go with wood and tools and things, he never said you can't do that." He could not remember playgroup at all he said, on the other hand he could not remember being unhappy at playgroup either.

About school, he said it did not go well from the outset saying the village school was, "Alright, but I hated the city primary school. The problem was the teachers who weren't nice and shouted a lot". He also said, "My problem is concentration, I'm not good at concentrating because I don't like the work and I am not successful at it. In primary school it was awful I never liked reading. I like listening to stories but not reading them". About spelling he said, "I am not sure what went wrong with spelling, I just hated it and I didn't like getting things wrong in a spelling test". Mother confirmed this saying her son always got worked up when he had a spelling test. When asked what he thought the actual problem was with spelling Child B said, "To start with, before I had help, I never understood the phonic alphabet, I did not understand that by knowing the sounds you could begin to work out the words." He went on, "I was slow at reading probably because I did not know how to work things out and when I came to write spellings the letters got muddled." The researcher asked if he knew if the words he was spelling were wrong, and he said, "Not really, I think that was part of the problem too." He said, "Even if I got words right in a spelling test I could not remember them again."

In primary school, child B remembers being cross and frustrated at being withdrawn from the class for extra literacy lessons. He said, "It was always in the corridor and mostly I had to miss art and cooking to do the work. None of this helped my confidence because I never wanted to ask the teacher if I did not understand in case she said I was thick." He remembered most of the work he did outside the class was reading and spellings but he could not remember how this impacted on his work once he got back into the class or whether mum knew what happened in these extra lessons. Mother confirmed that she knew he had extra help but did not know what he did. She said, "The problem with that

school was that you never got told anything.” At the time of the interviews child B believed his best subjects in upper school to be mathematics, geography and design/technology because he said these were all practical subjects.

In other areas of the curriculum at primary level child B said he made steady progress, “I coped with mathematics, but I hated all the worksheets. I also hated it when the teacher shouted at me because I got my sums wrong, because everyone could hear and thought I was thick.” The researcher asked what he felt about this? Child B said, “It made me sad but I knew when I was away from school I had a happy home and lots of friends so I put up with school.” He added, “By the time I was leaving the primary school I had extra help with my English and it was getting easier to write.” The researcher asked how he had progressed with mathematics in primary school and he said, “That was OK, I was never great but I got by.” As sums and worksheets had made him frustrated he was asked how he thought he should have been taught mathematics and he said, “I think it is much better to teach mathematics using practical things. Worksheets mean nothing especially if you can’t read the instructions properly. But if you are holding objects and using equipment to work things out it is much better.”

Child B was asked if overall he felt supported in school? He said, “Definitely not in primary school until I had extra help and you went into school to talk to the teachers. Then everything changed. I got better with my English and they realised that they had to help me.” About upper school he said, “It was good at upper school. Right from the start I had help, Mrs (*he named the teacher*) in the unit was great and helped me lots, I didn’t mind going out of class and I trusted her, it was good.” Asked what he thought about the work he did in the unit he said, “It was a lot of repetitive spellings we used the Toe by Toe Scheme and we did writing which I used for my class work like English geography and history.” When asked if he minded the repetition he said, “I put up with it because I knew I was getting better at reading and writing and I knew Mum and Dad were pleased and overall I enjoyed upper school with friends and things so the whole thing was bearable.”

At the time of the interview child B was working towards his GCSE examinations. He was taking five subjects English, mathematics, science, design/technology and geography. Throughout his upper school years he had not done languages because additional time in school had been spent on extra support for literacy. He said, “I am happy with taking just

five subjects I can cope with that and know that if I get C grades for mathematics and English I can go to College, I want to do carpentry.”

Asked how he felt his reading problems had impacted on him in and out of school he said, “I think the way that I was treated in primary school was not good, but I had a great family and lots of friends and underneath it all I knew I was good with my hands and making things.” He went on, “Dad was always great with me he let me build and make things and always gave me lots of praise, and I know when I leave school I can work for him and I will be doing something that I like.” He said, “Mum worries that I can’t keep up with reading but she knows that has improved and that I am confident outside school.”

Talking about Ice hockey child B said he felt he had become really proficient at the sport. This interest had developed since the age of nine when he was taken to an ice rink with his brother who was having ice skating lessons. Child B said he found the ice ‘exciting’ and something that he could do ‘easily’. He said, “Mum and dad said I could have lessons and then I got interested in ice hockey. By the time I was ten I was playing for the region”. He said, “Nobody pushed me into doing this, it was my idea, it was my talent.” By the time he was twelve he was playing ice hockey at a national level and had become accomplished in the sport.

The researcher asked what it was about ice hockey that appealed to him? He said, “It is a fast physical game and I like the action.” He went on, “It is also a game of tactics you really have to think where you are putting the puck, you have to think all the time and you really have to think where you put your body and the actions that you do.” He was asked what particular skills were needed to play and he said, “You need really good ‘hand/eye’ coordination and you have to be able to think about what goes on at all sides of you on the rink.” He said, “It’s almost as though you have to see what’s not there but is there. Like having eyes in the back of your head, you have to guess what is going on behind you so that you do not lose the game. Not only do you have to think fast you have to be able to control your movements. Your brain and hands and legs all have to work together physically and you need a good sense of balance.”

The researcher asked about the rigid nature of the training and learning new skills in the game, listening to instructions, did he find this hard? He said, “No I take all that on board

easily, I want to play and I want to train, nobody forces me to do it, it's my own choice. I know that if I wanted to give up tomorrow mum and dad would support me, they would not force me to stay with it." Talking about his future He said, "It's important that the work I do I enjoy, I know sometimes not all work can be good, but I want to work in an area where I know I can succeed and be creative and come away at the end of the day and know I have done the best I can. I shall carry on with ice hockey and sport again because I really enjoy that.

Emotional qualities

Figure 7: Child B strengths and weaknesses

Child B	Mother B
Strengths	That he had lots of confidence, especially talking and relating to adults
That he was physically strong	The he was very caring with his family and friends.
That he liked to help people	
The he was a caring person	
He was great at ice hockey.	
Weaknesses	
I can be lazy	That he could be lazy
I will never master spelling	

The researchers viewpoint

Child B was referred to the researcher when he was nine years old and towards the end of year 4. Both his parents were very concerned about his progress. The inner city primary school that he attended was in a multicultural area and the school reading policy was a *shared* reading scheme, whereby older children listened to younger children read. By year 8 the older children were assumed to be more accomplished readers. His teacher listened to reading occasionally but not every day. He did not always read to the same older child and it was the older child's responsibility to write in the reading diary.

For child B this strategy was obviously not working because when the researcher first met him he was reading Oxford Reading Tree books and struggling at level 3. His mother had bought him the Oxford Reading Tree Extension books, the Jackdaw series, but judging by the piece of free writing he was asked to bring with him to the first meeting these books would have been too difficult.

When child B read level 3 Oxford Reading Tree books he did not have secure knowledge of the phonic alphabet, and no understanding of how to apply what phonic knowledge he did have to the written words. No knowledge of blends was in place and he did not know the first hundred essential words. His handwriting skills were poor and his pencil grip awkward, his writing was slow and he did not have the confidence to have 'a go' at spellings without asking for help.

Conversely, he was found to be outwardly confident, able to hold a discussion about school, home life and interests and equally he was aware of his limitations with literacy. He did not blame school but he admitted that when it came to schoolwork, "My confidence is poor and I hate not being able to keep up with the other children in my class."

Child B had a poor pencil grip following an accident with a door when he was a toddler and he had not gained the strength back in one of his fingers on his right hand. He had been diagnosed as being short sighted, but he refused to wear his glasses at school.

His love and competence for ice hockey superseded his love of school. The researcher understood from conversations with him that ice hockey was a passion and was a skill that he considered to have real relevance in his life. It was something that he easily succeeded at and additionally, it was a skill in which he achieved high status by playing at national level.

His motivation for ice hockey was a variance with his schoolwork. Ice hockey was something he was prepared to work at whereas he was not so prepared to work at school. He attended extra lessons for three and a half years and made slow progress. He was very happy to attend and he appreciated the help that was given to him with homework, especially in upper school, but his mind was not on academic work.

He found writing and using a pen difficult because of his injury and as a result he wrote slowly. He was supposed to wear glasses for reading and written work but refused to do this because he said, "They are not cool." This would have had an impact on what he could see on the page. Child B was not difficult and he did not show any problems in the class in school, he was stubborn and appeared not to want to take risks with written work that would mean that he had made a mistake.

However, he completed the homework that was set by the researcher and his upper school and he remembered 75% of the spellings that he had been given to learn. He was not prepared to read books either in his out of school lessons or with his parents but he was prepared to listen to others reading to him. He remained a cheerful, happy go lucky teenager for the duration of his extra teaching and realistic of his own ability.

Career choice

He left school at sixteen and joined his father's floor laying business. During the two years after leaving school he also joined an apprenticeship scheme at a Further Education College and studied carpentry. His specialisation is wood and wood flooring designs. He is a happy contented adult who has also retained close links with his family. His outside interest remains ice hockey.

Child C

Male Age 16

Status at time of interview: Takings GCSE's in rural upper school.

The researcher first met child C when he became a member of her year 2 class in 1993 when she taught him in school for one year and then out of school on a one-to-one basis for reading and spelling problems for two years. Child C was outwardly happy child in class and he had good friends, was always willing to learn and could converse with adults. He enjoyed listening to stories, and could understand stories from the point of view of content. He would not write unless he had an adult sitting next to him. He could sometimes be a bit of a dreamer. He excelled at model making compared with his peers and understood how to make working models from kits and from junk modeling. In 2002 the researcher interviewed child C as part of this research when he had just entered his sixteenth year.

Table 12: Child C

Mother	Father	Brothers	Sisters	Normal birth	Happy baby	Walked	Talked	Early ailments
Part time secretary	Garage owner	0	2 older	Yes Poor sleeper	Yes	1 year	18 months	None

Playgroup	Nursery	Happy	Played with indoors	Play outdoors	Started school	Friends	Upper School	Extra help school
2 years Mornings only	1 term. afternoon only	Happy at playgroup, not nursery school.	Play dough. Drawing	Machines Cars. Climbing frames. Outdoor games.	Village school aged 5 years	One or two good friends	LEA Comp.	No

School history: Attended village primary school and rural upper school. Despite difficulties learning to read and write no extra help was given and parents were keen for him to have extra help outside school (rather than in school). Mother particularly did not want her son to be seen as different. Out of school he worked hard with private tutor and with help of parents. Had good S.A.T. scores at 11 years when he transferred schools.

Personality: Shy and sensitive, especially to the needs of the other children in the class. Good early social skills with friends. Quiet and attentive, always keen to please.

Playgroup: Attended village hall playgroup 3 mornings a week, then additionally nursery school in outer city setting on two afternoons. The latter did not work as the child was unhappy so stayed with village hall playgroup increasing to 5 days a week by 5 years old.

Literacy Problems

During his time in the class he had no problems with either mathematics or science progressing at the normal rate for mathematics and above average rate for science. His year 2 S.A.T. tests results were as follows:

English	Level 1
Mathematics	Level 2
Science	Level 3

However, his reading and spelling ages at the time he completed his S.A.T. tests were as follows:

Reading age	7.0 years
Spelling age	0
Chronological	6.6 years

From the researchers point of view as class teacher, child C's problems showed in his inability to read easily. He pondered over words in reading scheme books and refused to write alone. He would not use scribble writing in the classroom. However when he produced copy writing this was extremely neat. He took a lot of time getting the shape of the letters exactly correct.

This problem was solved in the classroom by the researcher providing support either in the form of an LSA to sit with his writing group, by writing out what was said for him to copy, or by getting the LSA to act as a scribe for his ideas. This scaffolding (Vygotsky, 1978) worked very well so that by the end of year 2 he was having a good attempt at writing alone, although he still needed the support of being able to use copy-writing, so that he could write a complete story. In fact at this time he had so many ideas for stories in his head that he could not get them down on paper quickly enough.

Child C received out of school support from the researcher from the end of year 2 for three more years. His reading and spelling scores at this time were:

Reading age	12.3 years
Spelling age	11.8
Chronological	9.3 years

Analysis of teenage stage interviews with Child C and mother.

At the time of the interview child C was in his last term of school completing his GCSE's. He was taking ten subjects and considering the possibility of joining either Formula 1™ or a Rally Car Group, as a motor mechanic. He had first interviews with both organisations. He had become a serious young adult with a good grasp of what was achievable for him for his future. He had a good sense of family and a willingness to learn new skills. He was also aware of his shortcomings and accepting of the fact that to succeed in a career he may have to make careful decisions in the future.

Child C started playgroup happily as a child who enjoyed playing out of doors and the opportunity to explore his own environment through play. His mother remembered him as having a 'boisterous disposition who loved the outdoors.' He was encouraged to use tools and to draw at an early age by his parents (his father was a garage mechanic and his mother liked art and drawing). His parents encouraged any creativity in all their children and his eldest sister completed an art degree. His early years were full of 'exercise play' (Smith, P. cited in Moyles, 2005) that fostered independent learning. Outdoor play has been shown to benefit boys in particular (Duffy, cited in Moyles, 2005) and it offers experiences and risks essential to learning that indoor play may not offer. This was true

for child C, his mother said that at playgroup he tended to be quite rough with the other children, and push them off the climbing frames and he remembers the climbing equipment and outdoor equipment being his favourite pastimes at playgroup, he did not remember being boisterous.

However, child C remembered being happy at playgroup and being encouraged to design and build things, he said, "I liked outdoor things like the climbing frame and building things with the kits." He remembered feeling secure and not afraid to ask for help if he needed it and he said, "Part of the feeling of security was that the playgroup was near home and his parents knew the people who ran the group, and he knew lots of the children there." The transition to school was smooth, because mother said there were good links between playgroup and school and because she had two daughters who were already attending the school at the time. It was she said, 'a natural progression.'

Child C entered the school without fear of separation that he could remember nor being either happy or unhappy at school in his early years. He remembered that he preferred listening to stories rather than reading them. He said, "I remember with listening to stories you could be 'out of yourself' and you could make up lots of ideas in your head". He went on, "I like to make up things and make my own designs." His school used 'Breakthrough to Literacy' (Mackey et al., 1970) which meant that the 'Gay Way' reading scheme books were still in use (his mother remembered them with both of her daughters) and alongside this various other reading schemes as well as the Oxford Reading Tree books.

He remembered that he got cross in his infant years at not being able to read easily, "I knew I was not good at it and that I could not read like everyone else." The researcher asked him what affect this had on him and he said, "I think I was naughty and got frustrated and gave up in some ways with both reading and writing." He may have been responding to the idea of social comparison (Poskiparta et al., 2003). Entering school child C had never been confronted by situations in which his play and learning had been subject to systematic social comparison as in the case of learning to read.

He had no idea why he found reading hard but said that the difference with reading and writing when you got older was for him a big difference. He went on to explain that,

“Reading is different from spelling and writing because when you have learnt to read to a certain level you can read what you like and you can take it at your own pace. This means that there are no demands on you.” The researcher asked about writing and spelling. Child C said, “I am still not brilliant at these, when I was little I remember getting my letters mixed up like p : b : d : q and that I could not write words in the right order. That is the trouble with spelling you ‘have’ to get everything in the right order or else it is not right.” When asked if he could remember exactly what it was about spelling that made it difficult he could not say.

His mother identified the same issues with reading and writing as her son, confirming that he had lots of ideas but found it difficult to write them down. She also said that she had had the same problem at school. Asked if she could be a bit more explicit about her difficulties she said, “I think for me and my son it was a question of equating the pictures to the writing and putting the pattern of the letters together to make a whole work. In my own case it was my mother who taught me to read and I was eight years old by then, and it got embarrassing at school. I became cunning at making up words that I thought fitted the story and that’s what I thought my son was doing too and, like me, I thought he was losing confidence very quickly.”

Child C had become a quiet but fairly confident teenager, but his downfall he admitted during the interview was working as part of a team. This would be crucial to gaining a place with a Formula 1™ team. The reason for his inability to be a team player he conceded during interview was the fact that he found it difficult to work with others and not become impatient because they did not catch on as quickly as he did with problem-solving tasks. His mother confirmed this saying he was not a ‘team player.’ She said that he had to get everything ‘just right.’

Despite gaining good grades throughout upper school in most subjects (except literacy where he succeeded but not at a high level) child C had not enjoyed upper school. His preferred learning style was independent learning and the fact that he enjoyed solving problems alone confirms his solitary learning style. This dogged persistence to perform at tasks alone had persisted from playgroup to year eleven in school.

How therefore did child's C aptitude for spatial skills impact on his schooling his dyslexia and his ultimate career choice? In a similar way to the other children in the study, child C started pre-school/playgroup as an independent learner with plenty of scope for play. He had a 'boisterous disposition' according to mother and loved the outdoors. He was encouraged to use tools and draw and design at an early age by both his parents. As a child therefore, he had plenty of opportunity for 'exercise play,' (Smith, P. as cited in Moyles 2007). Outdoor play has been shown to benefit boys in particular (Duffy as cited in Moyles, 2007) and it offers experience, challenges and risks essential to learning, that indoor play may not offer. Bruner (1972) points out that play 'is one of the key experiences through which young children learn and is important because it develops flexibility of thought'. Moyles (2007) claims that children who have had experience of playing with 'materials' were more likely to develop strategies to solve problems and persevere longer if their initial attempts did not work.

Figure 8: Child C Strengths and weaknesses

Child C	Mother C
Strengths	
That he was good at art and design	That he was honest.
That he was happy, especially when he was with his family	That he looked after his family.
	That he made people feel good about themselves.
Weaknesses	
I can be aggressive	That he was lazy
I do not find it easy to express myself.	That he was not a team player
I am not a team player	He was a loner

The researchers viewpoint

Child C was a member of the researchers year-2 class and she taught him for one year. He was an outwardly happy child who was very sociable and he had good friendship groups within his class. He was quiet and reserved but not afraid to ask questions and join in

classroom discussion. Equally he was not afraid to ask for help if he did not understand things.

This one-to-one support used a multi-sensory scheme, 'Alpha to Omega' to remediate his spelling problems and encouraging him with his writing skills, particularly the use of grammar and sentence construction. His mother declined extra help within school saying that she did not want her son to be different from other children. To support the out of schoolwork with spelling and writing, child C's mother concentrated on helping him improve his reading skill and speed outside school. She did this by reading with him most days, and used the method whereby she would read one page and he would read the next and in this way he was able to manage books that were the right content for his age group.

Alongside his reading problems in the classroom child C showed an ability to draw and construct in three dimensions that was at a variance with his peers. An example of this can be seen in Chapter 1 Figure 3 (Page 15) that shows an example of a car that he would have made. Instead of the basic infant construction of a car with a box and four pieces of toilet roll holder cut out and stuck on at each corner, he would produce a model car that could move on its own with wheels that had axles. The researcher used this ability in a project for the whole class when child C was put in charge of organising a Grand Prix on the school playground. Four teams were established in the infant class and child C was the track manager. This was seen as a good project for the National Curriculum Science Level 1 in that the year 2 children gained some understanding of pushing and pulling forces. The four groups of children each made a racing car and child C was responsible for the supervision of building the track along with two other children. This project enabled him to take part in relevant learning and showed him that whereas he struggled with literacy there was an area in which he could excel.

During his time in year 2 his spelling and writing improved because he began with the other children to learn the relevance of phonics and could then relate this in his spellings. By the end of the year he had moved up to level 3 in the school reading scheme and he was writing alone for the most part. During years 3 and 4 he had the same class teacher who was aware of his needs and supported his writing by giving him the same opportunities that he had had in year 2, an LSA acting as scribe, the use of a computer to

set out his work and the scaffolding of copy-writing if he needed it. Details of his spelling and writing out of school were given by the researcher to his year 3 and 4 teachers. By the end of year 5 he no longer needed literacy support outside school.

His ability to draw and design in three dimensions at an early age developed into a real talent for War Hammer™. The Wikipedia® definition of War Hammer describes it as a 'tabletop miniature war game produced by Game Workshop set in a science fantasy universe'. The manufacture of War Hammer™ started in 1987 so that by the time child C started to take an interest in this activity in the early 1990's it was very much in its infancy. Today, War Hammer™ can be used interactively on the Web. Child C designed and made up his own characters and by the time he was eleven to twelve years old he was in contact with the manufacturers and submitting his designs to them. His ability to design, create and paint the characters was advanced for his age. He showed a flair for originality and an interest in thinking 'outside the box' in the manufacture of his own designs and characters. In his primary school he was allowed to develop War Hammer™ workshops for other children in the lunch times and this built directly on the experience he had with the Grand Prix circuit in year two.

Career choice

Child C left school at sixteen but was unsuccessful joining a car racing team. Instead he took on a blacksmiths' apprenticeship, and is employed by a blacksmith whose specialisation is wrought iron garden and home furnishings. His aim is to start up his own design company and is currently looking for premises in London. He still lives at home with his family and his out of work interest is surfing.

Child D

Female Age 16

Status at time of interview: Part time in school, part time work experience.

The researcher first met child D when approached by her mother for extra one-to-one tuition outside school in 1995. She did not attend the school in which the researcher taught. She was a bubbly talkative nine year old at the time who was slow at reading and behind with spelling. She appeared confident especially talking with adults and at the time was excelling at dance outside of school. The researcher interviewed child D in 2002 as part of this research when she was fifteen years old.

Table 13: Child D

Mother	Father	Brothers	Sisters	Normal birth	Happy baby	Walked	Talked	Early ailments
Part time Learning support assistant	Self-employed plumber	1 older	0	Yes	Yes	1 year	18 months	Severe hearing problems

Playgroup	Nursery	Happy	Played with indoors	Play outdoors	Started school	Friends	Upper School	Extra help school
Mornings only	No	Yes.	Watching videos. Dressing up. Role-play.	Dancing classes. Swimming Club.	Large village school aged 5 years	Not many	LEA Comp.	Yes from years 5 – 10.

Personality: Vivacious, anxious, worries, likes to be centre of attention, outspoken.

Schooling: Identified by primary school as dyslexic but no formal assessment made. Had individual education plan in place during Years 5 and 6. Teachers found her difficult. Given some one-to-one support in primary school (5 hours per week) together with help with literacy outside school. By year 9 still failing with literacy and school placed her on

Action Plus, educational psychologist involved. Final school year taken up by individual (and at the time, ground-breaking) home, school and employment scheme. She was given work experience opportunities for two days a week, two days in school and one day at home.

Playgroup: Attended church hall playgroup starting 3 mornings a week increased to 5 mornings a week by 5 years old.

Literacy problems

The results of the Schonell Reading and Spelling tests at the first meeting showed the following results:

Schonell reading Age	7.8 years
Schonell spelling age	6.9 years
Chronological Age	9.9 years

From this and child C's writing it was clear that she did not know all her phonic alphabet and had not progressed past the logographic stage of spelling (Frith, 1985). For the individual lessons the initial tasks were to master the phonic alphabet, learn blends and the first one hundred essential words.

Using Alpha-Omega Child D maintained steady progress in learning to read and spell for the next two years. When she went to Upper School her Reading and Spelling Ages had increased to the following:

Reading Age	9.10 years
Spelling Age	8.6 years
Chronological Age	10.10 years

Analysis of teenage stage interviews with Child D and mother.

At the time of the interview child D was in year 11 at school, she had become a school 'refuser' and was on a School Action Stage plan of the schools special education needs

register. Her level of literacy attainment was reported to be poor and would restrict her ability to succeed with GCSE's. The types of behaviours causing concern in the school included her infrequent attendance, a poor record of handing in homework, a general apathy towards school, unruly behaviour such as storming out of class and perhaps importantly no friends. The behaviour that child D was displaying was detrimental to her peers and her own learning.

At the time of the interviews school was in close contact with mother and daughter about future progress and a realistic solution to the problems of irregular school attendance, Appendix 9 outlines the issues involved. By the time of the second interview with child D the school had reached an agreement with parents and pupil that she would attend school for two days a week and attend a work placement for the other three days. This placement was as a beauty assistant with a group of chemists, aligned to a particular cosmetic company.

This strategy between school and the workplace had been in place for two months at the time of the second interview and had resulted in a complete change in child D and her mother. She was more confident, enjoyed her work in the store and meeting the public. She had, she said, been interested in make-up and beauty therapy for a long time and this she felt was a positive opportunity to learn. The company had been very supportive and encouraging, and as a result child D said she felt she was doing something worthwhile. She had adhered to her commitment of two days in school, and home/school links via the special needs department, the school and the company were good.

Child D had been a happy toddler and went happily to playschool and primary school. Her mother remembered an outgoing child who enjoyed playing in the garden, who was particularly 'messy'. Mother said, "She was noisy and messy, the grubbier she got the better she liked it, she loved outdoor play, the sand pit, the paddling pool, her tricycle and the swing." Commenting on her grubbiness mother said, "If she was painting she just did not get in on the paper she had to get it all over her as well." Child D had an older brother who was, and still is according to her, quieter and more reflective. At the time of the interviews he was nearing the end of his 'A' levels planning to go on to study business management. Mother said her son, "Had done well at school from the beginning whereas her daughter had truanted, had no patience, was loud and had never settled down."

Talking about playschool both mother and child recalled a happy time. Mother said she could remember her daughter being 'noisy and boisterous' at playgroup, but could remember no adverse occurrences. She said, "I remember her being really active, on the go all the time, we used to walk to playgroup and she was so active that she had to go to playgroup on reins." At playgroup she said the supervisors told her, "She will just not sit still." As she approached four years old mother could remember child D taking a real interest in dressing up and putting on little plays, she said, "She would get us all in the lounge with her grandparents and put on these performances, she loved being the centre of attention." Child D also remembered dressing up and television being a big part of her early years, she said, "I used to put the television on and dance to the music and put on pretend plays and stuff."

Before commencing playgroup from the age of 3 years child D stayed at home with mother all day. She comes from a very close family network with her maternal grandparents living next door. The grandparents were involved with the children throughout their upbringing from birth into adulthood. Child D was a happy child, she had an older brother and there was no sibling rivalry.

As a baby she had severe ear infections that resulted in a perforated eardrum in each ear that was helped by medication, not by an operation. As a toddler, mother says she was, "Noisy and messy, she wasn't happy with a piece of paper she had to get it all over her body too!" Mother went on to say, "The grubbier she got the better and she loved outdoor play, sand pit, paddling pool, bikes swings." Mother said that child D also 'liked painting not only the paper but herself.' Mum recalled the difference between her two children saying, "My son is quieter and more reflective and has done well at school from the beginning. My daughter on the other hand is just the opposite she has no patience, is loud has truanted from school and never settled down."

Mother remembered that child D loved to be read to as a child. She loved stories about princesses and fairy tales. Mother said that before school as a toddler and at playgroup she was a happy and contented, albeit noisy, child. She also said, "I remember she was really active as a toddler, so much so that we had to use reins with her when we walked to playgroup. And at playgroup they said she would not sit still." As she approached 4 years old child D took a real interest in dressing up and putting on little plays. Mother said, "She

would get us all in the lounge, us and her grandparents and put on these performances, she loved being the centre of attention.”

Child D went to school earlier than the other children in this study. She started at a pre-school that was attached to the primary school at the age of 4 years 5 months. As her birthday is in May this would have made her one of the youngest children in the class. Despite the fact the family were Church of England, child D attended a Roman Catholic primary school. When asked why this was Mother said, “The discipline was better there and they got good results. Her brother was there and the school was in our catchment area.”

According to mother, school was problematic from the outset. Child D had a great deal of ill health and had repeated ear infections that were usually accompanied by throat infections. In her first year at school she was referred to the hospital Ear, Nose and Throat department as there was particular concern about her hearing. Montgomery (2007) makes the point that, children who have severe hearing problems run a high risk of not learning to read easily. Tests proved that there were ‘no significant problems.’ In addition an eye test at 5 years revealed that she had a lazy eye and had to wear glasses for the first two-years of her school life.

Mother said, “She loved pre-school and was very happy. She moved into the infants and again was happy.” She made a particular friend, a girl who according to mother was ‘very bright.’ This particular friend who was so important to child D was seldom put into the same groupings and this may have been significant as a mixed grouping approach is not always to children’s advantage (Rogers & Evans, 2007). If children are not placed with their friends, particularly at an early age, they can become vulnerable and feel very much alone. However, in the classroom mother said the teaching was not that good, “The teacher was newly qualified and believed in lots of practical activities, she used the ‘look and say’ model of teaching reading, not phonics.” She said, “I am sure this did not help my daughter and I am sure the endless ear infections and throat infections did not help either.” She continued, “When she read she was not able to take words out of context, so that when she moved on from the basic readers she had no strategies for working words out loud.”

Mother was asked about reading as child D had enjoyed listening to stories before she went to school. She said that the school reading policy was like other schools in that each child had a home/school book bag that the child brought home each night. However, whereas her son had been keen to read at home with his parents, child D would simply not do it. She said, "We would sit down with her each evening and start to read, then after a few minutes she would throw the book down or shout or storm out of the room." When asked why this happened she said, "She was fine if she knew the word but if she came to a word she did not know she did not have the patience to work it out, but looking back she did not really have the strategies either because she had not been taught phonics, it was a real nightmare."

The researcher followed this up by asking whether it had anything to do with child D never wanting to sit still? Mother replied, "Yes, I think you are right, that perhaps she never got enough time to 'play' and was not really ready to read at 5 and 6 years, not all children are, are they?"

Progress with reading, according to mum continued through years 1 and 2, but compared with her brother, at a much slower rate. By the end of year 2 she did well on her S.A.T. tests she achieved:

English level 2
Mathematics level 2
Science level 3

But her spelling and writing were still problematic and she could do neither of these easily and mother said, "I don't know how she got level 2 in English."

In child D's fourth year at school the family suffered a tragedy. Child D's father had meningitis. She was 'devastated by this, she cried a lot, and was very frightened especially when she went to see dad in hospital and saw all the tubes. She kept asking if he was going to die?' Child D's father survived and returned to a normal working life but the whole process took a year. During this time child D became very 'withdrawn' according to mother. The focus of the whole family was on the father's recovery.

In year 3 following the recovery of father, child D asked if she could go to dancing lessons? Mother said she was always dancing and dressing up and so this seemed to be a good

outlet for her energy. Mother said, "She was always showing off and loved being the little star." She went to tap dancing lessons, but these stopped after two years mainly for financial reasons.

To compensate for this child D began swimming lessons at the local council swimming pool. She had proved to be good when she had gone swimming with the school and they recommended that she take up swimming more seriously. The result was that she joined a swimming club, and had coaching lessons 3 or 4 times a week at pre-school early morning sessions.

During this period child D was neither motivated nor happy at school according to her mother. In the classroom she had differences of opinions with the teachers. She remained a loud and noisy child and mother said her attitude did not help the situation. However, she also said, "I feel the school does not help either because they do not see the best in her." When asked what she meant she replied, "I know my daughter rubs teachers up the wrong way, but they will not see her for what she is and get the best out of her." However, it is generally known that support for parents at this time is crucial (Hartes, 2008) and it is recognised that inappropriate schools often expect children and parents to make do with what is offered to the man group without considering what is important to the individual child (Devereux & Miller, 2003),

I asked about friendship groups, especially at school and mother said that child D found it really difficult to make friends. The good friend she had in year 1 was no longer a friend and mother said, "There was a lot of cattiness in school especially amongst the girls." The situation in the primary school continued until year 6. Child D became more unhappy according to her mother and more 'turned off school and learning.' Girls friendship groups are very important to the role in which they see themselves, both in and out of school (George & Brown, 2000). The problem in primary schools is seen as being one where for girls in particular, friendship groups focus around a single leader and once established by a group she remains the leader. Throughout the interviews child D repeatedly stated that she did not have friends and that the only real friend she felt she had was in the first years at school. Equally, not having a best friend in school is very important to girls.

From her primary school, child D went to the upper school attended by her older brother. He was enjoying upper school and his academic results were good, he had a good network of friends in and outside school. The school was in the same catchment area as the primary school.

For child D the transition was not good. She faced the same social problems as she had done in the primary school, either she was popular or unpopular according to mother. She did not like the majority of her teachers and mother said that her daughter, "Found the whole process difficult to adjust to." She continued with swimming and became proficient and popular at the swimming club but her parents became increasingly worried that their daughter was finding school so difficult. Mother said, "She was just completely turned off school." She failed to achieve a 'sense of belonging' in school, which tends to be important because it has been found that girls expect more nurturing from friendship groups than boys (Brown & Lohr, 1989). Child D said that she never felt at ease in school, either with other pupils or teachers and that she was very aware of needing to be part of a 'group' and she constantly felt as though she was an outsider. It is known that social friction amongst pupils at school is a main contributor to social exclusion and isolation (Pearce, Williams & Galvin, 2003).

The situation deteriorated through years 11 - 13. Eventually she was truanting from school showing continual unruly behaviour in school, but not out of school. This resulted in her seeing an educational psychologist and being in school for only 2 days a week. Appendix 9. This was later converted so that she attended school two days a week but worked in the beauty department at a chemist shop for the remaining three weekdays. Mother said that this was, "The making of her." Child D received training with the chemist and enjoyed working and meeting people. Her Mother said, "With the incentive of three days work and training at a job she enjoyed (she) was able to 'put up' with school knowing that it was only two days a week." Pellegrini (2007) observes that the reason children truant is predominantly lack of motivation, persistent bullying and the feeling of isolation. All these applied to Child D. When asked by the researcher what she thought of her truancy and behaviour mother said, "Something you think it is a reflection on us as a family, that we have done something wrong." According to McDonald and Thomas (2003) this is common and parents do feel that they are judged unworthy parents and it also

highlights parents' feelings of helplessness and their lack of rights to do anything about the situation.

Discussing her time after leaving school mother said, "I now realise that school does not suit every child. It's a pity that on-the-job training cannot be put in place earlier in a child's life, why must they stick at learning subjects they hate, in environments that don't suit them." She went on to say, "I have two totally different children, one suited school the other one didn't."

When the researcher commenced the interview with child D she asked about her swimming, dancing and singing. Child D was excited about the fact that she had been selected for an audition at a large local theatre for a dancing role in the chorus of a new production. She told the researcher that she had started tap dancing at 6 years old and that she had initiated this because she knew at that age that she enjoyed performing, acting, dressing up and dancing in front of the television, she said, "I was quite a show-off I realize now. I remember I loved listening to music when I was about four years old and I knew I enjoyed performing." This is also linked to motivation for learning (Pospikarta et al., 2003) that she wanted to do these things and realised she was good at performing.

Asked how she managed to remember all the steps and manoeuvres for the new production, was this difficult? Child D said, "Yes in drama and dance you had to learn your lines and your movements in a sequence." The question of sequence was pursued comparing it to spelling and she was asked what the difference is between learning spellings and dance sequences. She replied, "Spellings are hard to remember because of all the shapes of the letters and there are thousands and thousands of words. Anyway I enjoy dancing, it is easier than spelling and people get to clap and praise you, they don't do that with spelling."

Returned to the question of early play child D said, "I remember that I liked to play in the garden and dressing up and watching videos and Walt Disney® Films. I hated reading. I liked picture books and listening to stories."

Asked about reading and school child D remembered that she first had a problem in year 3 when she was aware that she was not reading like the other children in her class. She

hated the fact that the others might laugh at her because she could not read. As she got older this became more and more of a problem because in years 5 and 6 the teachers expected all the children to be able to read out loud. Child D could not do this because she read so slowly and her problems became apparent to everyone in the class. The teachers made her come into school early in the morning to read. Child D said, “I hated this and became really angry with myself for not being able to do it. When all the others came in from outside they kept asking me what I was doing in the class and what was wrong with me?” Child D could not think why it was difficult to read and spell.

Figure 9: Child D strengths and weaknesses

Child D	Mother D
Strengths	That she considered her daughter was amusing
That she knew her own mind.	That she was bubbly and outwardly confident
She knew what she was good at	The she could make a point without being shy
	That she stands up for her beliefs
	That she is a strong family member
Weaknesses	
That she was not always caring of other peoples' feelings	That she doesn't always listen
	That she can be strong willed

The researchers viewpoint

Child D came to the researchers notice while attending the after school literacy club. On first meeting the researcher found her to be a bubbly, loud, funny and at the same time cheeky nine year old. From the outset she was obviously disenchanted with school, she said, “I hate school and I hate the teachers.” She went on, “They think I am thick and they don't understand my needs.” When the researcher questioned her more closely about this child D said, “The problem is that the teacher always covers her writing with red

crosses and that she was made to stay in at lunchtimes to learn her tables.” She said that ‘she felt fed up because she could not spell properly and hated reading because she was slow’. She said the issue with reading became ‘horrid’ in the class situation because the teacher made the whole class read a book together and each child had to read out a paragraph. This was a daily occurrence and child D said she dreaded waiting for her turn to read out loud because the other children would think she was stupid as she could not read very fast.

However, progress with child D was not easy from the point of view of motivation and her inability to stay focused all the time. She was constantly interrupting with stories that she wanted to discuss about things outside school. It was a case of anything but work and it was apparent from her attitude that this sort of chaotic thinking would be difficult for a class teacher to incorporate in everyday teaching.

The researcher found that the way through this was to allow up to 10 minutes per session for child D to ‘let off steam’ usually about some injustice that had happened at school the previous week. Then to talk through the issues with her from the teachers point of view or if she had fallen out with friends (which happened a great deal) from their point of view. This worked largely because it appeared that at home mother and father always sided in a situation with child D. Their love for her was so great that they did not always understand the need to show their daughter other peoples feelings. This meant that part of her individualised teaching programme involved the researcher playing the part of the listener.

In addition to her problems in school, which were there until the researcher stopped teaching her at age 11 years, child D was extremely talented at dance and swimming. She was good enough to be chosen to swim for the county and had to attend swimming lessons before school every morning. Additionally she took up tap dancing and reached a high standard with that as well. By the time she was 11 years old she had been picked as a dancer in a large theatre group. This meant that she had to decide between dancing and swimming. She chose dancing because she said, “It goes back to what I like doing, dressing up and make up and all that.”

In the researcher opinion, Child D was a child who was outgoing and able to make her own decisions about learning. To a certain extent she would only learn in areas that she thought were relevant. She was aware that she had the ability to create explosive situations in the classroom but equally she was not prepared to look at the situation from the other persons' point of view. It was of no surprise to the researcher to find that when she went back to interview child D after a period of three years that the situation in upper school had deteriorated. On the other hand child D had maintained her interest in the theatre, and had remained at the heart of her family. Her rebellion was directed entirely at school, not in the home or in her outside interests.

Career choice

She left school at sixteen. Her work with the beauty company meant that she was able to apply to a Further Education College for a two years NVQ beauty therapy course. She was motivated and successful in this. From there she went to work for a large spa hotel locally and after two years there set up her own beauty salon. This is working extremely well and she is, at last, contented. She too has retained strong and close links with her family. She still loves dancing.

Child E

Female Age 17

Status at time of interview: In sixth form studying for four 'A' levels.

The researcher first met child E when her mother approached her to ask for extra one-to-one tuition outside school in 1996. Although she attended the school in which the researcher taught she was not in the same building and at the time was a year five pupil. Child E was a shy slightly introverted child with only one friend in the school. At the time the researcher started to teach her she had just moved from an outer city school and was having some problems adjusting to her new school. Her class teacher had told the parents that their child had special educational needs which may never be corrected as a result of this the parents were devastated and sought extra help outside of school. Child E was later interviewed for part of this research in 2002.

Table 14: Child E

Mother	Father	Brothers	Sisters	Normal birth	Happy baby	Walked	Talked	Early ailments
Part time nurse	College lecturer	1 older	0	Yes	Yes	13 months	2 years	None

Playgroup	Nursery	Happy	Played with indoors	Play outdoors	Started school	Friends	Upper School	Extra help school
For a while	Yes. 1 term	No	Helping Mum. Music	Football. Playing with toy cars.	Term in which aged 5 years	One friend after age of 9 yrs.	LEA Comp.	Yes. To year 10.

School history: Attended village primary school out of her catchment area because she was failing in the allocated school. Moved to a rural upper school remaining there until 'A' levels. When she moved to the new primary her parents were told that she 'would never be good at anything to do with school because she was a slow learner'. Despite this she

was not put on the special needs register or given any extra help. Her parents sought help with literacy and mathematics outside school. She herself taught herself to play the guitar and became engrossed in art.

Personality: Shy, not many friends. One close friend in primary school, two close friends at upper school. Worrier, very anxious. Eager to please.

Playgroup: Attended playgroup attached to first primary school for 3 mornings a week and additionally an outer city nursery school for 3 afternoons. Was withdrawn from both and stayed at home with mother.

At the time of the interviews child E was nearing the end of her first year of GCSE examinations. She had maintained steady progress during her secondary years and had needed no extra support in school. Her father, a college lecturer had been able to give her extra support if any was needed, with homework for example. At the conclusion of the study child E was training to become a community police officer.

Child E had a normal birth and crawled at an early age according to her mother at 6 months, she walked at 12 months and started to talk at twenty months. Mother said her daughter was a 'quiet' toddler and contented to be at home. Mother and child's memories of early play were hazy, mother could remember her daughter enjoying outdoor play, painting and playing with her son's toy cars and garage. While neither could remember particularly favourite play, mother could remember clearly that she was not one who enjoyed sitting down and listening to stories. Mother said, "She certainly wasn't a child who wanted to sit down and look at books or listen to stories, she was quite happy doing other things."

Results of the semi-structured interview with mother and child relating to Child E's performance in the curriculum

- She did not enjoy writing tasks.
- She found reading difficult initially.
- She enjoyed mathematics but struggled and needed extra support.
- She liked art and psychology in her Upper School.

- She was a lone player at school.

Literacy problems

At the researchers' first meeting with child E in the normal course of practice a Schonell Reading and Spelling Test was administered with the following results:

Schonell reading age	8.6 years
Schonell spelling age	7.6 years
Chronological age	9.5 years

This showed that in fact child E's reading age was only nine months behind her Chronological Age. While this is not ideal, it certainly showed that she was able to read. Similarly her spelling age, while nearly two years behind, did need to be addressed but she was by no means a hopeless case.

The individual one-to-one teaching at the after school club continued throughout the rest of child E's primary education. Her last recorded scores (from her teaching records) of reading and spelling during her last term in primary school were:

Schonell reading Age	11.3 years
Schonell spelling Age	10.2 years
Chronological age	11.10 years

Her S.A.T. results for year six taken from school reports were:

English	level 4
Mathematics	level 4
Science	level 4

Analysis of teenage stage interview with Child E and mother.

According to her mother child E had a normal birth, crawled at 6 months, walked at 12 months and started to talk at twenty months. She had no significant childhood ailments. Child E stayed at home with her mother all day until she started playgroup at the three years of age. She initially attended on three morning sessions a week. Mother said that this arrangement did not work and child E was withdrawn. She said, "This was because it

was rowdy, disorganised and unsupervised with children all over the place.” She said her daughter did not like it at all and child E confirmed this, saying, “I did not have any friends there and the only people who talked to me were the supervisors and then not very much.”

After withdrawing her from playgroup mother said that her daughter stayed at home and played. She remembers that she was always on the go and liked outdoor play. As a baby mother recalls her daughter had always needed to ‘see’ what was going on around her. For example, she could not be left in a pram or playpen on her own unless she could see other people. This was at a variance with her son who was quite happy to be left alone.

Child E remembers early play as, “Helping Mum in the house, cars and garages,” (that belonged to her older brother) and as she got older she said, “I liked football and making models particularly out of clay, never Barbi® stuff and dolls.” She continued, “I wasn’t a stereotype girl, I liked outdoor things and I particularly remember being obsessed with motor bikes and always counting them when I was out with Mum and Dad.” Henninger (1985, as cited in Moyles, 2005) states that some children are socially inhibited in an indoor environment and the outdoor environment influences their type of play. Athay (1990) states that the outdoors provides a good environment for developing tactile and observational skills.

A year later when child E was four her mother tried her at another playgroup. Again, for half-a-day every day and mother and child each confirmed this was a more traumatic experience than the first playgroup. Mother told the researcher that her daughter became very distressed especially when left and was crying a great deal of the time. She said, “She would not tell me why she was so upset and it was not until a while ago when we were talking about it that my daughter said that she had hated her time there and one of the women supervisors shouted at her a lot. I wish she had said this at the time and then it would all have made sense.” The transition process is not the same for all children and separation from familiar adults and environments may well prove significant for children in their inability to settle and be happy (Cassidy, 2005).

Child E confirmed this saying, “I hated every minute of it, there was this woman and she kept shouting at me. One day I mistakenly went to a part of the playgroup which was out

of bounds and she shouted at me so much that I just cried and cried.” She could not remember making any friends of her own age at either playgroups, she said, “I realise now I am older that mum sent me there because it was about socialising but I realised at the time it wasn’t right and it did not work out for me.” Mother said, “My husband and I decided to withdraw our daughter from playgroup for a second time, this time she stayed at home with me until she went to primary school.”

These two experiences obviously had a great impact on child E’s early life. She was aware of being lonely and of playgroups representing places where she was not at ease. Fabian and Dunlop (2002a) claim that the way in which transitions are experienced not only make a difference to a child in the early months of school, but may have a much more lasting effect. They say that the extent to which they feel successful and happy in the first transition is likely to influence subsequent experience. Equally, child E could remember feeling unhappy at playgroup because of the unkind and aloof attitude of the helpers that may also have impacted on the way she perceived school and learning. Donaldson (1978) emphasises the importance of human contact in children’s play and learning in the early years.

It is well known that a child is less likely to learn well and profit from school without the support of friends and mother wanted her daughter to be able to socialise and play with other children and to fit in as her son had done, but this did not happen and the implications resulting from this may have resulted in difficulties later in school. By her own admission, child E found socialising difficult and she said, “I really have only had one good friend and I did not make that friendship until I was nine.” The skills in making and keeping friends are complex social skills that involve the ability to gain entry, to be approving and supportive of peers and to be able to manage conflict (Newman & Lohman, 2007). Again, a sense of group belonging applies here (George & Brown, 1999), as in the case of child D. Whereas child D’s unhappiness and feeling of not belonging to a group precipitated bad behaviour, with child E it resulted in her withdrawal into herself, with shyness and thinking she would not fit in. George and Brown (1999) claimed that the desire to belong to a group might influence an adolescent well before he/she is actually a member of a given group and that closeness in peer relationships is positively correlated with popularity.

Child E started school when she was five years and three months old. Mother said she had no contacts with school before she started school, only that she had registered her name. Her son already attended the school so there were links of a kind in place; that is the parents had attended parents evenings and were used to picking her son up from school each day and therefore had contact with other parents. Despite the fact that playgroup had not proved satisfactory for her daughter mother said that she had no worries about her daughter starting school. She said, "Our son was doing very well and we expected that our daughter would do the same." It was clear from the discussion here that she was convinced that all would be well for her daughter in school and that as her son had done well she saw no reason that things would not go well for her daughter. Child E's mother said that she felt included in her son's schoolwork but that the reverse was true of her daughter.

According to her mother the first year at school was 'reasonably OK'. She went on to say that her daughter did not stay in the reception class for a full year, which was a pity. Mother thought that an extra term would have meant her daughter would have become better adjusted to the structure of school. However, she could not remember any problems with socialising, but did say that not many children came home to play with her daughter and she did not visit other children's homes. However she also said, "Neither my son or daughter had children back here to play." Asked why this was she said, "Its just not something that I do particularly and I think when they come home from school they should be here relaxing and doing their homework."

By the time her daughter was reaching the end of year-one mother became concerned about her reading. Although she realised she was very young, she said, "I was comparing (name) all the time to her older brother, who took to school easily and found reading very easy." Mother said, "I spoke to my daughter's class teacher and she said 'your daughter is working to the standard that she needs to work to.'" So things were left to take their natural course. But she remained concerned, "Early on with her reading and writing I did not think it was as good as it should have been. It was not as good as her brothers at that age, I know I should not compare but its human nature not to and when I think of what my son was doing at that age she was just not getting it right." However, research by Edwards and Warin (1999) into parental involvement into children's learning shows how complex the contribution parents can make, particularly when analysing where their children ought

to be in the learning process or gauging the amount of input. Today, involvement in early school is of paramount importance for parents and children and being kept informed of the progress of their children is essential for parents not only from the point of view of reassurance but because if parents are relaxed about school so will the children be stress-free (Dunlop & Fabion, 2007).

Equally, parents expect to see changes in Year One from structured play-based activities to more formal teaching (OFSTED, 2004), which includes a sharper focus on reading, writing and numeracy. This was the case where by year three mother said, "The worries really started because she was not reading." Again the teacher was approached who said she wasn't at all worried. Then a week after this meeting the teacher asked if she would like her daughter to see a special needs teacher. This support was put in place for two terms during which her reading improved but then the support was withdrawn because, according to the school, she no longer needed help.

However, mum said, "I still had this gut feeling that something was wrong, it was the writing that I was really concerned with. Some of the words were unintelligible and the letter formation and spellings were far from right." Again, mother said she had concerns about the structure of the class. Like the playgroups mother said, "There were disruptive children in the class and her daughter was not getting anywhere." She continued, "We left it for a while and then when, our daughter was in year four, we moved her to another school in a nearby village. During year four Child E made progress, formed a happy relationship with her teacher, who according to Child E 'was brilliant, so kind and interested in us all.' She made a particular friend, who remained her best friend until year seven when the friend moved away from the area." Mother said, "This class teacher understood that (name) needed coaxing and encouragement and really built up her confidence. We really thought progress was being made and we relaxed much more."

However, when child E moved to year five mother said, "We were shocked when the class teacher told us at the autumn parents evening that our daughter has a lot of problems especially with literacy and she will always be a special needs case in all subjects." The researcher asked how Child E's mother responded to this and she said, "I just burst into tears, the teacher had only known my daughter for a six weeks and the other teacher had been so positive. When she came out with this judgement I thought it was very harsh."

Equally, during the interviews, mother was very realistic about her daughters' ability with literacy. She said, "I always realised that she needed direction and coaxing. When we read stories to her she would listen and enjoy the stories for a while and then she became distracted. We became frustrated when she brought books home from school and could not work out the meaning of the words. However, my husband always thought she would get there, but I was not so sure."

Mother was unable to be more specific about her daughter's problems, but she did say she felt the first school did not help the situation and said, "They did not teach any real phonics, so that did not help us at home, because we would make her sound the words and letters out loud, but she hadn't a clue what we were trying to do." Mother said, "At the second school they had a very rigid system about spellings, tables and homework. We felt more confidence that our daughter was being taught properly."

The researcher asked how this confidence stayed in place when the year five teacher said she was a special needs case. Mother replied, "Well we had appreciated that our daughter had a lot of catching up to do, and the problem with the second primary school was that it had very high standards because lots of children left that school to go to public school so there was understandably a lot of pressure on the children and the teachers." Mother continued, "We thought that they would be able to give extra support, which they did in year five and six, but we were not expecting the teacher to be so blunt."

Child E remembered the problems she had with literacy in the same way as her mother, speaking about her early problems, she said she realised she had problems reading when she was about seven years old. She said, "I could understand the content of stories, but could not read the words or work out the sounds, from the pages." She continued, "Even at that young age I knew that I had been 'turned off' work. I became sad because I could not do what the others were doing and so I got bored and disillusioned. Even now I get frustrated at the slowness of my own reading and I know when I read aloud that my voice has no expression because I am trying so hard to get every word right, I lack confidence."

Asked about her transition from the first primary school to the second school, she said, "When I went to the second primary school I found it exciting and different and the teachers took an interest in you." When asked to explain what she meant she said, "At my

first primary school I really got bored with what was going on. I couldn't do the work and there wasn't a great deal of need for reading. If you couldn't read it would go unnoticed. Looking back there was no support for my needs, but I remember a lot of disruptive noisy kids in the class, so I suppose if you were quiet like me you got overlooked." She said, "I think my family noticed that I had problems but no-one else did. Mum took me to an opticians and he said that my eyes jogged, they moved around as I was looking at something, but I grew out of that problem but I never got out of the problem with reading and I still don't like it." Child E was unable to say anymore about her reading problems only that she realised that she had always read slowly.

When interviewed at thirteen child E said, "Reading and spelling are two things that I am just not good at. I love writing stories and my teacher says that I have good creative ideas but I am just unable to get those ideas down on paper." However, she said, "Luckily, upper school is not about stories but more about facts and remembering things." She remembered her father helping her to spell when she was six or seven and said, "He tried to help me to learn to sound out the letters of words like d-o-g. Dad would say the word and I would repeat it after him and I think that is why I don't like reading because it was so boring to have to do that all the time with words." With regard to spellings she said, "The trouble with writing is that I have to get every word right, and so I don't relax because I am trying too hard." The researcher asked if she thought this was a question of memory? Child E could not say, but did say that when she had spelling tests at school she usually got between 75% and 80% correct but then could not always remember them when she used them in written context.

From the point of view of socialising child E remembered the importance of making friends at the second primary school, she said, "I made one really good friend who also went with me to my upper school. This lasted until year eight when she moved and I was very unhappy, but then I made another friend and we are still good friends, for me I think it is important to have one good friend, I am not someone who is the centre of attention." Mother confirmed this and said her 'daughter is happy with one friend she can trust and rely on'.

The transition to the upper school was smooth, the primary school having very good links and the deputy head teacher of the upper school visited the primary feeder schools as a

matter of course for two visits before entry. In addition the children spent two days at the new school before they started. Child E's brother was already at the school and her best friend was moving to it as well.

Because child E was improving from the point of view of literacy and her end of term results were good, her parents (and mother in particular) became more relaxed. Both parents 'had great faith in the upper school' and both felt that if they needed to approach the school any concerns would be dealt with quickly and smoothly.

When she started, child E continued to have extra support outside school for a further year. However, for the previous twelve months she had moved from one-to-one support to working with three other children as a group. For child E this worked well because she had an understanding of other children's similar situations and she was also mixing with them thus eliminating some of the loneliness of her own situation.

The researcher did not see child E for two years after she finished with the after school club, until the interviews for this study. This revealed that she had become a reflective and serious student, her literacy problems were no longer evident in school and she did not have any special needs support. She reported at the interviews that she still did not like reading out loud in school, but that the teachers understood and made allowances for this. One of her favourite subjects was English literature and she was also interested in drama.

The reason for the choice of child E to take part in this case study was not the fact that she shone at any one particular creative skill as observed in the other four children, but because she decided on her own, without the help or influence of either parent, to take up the electric guitar. This is a difficult instrument to learn and no one in her family played an instrument. During curriculum music lessons at her upper school she had been encouraged by her music teacher to have a go at playing the guitar and from this her mother said, "She came home from school one day and asked if she could play the electric guitar." Mother said, "Up to that day she had not mentioned a thing about it."

The question of this interest in the electric guitar was discussed with child E. She did not know why she had chosen it saying only, "I got the opportunity at school, and I liked the

teacher and I found it easy to get to grips with.” She continued, “I am not good at reading music, but I find that I can hear a tune and play it from listening only to the tune.” At the time of the interviews child E said that she had become quite accomplished at the guitar and was playing with others in a group. She said that they were hoping to play at some ‘gigs’.

She was asked how remembering notes equated with remembering spellings and was there a difference? Child E said, “Yeah, there is a big difference because playing the guitar is something I want to do and spellings is something that I am just not interested in doing.”

Mother confirmed this by saying, “I think my daughter is good at the guitar because it is something that she finds interesting and it comes naturally to her. But then I think that is the same for anyone, if they are interested they will succeed.”

Mother said that she thought her daughters’ strengths were her personality and her ability to have fun. She thought that she was kind and understanding of people and often the first to offer help to someone who needed help. She felt her weaknesses were literacy and the fact that she became disheartened easily, that she expected everything in life to go right the first time.

Child E said she thought her strengths were to be able to see another person’s point of view. Her weakness she saw as being unable to come to terms with her poor literacy and always wanting things to be just right.

Figure 10: Child E strengths and weaknesses

Child E	Mother E
Strengths	That she is under-standing of other peoples’ feelings
That she can pick up a tune by ear	
That she is good at socialising	
Weaknesses	
That she had an inability to say what she really felt	That she needed direction for lots of things
That she kept things to herself	That she is easily distracted

The researchers viewpoint

The researcher first met child E when she was nine years old and had just started in year five. Her mother had been upset at the parent's evening during which she had been told that her daughter had significant learning problems. Her mother confided that she was devastated by the outcome of that meeting, and that whilst she realised that her daughter was not making the same progress as her older brother at the same age, both she and her husband were confident that their daughter could read and write reasonably well and they both thought that with mathematics and science there were no problems at all. Initially there was a need by myself as the after school tutor to reassure the parents and to liaise with the year five teacher so that we could all work together to support child E.

An initial discussion between the year 5 teacher and the researcher revealed that indeed the teacher thought child E had many problems relating to literacy that impacted on her work across the curriculum. These were compounded, the teacher thought, by an anxious mother and child E's lack of confidence. However, despite the teachers concerns, particularly about literacy, notes taken at the time show that the school did not place child E on the special needs register. When asked by the researcher what she thought the special need was relating to literacy the class teacher said, she is probably dyslexic. However, school had not carried out any form of assessment and did not plan to do so. Discussing my own role in child E's progress the teacher was relieved that she would receive extra support as the school was recognised for attaining good S.A.T's scores.

During this first meeting the mother had brought with her evidence of her child's writing and the library book she was reading at school. The book was 'Milly, Molly, Mandy' by J. Lankester-Brisley. When asked how well her daughter read the book she admitted that she read slowly and so her parents would read one page and child E would read the other page. However, mother said whilst reading was slow she could probably read 80% of the words but she did have trouble segmenting those words that she did not know, and this was the real problem. Mother said, "She gets frustrated and then gives up."

At the first meeting after the administration of the tests child E was asked to read aloud because her mother had said she did in fact read slowly and was unable to sound out particular words that she did not know for example 'adventures'. She had no real

understanding that ad-ven-ture-s could be broken down, however, she did understand that play-ing could be broken down. It was the longer syllable words that posed the problems and the more obscure words like 'alright.'

Child E's writing was basic joined up writing and she did not have any trouble using or holding the pencil, her pencil grip was fine. The researcher observed an articulate nine year-old who was quite willing to discuss school and out-of-school pursuits. At the same time she was extremely nervous, talking quickly and fiddling with her hands. Notes recorded at the time show that she was in fact trembling when she talked about school. She completely understood that literacy was not her strong subject, telling the researcher at this first meeting, "I try to do well but find spelling really hard and then I get put off writing. I am fairly slow at reading and have to follow the words carefully or with my finger." She appeared to be keen, almost relieved, to have support with her English and spelling that she said, "Individual help with literacy would improve my work in school and get me better." During all the time she received extra support she worked very hard and diligently at the tasks, both in lessons and for homework. Interestingly it was always her father who helped her with the homework and she seemed to have a relaxed attitude towards his support. Notes made at the time show that often, during lessons when talking about her homework, Child E said, 'Dad will help me with that or if I get stuck dad will show me what to do.'

As with the other pupils her extra support used the 'Alpha to Omega Reading and Spelling Scheme' and as a result the tutor concentrated on one spelling pattern a week and used a lesson plan in the same way as for the other pupils. Links were made with her primary school and they supported the programme in school with one-to-one tuition for one hour a week. Throughout the extra tuition the tutor found that there was total reticence on the part of child E to read or indeed share a book. She could not be cajoled into reading. The situation improved slightly when she took up riding lessons and an interest in the care and grooming of horses. Then she would read as a means of finding out information about the care of horses. Child E said at the time, "I can see that finding out things from a book is important for learning, but I still hate reading for pleasure."

Socially, child E appeared to the researcher to be very much alone. She said that she had one particular friend at school but did not appear to join in any out-of-school activities or

have other friends round to play. At the time it was not apparent why this was the case but the individual interviews for this study would reveal why in due course. At the after school club child E joined in happily with all the social activities, like arranged visits to Laser Quest and she appeared to thoroughly enjoy these activities. However, within school and home life she appeared to remain very much a 'loner'.

Career choice

Child E left school at eighteen years of age after obtaining three 'A' levels. At first she did not gain work after school but applied to become a policewoman and is currently waiting for a place on the training course, in the meantime she is a full time community police officer. She lives at home. She has not pursued her outside interest in music.

OVERALL ANALYSIS OF THE CASE STUDIES

Introduction

The results from the case studies found that mothers and children were able to identify spatially creative abilities in their children at an early age. The spatial abilities were good hand/eye co-ordination and good visual memories. The creativity was different for each child. For children A and C art and design, child B design and ice hockey, child C, drama and dance child D, and child E musical notation from memory.

The reading problems of all five were not easy to identify either through the literature review or from the results of the individual interviews.

The question of motivation and learning was different for each of the five children. Motivation towards learning was present in the case of children A and C in their primary years and in child A in his secondary years. Child B was de-motivated in primary school but motivated in upper school. Child D was de-motivated throughout her schooling except in year 1 and her final year in school. Child E was de-motivated in years 1 - 5. However, out of school pursuits that the children said improved their self-esteem meant that school became more bearable and showed, in three of the cases, a means to an end attitude, which meant that they were motivated towards learning because they could see an end objective and career they would enjoy.

The interview results clearly show that early play activities were indicative of subject preferences in school and in future careers. This was a significant finding and one that resonated with the findings from the students in the College survey. Equally, transition from playgroup to school proved to be a stumbling block for all five children and their mothers. The transition was not smooth and the children were very aware of the difference between playgroup and school. School became a place for learning whereas playgroup had been fun and allowed freedom of activity and thought. Again these were important findings.

These findings will be discussed under the following headings:

- Early play preferences
- Transition from playgroup to school
- Spatial ability
- Self-esteem and motivation

Early play preferences

The results of the interviews showed that all the children enjoyed great 'freedom' in their early play between the ages of three and six years. Interviews with the mothers revealed that they were all encouraged to be inquisitive toddlers, had access to creative tools such as paints modelling equipment tools and in the case of children A, B and C encouraged to used hammers and spanners to make realistic models and to be generally independent and to ask questions. The three boys confirmed that this was the case; children A and C both said that they loved to be creative. Child A said, "I like the opportunity to be an individual, I love creating stuff it offers freedom." Child D could remember loving to dress up and perform plays and admitted that she was allowed to choose these activities and encouraged to stage performances for her family. Child E could remember preferring to play outdoors and do 'her own thing' rather than being indoors.

Table 15: Outside school activities

Child A had a large garden with adventure toys and was encouraged to make realistic models, and loved Lego® and was still playing with this as a teenager.

Child B used his father's woodworking tools, helped him in his workshop and used to work in the garden. He was to become major league ice hockey player.

Child C was encouraged to accompany his father to his garage and watched while he repaired cars. He too enjoyed outdoor play in the years 5 to 8 and was engrossed in model making and War Hammer™ and used to send his designs to the manufacturers of the games.

Child D loved imaginative play and putting on plays and productions for her family, she went on to dance in a theatre group.

Child E loved playing outdoors, with cars and playing football. She enjoyed music and taught herself to play the electric guitar.

Today creativity in early schooling is encouraged in Government documents ranging from Birth to Three Matters (DfES, 2003) to the Early Years Foundation Stage (2007), which places emphasis of high levels of involvement of self-chosen activities in early childhood. In particular the ability to concentrate on a task and to be self-motivated are considered important to children's early development (EYFS, p.26). This sense of independence to make their own choices was reflected in the responses of all five children. At the same time the five had been given a high degree of responsibility in the outdoor and creative pursuits that they enjoyed. None of the children reported parents who said, 'You can't do that or I would rather you played indoors or be careful'. The reverse applied in that they were all encouraged and praised for their choice of play activities. This may have had something to do with the fact that in the case of Children A, B and C their parents had creative careers which fostered independence. Child D's father was self-employed and used to making his own decisions and both her parents encouraged her creativity even though as mother said, 'She just loves to show off'. Child E's parents were not creative mother had said, but she was encouraged to be herself.

The opportunity they each had for exploratory creative play before they went to school may have impacted on them when they reached school for the first time. The rigidity of school that children A, B, C and E found during their first term may have had a disempowering effect on their learning. Dunlop and Fabian (2007) claim that an early exposure to a curriculum built on observable and testable outcomes, delivered in a structured manner has the ability to create a context in which young children do feel 'disempowered'. Similarly Poskiparta, et al., (2003) make the point that school entrance in the early years exposes the child to 'potential stressors uncommon in their previous milieu'. Before young children start school they are not expected to rise to certain objectives neither are they compared with their peers on their achievements. For the five children this could have been the case, given freedom of both choice and opportunity before school, being children who were able to 'entertain' themselves and to be self-sufficient may have meant that school did become restrictive.

Equally teacher understanding of the needs of young children would have been important for these children in their early years. Children A, B, C and E all remember their first teachers as being 'strict' and the emphasis being on learning to read and doing sums, as children A, B and E remembered sheets and sheets of sums. Child E's first teacher by contrast was young and newly qualified and taught through drama and storytelling. This suited child D, her mother said, but sadly she was put into the next year group after only two terms with this teacher. Mother said she 'loved her' but her daughter found it difficult to relate to her next teacher who was very strict and expected them to sit and work.

It is known that by providing a flexible and creative learning environment in school children gain confidence and take risks in areas where they feel less confident (McGreevy, 1990). Additionally, as Dacey (1989) points out having a good relationship with pupils and being open and flexible to their ideas is essential especially in the early years. As an infant teacher the researcher was aware of the need to 'allow' children freedom of choice particularly in early play in the classroom. This is achieved by creating opportunities for structured play scenarios (Nutbrown, 1999). The class shop, post office and café are areas where children have easy and safe access to construction toys and are encouraged to play independently and responsibly are crucial (Moyle, 2005). However, this sort of play was not remembered by either children A, B, C or E in their first year in school. Children A and C remembered these play options available in their second year of school. As a result the children may not have felt motivated to learn because areas they considered important were not regarded as such by their early years teachers.

This study will further argue that the classroom may have had a stifling effect on the children from a physical point of view. All the children favoured outdoor play. Outdoor play offers freedom associated with space that cannot be replicated inside (Bilton, 2002). As a result some children are more able outside, can be more mature in their discussions and enjoy more advanced play. At the time these children were in primary school there were few studies that focussed on the issues of outdoor play and in the importance it may have on the way young children learn (Clark, Moss & Kjørholt, 2005). A study by Clark (2007) researched this area, in particular the way in which young children's perspective on their outdoor play related to their exchange with adult educators. His study found that children were able to imaginatively use outdoor space and that such play helps to develop

creativity and imagination. The study also made the point stating that children as young as six years old are able to make decisions about this type of play and be involved in how to construct play areas. Clearly the children in this study would have been motivated to such ideas. As Ouvry (2003, as cited in Clark 2007, p.43) points out creative outdoor play need not incur cost, the availability of inexpensive resources such as planks, crates, blocks and dressing up clothes help to promote even barren spaces to promote imaginative play. In this study children A and C attended a primary school where outdoor space was available on a large scale and they had freedom at playtimes to access a large field with trees and hide outs and an enclosed pond area. However, children B, C and D all attended schools with limited outdoor facilities and no opportunities were provided for the type of creative play noted by Ouvry.

In turn, the five children may just not have been willing to sit down to a rigid curriculum and the lack of play opportunities may have resulted in them becoming reluctant learners. As Moyles (1989 p.133) points out, those young children reluctant to engage in school work will almost certainly engage in school play and teachers must ensure that they direct play in order that both situations provide the same end product of learning.

It is clear from interviews with the mothers and children that teacher awareness of their spatial ability and their need to be allowed a certain amount of free choice was not evident in their early education. Instead they all entered a school environment where play was restricted to a small part of the day, or just the playground and break periods. This would have had a detrimental effect on children, who had a high degree of freedom before entering school and used both 'skilful and imaginative play.' Play of this sort would, according to Jefferey, McConkey and Hewson (1977), have enhanced their early learning social skills by reducing frustration (in the case of skilful play), learning independence and increasing self-respect. In the case of imaginative play, thought and language would be developed and understanding of others. These opportunities were available to them all before school but once in school not highly rated at all. The counter argument to this would be the perceived need by the schools and teachers to teach young children to gain literacy and mathematical skills at an early age. The question of school readiness was not applied in these cases.

Transition from playgroup to school

This proved to be difficult for children A, B, C and E. They all entered primary school into year one from playgroups. None of the children had been in playgroup settings full time for five days a week. School would have been traumatic from that point of view alone and all five children moved from a playgroup situation to a year one infant class. Only children A and C remember any links between playgroup and school, in their cases the primary school teacher visited the playgroup in the half term before they started school. All the children attended school for a full day following only half days in playgroup.

All the children remember that early school was about reading and writing, with very little time for play and they all remembered that they were given book bags and had to read at home after school with their parents. None of the mothers remembered strong links between playgroup and school and they all considered that their children were ready for school as they all had older children who were already attending the same schools. All of the mothers considered that school was about learning, but during the interviews they said that they thought it would have been beneficial for more time to be devoted for their children to play in school.

The mothers' recollections about their links with school were clear. Children A and C's mothers said that they felt fine with going into school at any time and talking to the teacher. However, both these children had the same infant teacher and both mothers (as did their children) said that she was fierce and unapproachable. Child C's mother helped in her child's year one class so that she could see what was going on. But both said that the school had an open door policy whereby they were able to go into the classroom and pick their children up and look at their work.

By contrast the mothers of children B, D and E said that they did not have such an easy relationship with the first year one teacher and that they were kept very much at arms length and at the school gates. However children B, D and E attended town schools whereas children A and C attended village schools. In village schools the inclusion of mothers in the classroom may come more naturally than in town schools. The researcher worked in the village school children A and C attended and that school offered an open door policy where parents were free to come and go at any time. For children B and E in

city schools it was not easy for the mothers who said that just to go into school you had to make an appointment. In the case of Child D who attended a rural town school mother said she felt she could go into school but they preferred it if you made a more formal request to see the teacher.

None of the mothers or children had any recollection of interest in their children's out of school interests by the early-years teachers. All of the mothers reported that they felt their son/daughter was 'ready for school at the age of five' and as a result expected their children to be working at mathematics and English. However, their needs as parents to be informed of progress may have been hindered by their lack of opportunity to go into school and talk to the teachers, particularly for children B, D and E.

Today, it is understood that parental confidence is a key factor in much of children's success in school (Pugh et al; 1994), and that parental involvement in early schooling is desirable, outlined at the start of the Early Years Foundation Stage, 2008 (01), that states 'parents have a right to play a central role in making decisions about their child's care and education at every level'. However this does not always happen and as Devereux and Miller (2003) p.81, point out, 'we often expect children and parents to make do with what is offered to the main group, whatever their circumstances, and that this is the problem with having one stated version of the curriculum.' For the five children in this case study it could be argued that this question of 'making do' meant that for children B, D and E the mothers felt ostracised by school. This was especially the case of these three children because their older siblings had not had reading problems so not being able to talk easily with the class teachers about their concerns resulted in worry and frustration. Children B and E's mothers said, 'We felt we were outsiders'. Equally, concerns by the other three mothers were interpreted by the class teachers as being unnecessary worries and that the children were late developers. However, it is known that the effects of not meeting and responding to individual needs, results in the entrenchment or exacerbation of special needs (Dawson, 1985).

These days when children move from pre-school settings to compulsory school, parents are a key part of that transition. It is known that links between home and school, collaboration between parents and teachers, is an integral part of transition (Margetts,

2002). Equally parents need to be kept informed about school's expectations and procedures as this reduces parental stress and helps them to support their children.

The point that all the mothers made about their children being ready for school was general as all the children were second or third children and the mothers thought they understood the process fairly well. OFSTED (2004) says parents expectations of what their children should be doing at this stage is an important part of the early years process. Parents did expect to see change in year one from structured play-based activities to more formal teaching and learning including a sharper focus on reading, writing and number. This was confirmed in all five cases.

However as child B's mother said, "We did not expect not to be helped when things went wrong in school with our son and he was unable to read." Child D's mother was not prepared for the 'hostility' to her daughters problems she said she received. However, the children were all in primary school nearly twenty years ago and it is expected that with all the early years guidelines that the transition process is now much more structured and understanding of individual needs.

The five children in the study would argue that had this been the case for them children their reading problems and the parental concerns might have been dealt with more smoothly. None of the mothers said that the teachers were interested in what their children could do. Relevant to this is the point made by Dunlop and Fabian (2007 p.145) that a curriculum in which children are able to explore their own interests, delivered in more flexible way will provide an environment more conducive to the development of learning dispositions. Further and of more importance to this study, Dunlop (2004) found that children who are creative, fluent and capable often experience a loss of confidence in the first days, weeks and months at school. Except for child E, all the mothers reported that their children were outgoing, confident and able to express themselves very well verbally before they started school. Dunlop warns of the dip in confidence particularly of creative articulate children in the early years and says an inappropriate approach to teaching and learning in key stage one may not enable this dip to be restored.

Spatial ability

From the outset, the study was struck by the way in which the five children accessed and enjoyed creative play and interests outside school. The study was interested to establish whether there were particular spatial abilities that all the children possessed or whether the spatial abilities were individual to each child. The study also wanted to ascertain if the children themselves recognised their own spatial ability and equally whether the mothers could offer further insight into their children's creativity and spatial ability?

Trevas et al., (2003) point out that creativity is a multi-dimensional construct very much linked to personality or 'creative style'. It is also recognised that creative activity involves the mental and physical process of remembering, organising, imaging, expression and evaluation. Part of the uniqueness of creative children is the way in which they interact with their environment that involves new ways of seeing old problems or becoming aware of new problems (Cornelius & Casler, 1991).

These descriptors relate particularly to what the researcher observed when she taught the five children. She was not predisposed to search out a particular spatial ability because each child had chosen different creative abilities from drawing, artistic construction, woodworking and model making, dance and drama and music. Rather the relevance to the research was that the children were showing independent thinking, were able to organise their pursuits, express and evaluate their individualism to others. In essence the importance of their creativity to them was the ability to use their skills to make their lives out of school have more relevance.

The results of the interviews with the mothers and children revealed different perspectives on the different spatial abilities. All the participants said that they thought the particular skills their children were using for each pursuit required the children to have good hand/eye co-ordination skills and good motor control skills.

The concept of other spatial abilities did not feature in any of the responses and none of the participants discussed mental rotation skills, visual realisation or the ability to construct in three dimensions. However, both children A and B's mothers said their sons could draw easily in three dimensions but they did not go on to link this to their sons

abilities to construct in three dimensions, to them good hand/eye coordination was the recognised skill. Child B's mother was unable to think of any particular spatial skill her son used for woodwork and model making. Child D's mother said that as well as good hand/eye co-ordination her daughter had a good memory for learning dance step routines and for being able to imagine how costumes and make up would feature in production, but she linked this directly to creativity and flair rather than spatial ability. Similarly child E's mother said her daughter needed good hand/eye co-ordination and good listening skills to be able to play the guitar from only hearing a tune played and not reading the music. Again, she linked this to creativity rather than a particular spatial ability. None of the mothers linked creativity or good hand/eye co-ordination to intelligence and none of the mothers discussed intelligence at all in relation to their children.

By contrast the responses of the children in relation to spatial ability were more intuitive. Whilst every child said that they needed good hand/eye co-ordination in order to be able to pursue their interests, their thoughts on the subject were linked directly to their pastimes and their individual needs to make a statement, be noticed or to pursue the life and the learning style that they thought was important for them, while they were in school or at University. It was a though they accepted their creativity and spatial ability as being normal to them, but equally as a means whereby they could achieve the life they wanted.

Good hand/eye co-ordination is considered a spatial skill coming within the area of spatial visualisation (Soloman & Hall, 1996). Good visual memory skills especially relating to the ability to draw and design in three dimensions also comes within the area of spatial visualisation but is more directly known as visual realism skills (Smith, 1964).

Originally, my own interpretation of the specific spatial skills that I was observing with children A and C (and other children in my previous classes) was the distinct ability to draw and design in three dimensions which could be indicative of good visual memories. This could still be the case and an area for future research, but my reading showed me that there were actually the two defined areas. Further reading indicated that children B, D and E's adeptness and skill with ice hockey, dance and drama and music, were also spatial visualisation skills (Lohman, 1993; Moran & MacIntyre, 1998).

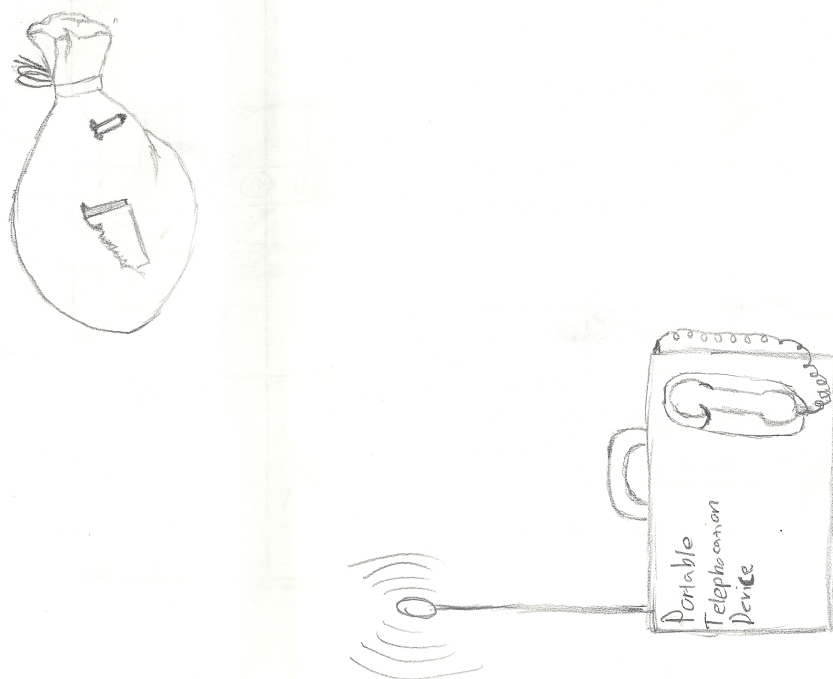
Knowledge that the two spatial skills can be identified as being specific meant that the choice of spatial tests for the college students would need to test these specific skills if comparative results were to be made in the conclusions. The FERT tests that were selected for the College tests contained those specific spatial elements, and this would prove to have significant findings in the results from the college survey.

In the case of the five children under discussion here however, the fact that children A and C could draw to a high standard aged 6 years (Figure 5) meant that the children were showing a specific talent at an early age. It is known that drawing to a high level of realism requires not only fine motor skills and good hand/eye co-ordination skills (Cherney et al., 2006) but also the additional ability to draw in three dimensions. It is a skill rarely seen in children below the age of nine years (Piaget, 1958; Cox, 1991). This is substantiated in the drawing (Figure 11) taken from one of the eighteen year old students in the College survey. This shows a bag with book and pencil and a mobile phone, the picture lacks maturity or the ability to draw realistically.

Equally, for children to be able to work successfully in technology and produce three dimensional models, two forms of spatial ability are necessary, a) the ability for them to work in terms of shape and space and then three dimensions and, b) the ability to carry out mental operations in their heads (Elliot & Hauptman, 1981).

In the area of sport and dance drama and music, the particular abilities used by children B, D and E these can be considered bodily kinesthetic skills (Griss, 1994) and yet still demand the same good hand/eye co-ordination and visual memory skills that are needed for art and 3-D construction.

Figure 11: Drawing by one of the college 'A' level students



Drawing of a school bag with book and pencil together with a mobile telephone.

Therefore, the five children were all displaying particular spatial skills in different pursuits. During their interviews they all said that in their primary schools they would have preferred to have had much more opportunity to be taught subjects practically and a more holistic, creative approach to teaching may have enhanced their learning and made it more pleasurable.

Art and drawing in particular can be a strong pre-cursor to writing (Edwards, 1993). Equally, young children who are provided with opportunities for lots of scribble, play and emergent writing, tend to move naturally on to writing for an audience Bissex (1980). None of the children could remember play writing in school except children A and C in year 2, and none of the mothers remember encouraging this at home, mainly because they said their children were busy playing creatively at activities that did not necessarily require them to write. Evidence from Olshansky (2006) shows that when children are

encouraged to write using areas of learning they can relate to e.g. drama, plays, cartoons, puppetry etc., then their writing skills improve dramatically.

The work 'conversations' written by child A as a preview for his first public exhibition of his art work shows that his creative imagination has been used successfully in the start of his career in the world of art. It reinforces the belief his mother had in him at an early age as having a vivid and lively imagination.

Conversations - The beginning

Originally the attempted manifestation of this study was to run closely alongside the idea of a place where I would like to have a 'conversation' with God. After only a few weeks it became apparent that the use of religion was parallel to the use of my audience, the two subjects, audience and religion, were very similar apart from one arriving with a lot less baggage than the other. This work took on a different level of understanding. In my opinion it became about the outsider entering a place that was not necessarily comfortable but regularly familiar to an audience from most cultural backgrounds.

Bearing this in mind my original proposal has become altered. The first of the two main aspects of my work changed to from being a written account to the account of my audience. Due to the fact that I wanted my audience to experience a personal and private encounter any method of capturing it I understood to be inadequate. This has left me with the shell of an idea and without real conclusion.

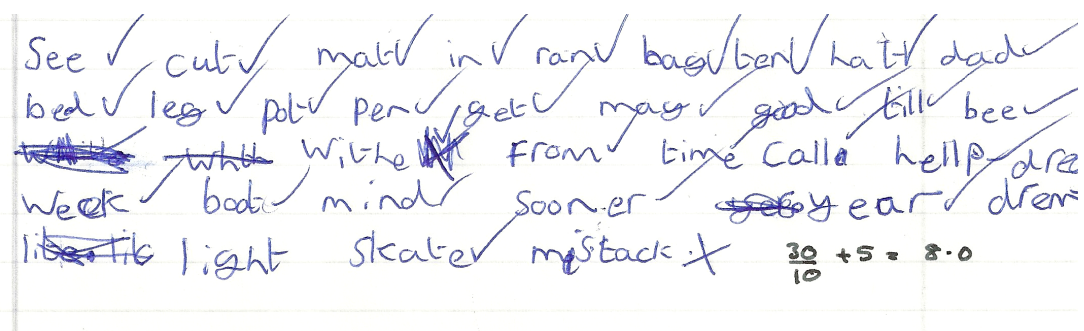
After questioning the success of the project it occurred to me that the performative element was even more important than the collection of evidence, and the success could only be gauged by individual internal experience. The decision to take this shell and re-interpret it in a more public space has posed many further questions. I want to challenge my audience not only with the decision of which seat to sit on, (or whether to sit at all), but how to engage with this space. During my exhibit I will ask them many more questions in an effort to challenge their reasoning for being there. As it is a fabrication of a pub will they get themselves a drink? Will they read the paper, or smoke a cigarette? Or, quite simply, will they touch anything at all? My reasoning to have no real indication of the limitations of the space is in an attempt to receive an honest reaction, and to not record the activity inside the space allows a slight temporary performance held in the memory of the participant. Mirroring the temporary and stage like presence to the installation.

However, drawing and art as a pre-cursor to writing is not only useful for extracting ideas from children and encouraging them to write but also because it can be used to remediate and solve a fine motor control problem in children.

The importance of drawing and art as a pre-cursor to writing (Edwards, 1994) may have been a missed opportunity particularly for children A, B and C. Their ability to draw and design in three dimensions at an early age was not apparently recognised in any of their year 1 classes and for child B never throughout his schooling. This was a shame, because it may have helped them in their understanding of the requirements of literacy, their pencil control, and their reluctance to approach writing.

For child B whose poor pencil grip due to a childhood injury, meant writing was difficult, encouraging him to draw and design more may have enabled him to become more proficient at writing. Figure 12 shows his writing skills in a spelling test when his chronological aged was 10. From this can be seen that he prints rather than writes and that the letters are for the most part badly formed. Montgomery (2007 p.51) says that children with handwriting difficulties from whatever cause try to avoid written work whenever they can. This was certainly true of child B who out of all the children had to be coaxed to write.

Figure 12: Example of child B's of handwriting




However, this may have been less of a problem for him if, in primary school he had been encouraged to see writing as a 'fun' activity and encouraged to supplement his writing with pictures to ease the pressure of only producing words. An example of how this worked for students at the after school club can be seen in the piece of work on swimming by child D. (Figure 13) who interspersed pictures with writing. Equally child E who also

hated writing and whose handwriting was sometimes non cursive and basic (Figure 14) found that her ideas grew if she used a computer to write a story, and her writing of 'Small World' shows this. Figure 15.


Figure 13: Example of child D's handwriting

24/11/97. The Swimming Gala.
Date / Monday 24th November

last Saturday evening I went to Allsbury Swimming pool for a gala. It was great fun. I swam in 3 races my first race was breastcock I had to do 2 legs of breastcock and I had to do a breastcock turn as well.

 Breastcock


Then my second race was 1 leg of front crawl that was harder then breastcock

 front crawl

Then my Threed one was backstroke that was only one leg luckily. Backstroke is my worst stroke I came second from last in that race.



My Mum and my dad were wacking me they found it rather hot upstairs wacking me. Swims in 3 difubit races my bother did not come and wackth me race beavce he nes that it is hot and so do I because we ~~wack~~ ^{swam} my cows swim in a gala ones it was belly hot we had to keep on going outside by the car we came in.



me and my brother by the car

THE END

Figure 14: Example of child E's handwriting

2. cow call ✓
 3. help ✓
 4. week ✓
 5. pie ✓
 6. boat ✓
 7. mined ✓
 8. sooner ✓
 9. year ✓
 10. dream ✓
 11. sight ✓
 12. mouth ✓
 13. large ✓
 14. might ✓
 15. brought ✓
 16. mistake ✓
 17. ~~pair~~ pair ✓
 18. while ✓
 19. state ✓
 20. staid ✓
 21. island ✓
 22. nerve ✓
 23. join ✓
 24. iron ✓
 25. health ✓
 26. direct ✓
 27. calm ✓
 28. ~~headcha~~ to headache ✓
 29. final ✓
 30. ~~increase~~ ?
 31. increase ✓
 32. slippery ✓
 33. bargain ✓
 34. copies ✓
 35. gest ✓
 36. view ✓
 37. safety ✓
 38. chusion cushion ✓
 39. account, ^{cushion} ✓
 40.

$$\frac{52}{10} + 5 = 10.2$$

Figure 15: Small World a story written by child E

Small World

One Saturday morning Peter got out of bed and went down stairs . When he was down stairs he saw that there were no COCO POPS left so he looked in the fridge and there was no milk and only one piece of toast left and no butter so he just had jam on it .When he finished his piece of toast he didn't feel very well so he ran up stairs to take his medicine and about ten minutes later he felt a tingling in his tummy. He looked down at himself and he saw his shorts getting longer and longer and his jumper was getting bigger and bigger and they just fell off his body and he didn't have any clothes on. So he went into his sister's room to get some Silvanian dolls clothes. when he found some clothes that fitted him he went to his Mum and Dad's room. On the way he found Fluffy the cat. Peter froze. "Nice kitty, nice kitty" said Peter over and over again. The cat started getting nearer and nearer and Peter turned and ran. when he got to his huge bedroom he saw a little car go right across his huge bedroom floor. He looked closer and he could not believe his eyes. There was lots of little people and lots of little shops and then he saw a sign saying "Small Town - this way" Peter thought for a moment and then he started walking and he saw a little light shining out of a shop window and started walking towards it. He saw lots of little people and lots of little houses all around him and then he knocked on a door of a little cottage and a little girl called Sally opened the door and said "Hello, are you lost?" Peter said "yes I am very lost. I haven't got a clue where I am. Can you help me?" Sally said "Are you trying to find your way back home?" and Peter said "Yes but I dont know where it is." Sallys Mum came to the door and invited Peter in. She said "would you like something to drink?" and he said "Yes please". So he had a little sip of orange juice and started to feel strange. He looked down at himself and saw that he was getting bigger and bigger until he was as tall as the ceiling in the little cottage. Sally and her Mum screamed and ran outside. Peter went dizzy and fell over, and when he woke up he was on the floor of his bedroom in his house. Peter shook his head and said to himself "Was that a dream or did I really go to Small Town?" when he looked down he saw some of his sisters Sylvanian dolls clothes on the floor and a tiny glass of orange juice!

As well as providing a method of recording work other than by simply writing, allowing children the opportunity to learn through art and design has been proved to improve all

round performance in the classroom and improve motivation in wanting to write (Wilson, 2009; Olshansky, 2006).

From the point of view of understanding how important drawing skills to understanding ability (Bensur, Elliot & Hedge 1997, as cited in Cherney et al., 2006) say increased drawing complexity reveals advanced working memory and spatial abilities. For children to be able to produce from memory pictures that depict depth and maturity necessitates them being able to recall figural configurations and to hold them in working memory (Cherney et al., 2006).

It was the mothers who commented on their children's good visual memories and while no research could be found to suggest that visual memory and the ability to recall figural configurations as being the same thing, it may be that what the mothers called visual memory was just that. Because if that were the case it could be applied to children B, D and E's ability to remember ice hockey moves, dance steps, and musically connotations easily.

When I interviewed the children about how they thought they could remember design strategies, ice hockey moves, dance movements and notes in music, they all said, 'it was easy'. I questioned children B, D and E more closely about this and they could only reiterate the ease at which they found these tasks, but all three added, 'we find it easy because it is something we enjoy and not something that we are forced to do'.

This study does not have the time to devote to following this up, the concept of what motivates a child to do something from the point of view of recalling figural configurations from memory, but this area could benefit from future research.

Research into how very young children work technologically is also an area that is very much a new to teaching (Anning, 1997). I found little in the literature that researched early years technology. However, work by Fleer (2000) proved to be of value to this study. Her work on investigations into how young children design and make during technology education, reiterated my previous reading about the particular spatial skills I was addressing in this research.

Firstly, she quoted the work of Solomon and Hall (1996) who stated that children who easily work in technology need to have two skills, the ability to think in terms of space and shape and as a result in three dimensions, and that to construct successfully children need to be able to carry out a series of mental operations in their heads. This clarified the issue of what I was actually observing in the five children and substantiated my reasons for the choice of standardised spatial tests used with the College students, that is tests that tested mental rotation, spatial visualisation skills and visual realism – three-dimensional drawing skills.

Secondly, Fler found as I had, that very young children are able to engage in oral and visual planning as a part of the process of making things from materials. Her research found that this skill can be observed in children as young as three years old. This substantiates what the mothers of all the children said about their children's pre-school play, that they considered their children to be advanced, that they could produce complex models, drawings and plays before school age.

The Fler study pointed out however, that while young children have complex designs in their heads and know what materials are needed to complete their ideas, this is not always possible without adult help if this only means gluing materials, cutting out costumes or providing more advanced tools and resources. Whilst I did not ask the mothers specifically about this it was apparent from the answers that they gave me that their children were encouraged to use whatever resources they wanted for their creative activities.

From the interviews it was understood that child A was encouraged by both his father and mother to design and draw and that an outside shed area was available to him for this. This was because his father, an architect, also enjoyed 'making and designing'. Child B's father, a floor layer, also encouraged his son's creativity and also provided outside play resources and encouraged him to use adult carpentry tools. Child C's father, a motor mechanic, encouraged him to play with car engines and his mother remembers engines being pulled apart and put back together again, although this was when he was in his later childhood.

Child D's mother said she had a little house in the garden where she used to prepare all her plays and again Child D had access to materials and props for dressing up. Child E was less creative but enjoyed outdoor play and making things with her brother, something her parents encouraged.

Research by Gmitrova, Podhocjekko and Gmitotrov (2009) showed that children who played constructively became creative builders and had no inhibitions during this sort of play. This type of play encourages fine motor control skills (particularly with the hands) and helps to develop good hand/eye co-ordination skills. It would seem therefore that the early play activities encouraged at home not only suited the children but also helped them to develop the motor and hand and eye skills that they would use in their future careers. This finding shows the benefit of a longitudinal study that shows a child's pre-school likes, school career and ultimately career choice. The results from the College survey will show that in fact the majority of those students identified what they were good at early on in school as well. While these results are more tentative because of the time limit in obtaining data, it nonetheless shows that early play activities and preferences seem to be an indicator for eventual career paths and which would be substantial in the College survey findings. This is a significant finding.

The role that the mothers played throughout their children's lives, but particularly in early childhood, proved to be of paramount importance to the significance the children were able to place on their creativity. The five children in the case study came from socially and economically different backgrounds. However, their attitudes and acceptance of their children's abilities allowed the five children to develop their spatial abilities to the full.

A study by Ring (2006) researching art and young children found that mother's everyday routines impacted greatly on their children's use of drawings. Whilst acknowledging that to date there was little research into young children's early art, she found in her study that the mother's attitudes and tolerance in allowing their children to develop their creative ideas was paramount. She found that mothers who allowed 'purposeful mess' (Pahl, 1999) and encouraged their children's drawing and design ideas, had children who were willing to have a go and take risks. At the same time allowing the space and resources for the children to make this mess, meant that through their art the children put meaning to life.

In this study none of the children reported that their mothers objected to mess, or their spatial activities, they could only remember encouragement from both mothers and fathers. Equally the mothers reported that they were willing to let their children produce their own play activities and supported and praised their models, plays, art or music. This encouragement by the parents to 'let their children have a go' may have led them to become the independent learners that they wanted to be. It would also have meant that before school the children probably had no understanding of failing at a task, even if it meant that in the last resort the parent would come in and assist in the end product, but this is summarised and is not known from the interviews.

Bodrova (2008), discussing the work of Vygotsky in relation to play and make believe play in particular, says that children who take part in make believe play on a routine basis show maturity and understanding of everyday situations. Child D used make believe play throughout her early years, took up tap dancing at seven years and went on to perform on stage with a theatre company in her early teens. Her interest in drama, and in particular costumes and make up, led her into beauty therapy and now her own Salon. However, the year 7 Tracking form, Appendix 3 does not show remarkable grades for drama that would be expected, given her interest in the area.

When school was discussed with child D in her interview when she was fifteen, she was non-committal and disillusioned in the same way that she was when she wrote about her life at upper school in year 7 (Figure 16). At the time I did not discuss her tracking form written in the same year as she wrote the piece about upper school because she was defensive and negative about school that I did not want to fuel the negativity. But despite all her problems in school, her enthusiasm for a career in beauty therapy was not diminished at the time of the interview.

The fact that members of staff at both primary and upper schools were unaware of her creativity out of school reflected in the results of the tracking chart is a shame. Like child B and E, child D could only remember school being for work, and play did not feature. Samuelsson and Johansson (2009) talk about the idea of play-learning constituting a continuum in which dimensions of each enrich the other and point out that often playing is ignored or invisible to teachers because of their perceived need to focus on other things.

This is a point reiterated by Moyles (2005) who claims that the targets of key stages stifle play and place emphasis on reading, writing and mathematics.

Clearly the fact that child D was a 'performer' and in her mothers words a 'show off' meant that she probably drew attention to herself in the classroom. 'I often shouted out', she said and 'I know I was rude to the teachers'. However, had the teachers been aware of her creative abilities and used these if only to enquire about her out of school pursuits or to mention them in circle time, or school assemblies she may have been more amenable towards learning.

Figure 16: Child D's assessment of school

12/10/98

My Life At School.

I started School on the 9th September 1998.

Break Times.

At break all the pupils in the school get 15minutes of free time in the morning. Pupils are allowed to bring a snack to eat or a bit of money to buy a cake or a bun from the tuck shop.

Pupils get to meet up with who they would like to, and have a good time. You are allowed to go into the main hall or anywhere in the school grounds, but no pupils are allowed in any classrooms. Students are allowed in the library, but on Thursday it is only years 7 and 8.

School Dinners.

I think that school dinners are **grim**. The cooks make lumpy mashed potato. It tastes disgusting! Luckily I don't have to suffer the pain of eating them!

School Uniform.

At school, students have to wear a plain black jumper or a logo jumper. The pupils have to wear plain black trousers with a white polo shirt and black or brown shoes with navy blue, black or white socks.

School Lessons.

All the pupils in the school have to do each lessons at least 2 or sometimes 3 times a week. Students do:

Art

Design and Technology

P.E.

Science

English

Maths

Performing Arts

Humanities

French

German

Tutorial

If you are wondering what tutorial is, it is when you get to spend 1 whole boring hour with your form tutor.

Self-esteem and motivation

One part of the study was to investigate the question of self-esteem and motivation to learn to establish whether poor reading skills impeded learning enough to result in poor self-esteem and reduced motivation towards learning.

The results of the interviews showed that the relationship between low self-esteem and dyslexia/ reading problems remained unclear (Terras et al., 2009). However, the children were motivated towards learning in areas in which they felt confident and that their out of school activities offered them a sense of achievement and self-belief that they could be good at other things.

Prior to school children are seldom confronted by situations where their learning achievements are subjected to systematic social comparison (Poskiparta et al., 2003). In the case of the five children this would appear to be the 'nub' of the case. The five came from extremely supportive families who all encouraged their activities. As such, before starting school, none had encountered learning failure, especially as older siblings had learnt to read and write easily in school.

All five mothers said that they knew it was wrong but that they were continually 'comparing their child's progress' with their older siblings at the time. However, Butler (1999) claims that children under the age of seven years do not understand that certain areas of the curriculum are diagnostic of their current ability. Further, Aalsvoort and Verheggen (2004) say that before the age of eight or nine years old children are unable to judge for themselves whether they experienced poor self-esteem.

These three issues therefore, the children's ability before school as seen by all five mothers as advanced; the mothers expectations and the children's non understanding of what school stood for may have contributed to mixed messages about what school learning and reading was about. Poskiparta et al., (2003) point out that learning to read is highly valued by both teachers and parents and that if a child makes slower progress than his/her classmates he/she become easily exposed to a cycle of repeated failure experiences that increases their vulnerability in learning to read. We know that reading is a complex and a complex process (Solity & Vousden, 2009) and that to be successful in reading needs sustained and focused attention, especially for successful word decoding and text comprehension.

As such the results from the interviews suggest that rather than suffering from poor self-esteem the five children suffered from what Poskiparta et al., (2003) call 'motivational-emotional vulnerability' in their early years at school, which impacted on their ability to actually learn to read. They had been so successful before they entered school, that when they found that they were unable to read easily they may have become overwhelmed and as a result their performance in reading deteriorated.

The evidence for this comes from the interviews. According to their mothers all five enjoyed listening to stories and could follow a story and turn the pages of books. They could all retell the stories and had story preferences before bedtime. As the year 2 class teacher for children A and C the researcher was in a position to confirm that they were able to listen to stories on the carpet and retell stories and understand the content of stories. They were both able to communicate effectively and ask questions. Equally, with children D and E who still enjoyed being read to at the after school club as part of the teaching programme was to share a book. Child B by contrast did not enjoy reading but was happy to extract information from magazines and read these if they were about sport or ice hockey in particular. Therefore all five children showed a liking for literature.

However, the success with activities that happened out of school were not matched, acknowledged or recognised in school for any of the children. Smith (1990) says to become able readers children have to 'want' to read and that reading is a state of mind accompanied by feelings or emotions that make reading more or less possible. Reading

also means sustained focussed concentration and the five children had been used to a certain amount of freedom of choice outside school and received continual praise for their achievements from supportive mothers. All this may have led to a motivation in wanting to read rather than a loss of self-esteem in not being able to read (Poskiparta et al., 2003).

The question arises as to whether the children had lasting effects as a result of being unable to read easily and was it possible from the results of the interviews to establish this? The mothers, children and family recognised the strengths of the children outside the learning environment, they were able to successfully transmit an understanding to their children that out of school activities were also important and that reading problems could be supported. Consequently four of the five children remained on task in school subjects and maintained their confidence and improved their literacy skills.

Long, MacBlain and MacBlain (2007) show that by supporting students' strengths, yet being mindful of their additional needs, can result in a feel good factor in children particularly upper school pupils. They advocated an 'holistic' approach to learning where the provision of appropriate learning opportunities go far beyond teaching the mechanics of reading and take in all the interests and skills of the child. Burden and Burdett (2005) also found that dyslexic boys in a school for dyslexics felt positive about themselves and reconciled to their reading problems. They attributed this to a supportive, understanding school environment, high-quality teaching that understood the problems and the promotion of learning in other areas i.e. Sport, where children may be able to achieve more easily.

Key to the five children's motivation and learning in school appeared from the interviews to be their inner understanding that they could excel in other areas. This resonated with them in a positive way knowing that, as children B and D said, 'school was something we had to live through'. However, at the end they had confidence in knowing that they could get jobs and be happy in careers, which is exactly what happened.

While children A, B, C and E conformed in school, Child D's pathway proved to be more difficult. Her mother said, "She was always noisy and a show off" and added "she will say what she thinks to the teachers, but she has always been like that." This 'attitude' did have an impact in the classroom and caused disruption. By years 9 and 10 she was

regularly truanting and shouting out in class. It could be argued that these are signs of anxiety (Willcott & Pennington, 2000). However others (Carroll et al., 2005) say the reverse is true and that children who display anti-social behaviour within the classroom actually show a degree of self-confidence.

My personal recollections of child D at the time would concur with this latter point of view. I consider her behaviour showed a lot of nerve, irritating though it must have been for her class teachers. When I taught her she was always a child who would speak her mind and have an opinion on everything. The piece of writing on My Life at School (Figure 16) illustrates this point. It was written while in year 7 and makes it clear what she thinks about school! This piece of work was done at the after school club. Part of her tuition at the club involved listening to her issues with school and talking them through. My notes at the time about this piece of work show the following: - *We read the piece together after D had finished typing it up. I asked her if the wording she had used was appropriate (would she use this in work she gave in to school). She said, "Yeah, well, not really but on the other hand it tells it how it is there and how I feel." We spent a few minutes discussing what she could do about this, could she tell her form tutor exactly how she felt (but politely) could she make more effort to understand the complexities of teaching?*

The work by Long, MacBlain and MacBlain (2007), that describes the benefits of using a 'holistic' approach with a boy in school, is very similar to child D. They found an intervention programme that focused on his particular learning style and his preference for visual learning helped to empower him while at the same time helped teachers in the school to understand his needs. Support of this kind would have helped child D, but would not necessarily have had any effect on her motivation in her ultimate career.

By contrast child B whose reading and writing problems remained into upper school, was served by a very supportive Special Needs Unit where his personal tutor devised an IEP for use throughout the school, met with him regularly to discuss school but more importantly to discuss ice hockey. He received one-to-one support for spelling and his support remained in place until he left school. This resulted in him feeling in his own words, 'school was ok, yes, I had to live through it, but in upper school they understood and made you want to do it'.

Children A and C were identified at the age of six because they were not reading easily yet they worked well in all other areas of the curriculum. While they could both remember being frustrated at being unable to write stories easily or get their ideas onto paper, they did not say at interview that this had worried them. Child C was aware that his mother was worried about his reading and writing he said, "I knew she was worried because I could not read easily." But from the interview I did not get the impression that he was worried about this. Because both had an early intervention programme and extra support, it be the case that any anxiety that may have presented itself later was alleviated because by the age of nine years, when they may have understood their problems and suffered a loss of self-esteem, (Aalsvoort & Verheggan, 2004) they were reading and spelling at a reasonable level and the reading tests show the improvement in their spelling and reading at this time. (Chapter 4).

Equally, in primary school, their creative abilities were being used in drama and design workshops and at home they were being encouraged to use these creative abilities in art, design and model making. Therefore the boys were constantly being reminded of what they could do easily, while their problems were also being supported (Long, MacBlain and MacBlain, 2007). In interviews neither boy reported that they had any problems of being unable to cope in Upper School, although child C did become, as he grew older, more and more inclined to want to work alone, not being 'a team player'.

For child E the picture was different again. She was silently frustrated in primary school years 1 - 4 in. She said, "I knew I couldn't read like my brother or the others in the class, but Dad always said it would come." Child E and her mother had a difficult time with her early teachers, 'they didn't understand me', and mother said, "I kept on to the teachers that she could not read" but added, "Her Dad said it would come eventually, but somehow she only made slow progress, certainly not like her brother." However, the feeling was from Child E's mother she said was 'not that her daughter had low self-esteem but that she was not understood or valued for what she could do'. As Poskiparta et al., (2003) point out, in the early years classroom children need to feel valued for the skills that they can achieve, without emphasis being placed on what they can't do.

When the researcher first met Child E she was easily able to discuss her reading problems and appeared resigned to the fact that this was an area in which she would improve with

extra support. I considered her attitude to be almost adult, notes from my first two meetings with her show the following: - *1st meeting she talked easily and at length about her literacy difficulties, knew that sometimes she did not concentrate, and said my thoughts wander at times. Said that she thought spelling was more of a problem than reading. I know I will never be good at reading but I can read I am just slower than most people. I need to spell and write more quickly because I have seen what my brother does in Upper School and I know I have to learn to get notes and things down quickly.* 2nd Meeting *I enjoyed my lesson last week, can see I have to go back to the beginning with spellings as I see I need to know how learning sounds and seeing patterns in words is important if you can't remember spellings like me.*

Again, this does not indicate necessarily a lack of confidence but more that child D understands that she needs support and is willing to engage in that support. The role of those teaching child D would prove to be important (Shell & Eisenberg, 1996) as she worked at the after school club.

The complexity and differences between the characters of each child and the way in which they accepted or 'worked with' their reading problems highlights two things, a) How difficult it is to assess self-esteem (Miller & Daniel, 2007) and b) that children are able to overcome or deal with their problems if they have the right home/school supportive environment (Burden & Burdett, 2005).

Each child dealt with their own situations differently from frustration at not be able to read easily to anger to indifference and acceptance. All five children were motivated towards outside activities in which they found success that enabled them to understand while slow reading and spelling difficulties were a nuisance, it was not the 'end of the world.' As such it was difficult to assess whether the five suffered from poor self-esteem either as a young child or as a teenager seeking employment. The five mothers reported that their children had put their literacy problems largely behind them, and they too had stopped being concerned because they were aware that the children would be able to pursue the careers they wished.

The important finding from the interviews was the perceived need of the children and their mothers and some of the students in the college survey, that schools and teachers

should understand all abilities and use teaching that incorporated strategies that support learning, in these cases practical teaching. Practical hands-on teaching was a point raised by the five children who all said that they thought mathematics; science and literature as far as possible should be taught by practical means.

Certainly the role of the school and in particular the class teacher is very important as to how children see school Sage (2002). Equally, to gain the best from pupils teachers need to establish a warm relationship with them Lawrence (2006). This leads to the question of motivation and the large part of this seems to play in getting children to achieve. Identifying what children did well proved important to the five children and was signalled as something that did not generally exist, in the case of the motor mechanics especially.

Humphrey's (2003) study of children with dyslexia in upper school found that the influence of teachers as 'significant others' was an important factor in low self-esteem. According to them children B and D both suffered from teachers shouting at them and not understanding them. Conversely, once in upper school, Child B saw the benefits of a good caring relationship with his special needs teacher that lasted throughout his schooling and helped as he said, to keep him 'on track and motivated.' Child D on the other hand did not have good feelings about her school or tutors from as early as year 7 as shown in her piece of writing My Life at School (Figure 16).

The work of Long et al., (2006) shows that once schools understand children with literacy problems and relevant teaching programmes often with a spatial element are introduced, then the pupil feels valued and his/her work improves. For child D this happened late in the day, when she was on the eve of leaving school. However, good appropriate intervention strategies were introduced that allowed her to stay at school for only two days a week whilst doing a work placement in the area of her interest for the rest of the week, resolved these issues for her. As a result she gained valuable workplace experience that ultimately lead her into an area she loves, make-up and beauty therapy.

Therefore the research found that success had more to do with motivation and an understanding on the part of the pupils of what they were good at and that once teachers identify and address the personal, social and emotional needs of young adolescent

learners who have difficulties with literacy, their motivation towards learning improves Long et al., (2007).

Transition and motivation to learn

The transition from a play environment, which supported their individual styles to a structured learning environment, did not suit these children and it will be argued that it had a detrimental affect on their learning. Entry into school stifled their creativity and may have de-motivated them, particularly in the case of children B, D and E. When children enter school they move from centre stage to side stage, some submit and are unconcerned others rebel (Sage, 2002). But rebellion does not have to be loud and result in bad behaviour its consequence can be de-motivation and disinterest in learning (Poskiparta et al., 2003). In a class situation the teacher tends to talk for three-quarters of the time resulting in pupils averaging less than three minutes talking a day, whereas at home (before a child starts school) it is usually the child who initiates talk and asks questions (Sage, 2002).

In this study all the mothers reported that their children had good imaginations and were able to converse easily. Vygotsky (1978) proposed that imagination builds on children's experiences however, for these children this was not recognised and their preference for creativity was not acknowledged, because the rigours of learning within the confines of a curriculum based on output (Anning, 2004) were adhered to. All the children could remember being asked to do lots of writing and pages of sums but none could remember play in the classroom.

Teacher expectations

Equally, their teachers did not recognise the importance of play during those early years in school, except in the case of Child D in her first year. Samualsson and Johansson (2009) point out that young children need play to include their teachers, and that they can gain help in play from them. Whitebread et al., (2009) give an example of how responsible 'scaffolding' and support in children's play helps them to do things for themselves. Citing a child in nursery school for three and four year olds, their study gives an example of a young child trying to put on a Fireman's jacket and struggling with the task. The nursery

teacher did not physically help the child but by responsive encouragement, smiles and, 'Yes, that's right', instilled enough confidence for the child to put the jacket on himself.

This is an example of Vygotsky's understanding of how children learn from a real life situation. In this case the child was creating what he called his 'zone of proximal development' where the child sets his own level of challenge and succeeds. It was this type of support the children in this study were used to at home, but they found no recognition in school for what they could do but a heavy emphasis, especially in the case of children B, D and E, placed on what they could not do.

At the same time, when the parents of children B, D and E raised their concerns about their children's inability to read in years one and two, their worries were not supported by school. The mothers all admitted that they considered their children 'ready for school' based on the experience of their previous children, but they also considered their children ready for school because they thought they were capable of making the move from playgroup. Child A's mother said it was time for her son to learn to read and do maths. Child B's mother said that her son soon learned to read the first level of the early reading scheme. Child C's mother admitted that she thought more play in school in the early years would have meant that her son, as she put it, 'would never have got reading.'

However, the point that they may have been missing is that while their children were able spatially and were able to communicate well both with their peers and with adults, they simply may not have been ready for the pressures of a curriculum that encouraged children to sit and work all day. Early exposure to a curriculum built on observable and testable learning outcomes, delivered in a formal structured manner creates a context in which children are potentially disempowered (Dunlop & Fabion, 2007). Nabuco and Sylva (1996, as cited in Anning et al., 2004) showed how overly formal approaches to teaching young children are counter-productive and can create anxiety and low self-esteem.

It is concluded that that this is what happened in the five cases. Rather than sustaining and nurturing them the prescriptive nature of the school curriculum meant that the children, who had previously had freedom to make their own activity choices and explore their own interests, were constrained in their development of disposition for learning (Dunlop, 2007). The study will also suggest that the children's spatial and creative abilities

were largely ignored throughout their schooling for children B and D and for child E until she reached upper school. For children A and C the early involvement of extra support for their reading problems and being in a small school promoted all types of interests that catered for individual needs, meaning that for these two children their creative interests were encouraged and this helped them to gain recognition from their teachers and school friends, resulting to a certain extent, in a boost for their self-image. Both were aware of their literacy problems (as they both said at the interview) but concentration by their primary school on what they could do (child A with drama and art and child B with art and design) meant that they understood that their reading problems needed to be supported but conversely they were able to excel in other areas others.

RESULTS OF THE COLLEGE SURVEY

Introduction

Factual questionnaires and the drawing tests were completed by 133 students (n= 133) from four vocational groups viz: Art, Motor mechanics, Electrical engineers and ‘A’ level students. From the information reported on the questionnaires three groups were identified for ease of analysis.

1. Students who reported that they had no reading problems at all during their school careers were titled no specific learning difficulties or No SpLD.
2. Students who reported either a specific problem with reading, writing or spelling were known as ‘SpLD’.
3. A third group of students who reported at least two areas of specific literacy difficulties and had been formally identified or diagnosed as having SpLD known as SpLD+.

Table 16: Student numbers in each group.

No SpLD	66
SpLD	27
SpLD +	40
	133

However, by the time of the administration of the CAT3 tests only 74 students were available for the test. As a result the analysis of the College Survey will be reported in two parts. Students who took both sets of tests n=74 and students who just took the drawing test and answered the factual questionnaire n=59.

Part 1

Data obtained on each of the measures were analysed by separate between-group ANOVAs for the groups SpLD, SpLD + and Non SpLD.

Level of reported literacy difficulties

Table 17 shows the mean score for the extent of literacy difficulties in the three groups. Students reported whether they had difficulty in reading, writing or spelling in school and received one point for each report, making a total possible of three points, if they reported all three scores.

Table 17: Level of reported literacy difficulties in College for levels of specific learning difficulties.

	N	Mean	SD	ANOVA
No SpLD	34	0	0	F=76.5, df=2,73, p<0.001
SpLD	20	1.05	0.94	Post-hoc Tukey comparison
SpLD+	20	2.30	0.86	Differences between No SpLD-SpLD; SpLD-SpLD+ and No SpLD-SpLD+ sig at p<0.001
Total	74	0.90	1.16	

The resulting analysis confirmed that those reporting SpLD+ (not only reporting literacy difficulties but with formal identification) had significantly more difficulties in one of the three areas than those in the SpLD group and thus validated the use of the three groups. Additionally, using Chi-square analysis, the results showed that those students with SpLD also reported more listening and questioning difficulties, which added further weight to the SpLD groupings. The sight/hearing data had too few reporting these difficulties to analyse.

Table 18: Percentage of students reporting other difficulties for SpLD levels.

	No SpLD	SpLD	SpLD+	Chi-square
Listening difficulties n=9	0	44.4%	55.6%	8.9, df=2, p<0.01
Questioning difficulties n=21	0	57.1%	42.9%	26.0, df=2, p<0.001

Analysis of CAT3 tests and spatial abilities scores

The descriptive statistics of reasoning, number and spatial test scores.

These findings relate to the distributions of the test scores – they show how the 3-D drawing test relates to other kinds of spatial tests.

Table 19: Descriptive statistics of reasoning, number and spatial test scores

N=74	Verbal reasoning	Number	Figure analogies	Figure analysis	3 D drawing
Mean	5.2	5.0	5.5	5.1	4.8
SD	1.8	1.7	1.6	1.8	2.6
Skewness / SE+ skewness	-1.26	-0.35	-0.62	-1.1	-0.23
Kurtosis / SE kurtosis ratio*	0.83	0.18	1.67	1.46	2.07

* if within range of -2 to +2, then distribution is normal

+ if within range of -2 to +2, then distribution is normal; no distribution is skewed, that is <-2 or >+2.

This shows that for each variable the mean is around 5 as expected if sample has average stanine scores. The mean for 3-D drawing is slightly lower and SD much larger – see frequency chart to show that these scores are more dispersed and this is evident in kurtosis ratio which is just above 2; indicating that these scores are not normally distributed. All other scores are normally distributed.

Inter-correlations between reasoning, number and spatial test scores

The following table shows that all variables are correlated moderately significantly within NfER set. Figure analysis is less correlated with number and verbal reasoning and 3-D drawing scores not correlated at all except at a low-level with figure analysis but this just misses significance at the 0.05 level.

Table 20: Inter-correlations between reasoning, number and spatial test scores.

	Number	Verbal reasoning	Figure analogies	Figure analysis	3 D drawing
Number		0.53*	0.53*	0.35*	0.07
Verbal reasoning			0.54*	0.33*	0.19
Figure analogies				0.61*	0.11
Figure analysis					0.23"
3D drawing					

* : $p < 0.01$; " : $p = 0.053$

Comparison of test scores and ANOVA results for course groups

The following table shows the results of the drawing tests and the CAT3 tests comprising verbal reasoning, number, figure analogies, figure analysis and 3-D drawing. It also shows that there is only one significant difference between the course groups in terms of their scores. Those doing 'A' level had higher verbal reasoning than those doing technical courses but not for those doing art. There were no significant differences for number, figure analogies or analysis.

Table 21: Comparison of test scores and ANOVA results for course groups.

Means (SD)	Tech: Electrical engineering Motor vehicle N=30	Arts n=24	A levels n=20	F value, df=2,73 Post hoc comparison Tukey
Verbal reasoning	4.4 (1.9)	5.4 (1.6)	6.0 (1.2)	5.6, $p < 0.005$ A level > Tech: $p < 0.01$
Number	4.7 (1.9)	5.3 (1.3)	5.2 (1.9)	0.9, NS
Figure analogies	5.1 (1.8)	6.1 (1.4)	5.6 (1.4)	6.4: NS
Figure analysis	5.1 (1.9)	5.5 (1.7)	4.6 (1.8)	4.4; NS
3-D drawing	4.4 (2.5)	5.9 (2.5)	4.8 (2.6)	3.1; NS, $p = 0.06$

For 3-D drawing, students doing art had higher scores but not high enough to be significant at the 0.05 level. Were they slightly higher this would be in line with what would be expected in terms of those doing an art course as opposed to technical or 'A' level subjects. The bar chart (Figure 17) shows this visually.

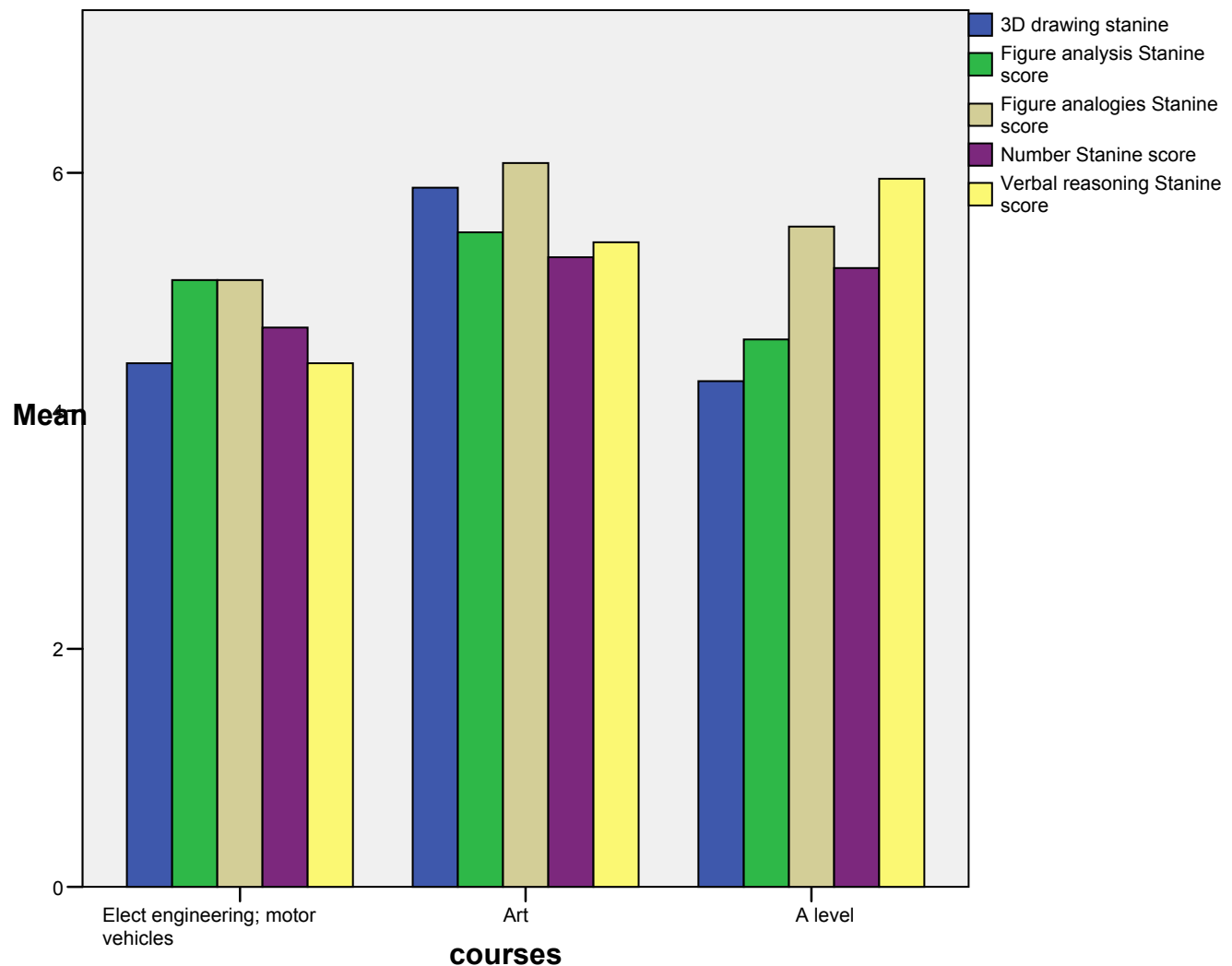


Figure 17: Mean reasoning, number and spatial scores for students in different courses.

No differences between students with and without both levels of SpLD in terms of number and figure analogies and figure analysis scores could be identified. Only verbal reasoning scores were significantly different showing that those without SpLD had higher verbal reasoning scores, while those with SpLD+ had the lowest verbal reasoning scores. Table 27 shows this.

Table 22: Comparison of test scores and ANOVA results for SpLD groups.

Means (SD)	Non-SpLD N=34	SpLD N=20	SpLD+ N=20	F value, df=2,73 Post hoc comparison Tukey
Verbal reasoning	5.7 (1.6)	5.0 (1.6)	4.4 (1.9)	3.6; p<0.03; non SpLD-SpLD+: p<0.04
Number	5.2 (1.9)	5.0 (1.2)	4.7 (1.8)	0.6; NS
Figure analogies	5.7 (1.9)	5.4 (1.7)	5.6 (1.7)	0.8; NS
Figure analysis	5.2 (1.9)	5.0 (1.6)	5.1 (2.0)	0.04; NS
3-D drawing	5.0 (2.6)	5.7 (2.3)	3.7 (2.7)	3.2; p<0.05: SpLD-SpLD+; p<0.03

This ANOVA shows that there are no differences between those with and without both levels of SpLD in terms of number and figure analogies and analysis scores. Only verbal reasoning scores are significantly different indicating that those without SpLD have higher verbal reasoning and those with SpLD+ the lowest. The bar chart (Figure 18) shows clearly that there are some students in the SpLD groups with high spatial abilities but not disproportionately so.

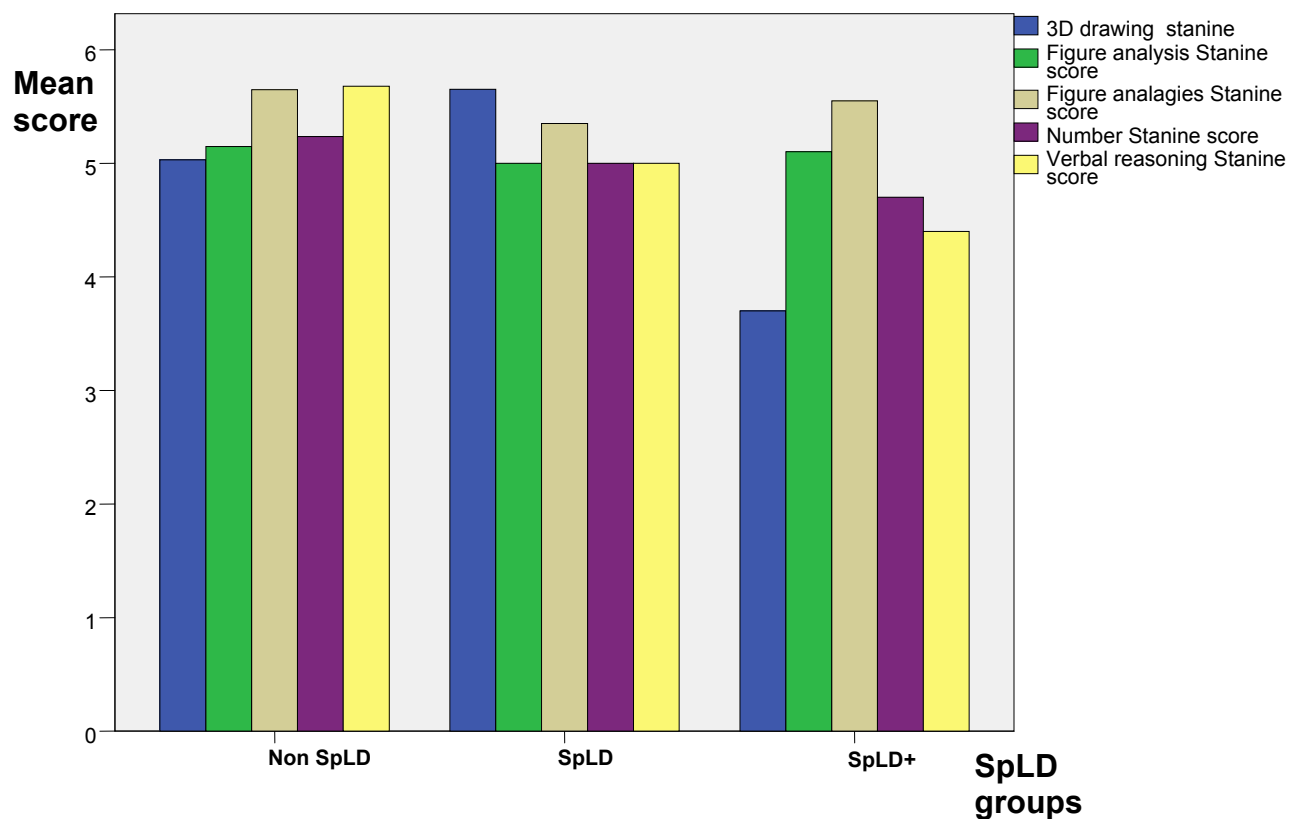


Figure 18: Mean reasoning, number and spatial scores for SpLD and non-SpLD groups

Cross tabulations

Below are the cross tabulations of the three spatial test scores and SpLD groups. This forms part of the SPSS analysis that shows the proportions of students with SpLD+ and SpLD with high scores. This table shows the percentage of students with high drawing scores (7 is taken as a high score as above mean by one stand deviation score).

Table 23: Crosstabs for full sample n=74 and those not taking CAT scores.

			Dyslexia * drawstan2 Crosstabulation									
			drawstan2									
			1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	Total
Dyslexia	no SpLD	Count	9	7	8	7	6	12	8	5	4	66
		% within Dyslexia	13.6%	10.6%	12.1%	10.6%	9.1%	18.2%	12.1%	7.6%	6.1%	100.0%
	SpLD	Count	3	2	3	2	4	7	1	2	3	27
		% within Dyslexia	11.1%	7.4%	11.1%	7.4%	14.8%	25.9%	3.7%	7.4%	11.1%	100.0%
	SpLD+	Count	5	5	7	2	3	9	4	2	3	40
		% within Dyslexia	12.5%	12.5%	17.5%	5.0%	7.5%	22.5%	10.0%	5.0%	7.5%	100.0%
Total		Count	17	14	18	11	13	28	13	9	10	133
		% within Dyslexia	12.8%	10.5%	13.5%	8.3%	9.8%	21.1%	9.8%	6.8%	7.5%	100.0%

So for those with formal identification of SpLD expect about 15% to have high 3-D drawing ability that is not much different for those without SpLD.

The following table shows the cross tabulations for figure analogies and figure analysis.

Table 24: Crosstabs for all tests.

			Dyslexia * Figure analogies Stanine score Crosstabulation							
			Figure analogies Stanine score							
			3	4	5	6	7	8	9	Total
Dyslexia	no SpLD	Count	2	6	10	8	1	6	1	34
		% within Dyslexia	5.9%	17.6%	29.4%	23.5%	2.9%	17.6%	2.9%	100.0%
	SpLD	Count	3	5	2	5	2	3	0	20
		% within Dyslexia	15.0%	25.0%	10.0%	25.0%	10.0%	15.0%	.0%	100.0%
	SpLD+	Count	3	4	1	6	3	3	0	20
		% within Dyslexia	15.0%	20.0%	5.0%	30.0%	15.0%	15.0%	.0%	100.0%
Total		Count	8	15	13	19	6	12	1	74
		% within Dyslexia	10.8%	20.3%	17.6%	25.7%	8.1%	16.2%	1.4%	100.0%

			Dyslexia * Figure analysis Stanine score Crosstabulation								
			Figure analysis Stanine score								
			2	3	4	5	6	7	8	9	Total
Dyslexia	no SpLD	Count	1	7	7	5	5	5	2	2	33
		% within Dyslexia	2.9%	20.6%	20.6%	14.7%	14.7%	14.7%	5.9%	5.9%	100.0%
	SpLD	Count	1	3	4	4	4	3	1	0	23
		% within Dyslexia	5.0%	15.0%	20.0%	20.0%	20.0%	15.0%	5.0%	.0%	100.0%
	SpLD+	Count	1	5	3	2	4	2	2	1	20
		% within Dyslexia	5.0%	25.0%	15.0%	10.0%	20.0%	10.0%	10.0%	5.0%	100.0%
Total		Count	3	15	14	11	13	10	5	3	73
		% within Dyslexia	4.1%	20.3%	18.9%	14.9%	17.6%	13.5%	6.8%	4.1%	100.0%

For first sample only n=74. Crosstabs of SpLD group with stanine spatial test scores – showing that 15% (6 out of 20 SpLD+) had high figure analogies. (7 and above scores (taken as high) mean by one stand deviation score). 25% (5 of 20) had high figure analysis scores.

Part 2

Students who took the drawing test but not the CAT3 tests

Fifty-nine students took the drawing test and completed the factual questionnaires, but did not complete the CAT3 tests. The results of these drawing tests and factual questionnaires that were analysed using ANOVA and have been tabulated separately. These results are shown in Appendix 17.

Table 25: Descriptives and ANOVA showing lack of significant differences between groups.

Descriptives

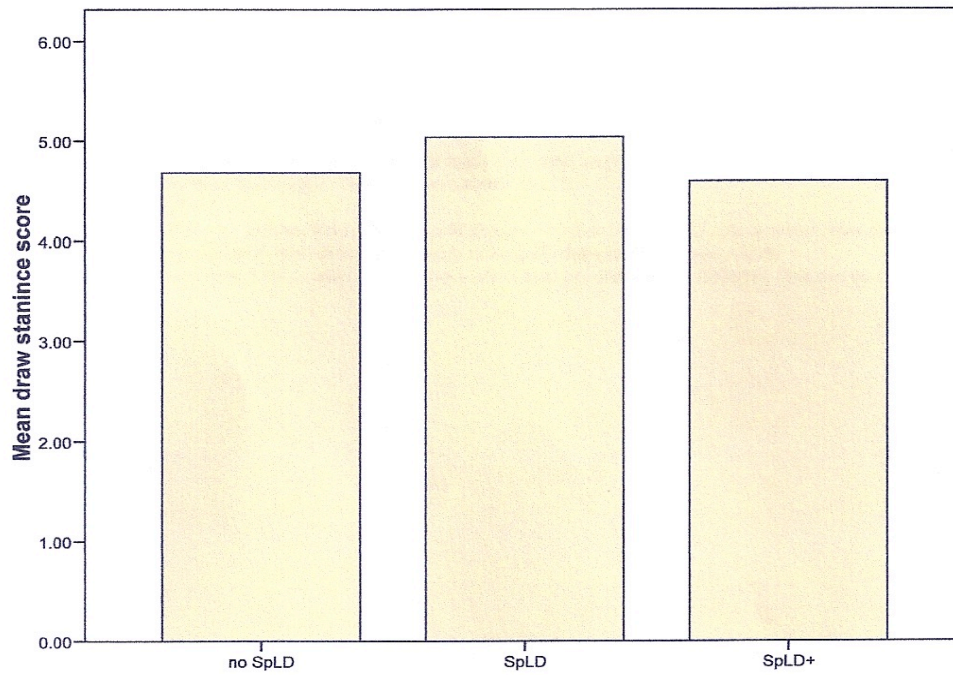
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
no SpLD	66	4.6818	2.45676	.30241	4.0779	5.2858	1.00	9.00
SpLD	27	5.0370	2.45704	.47286	4.0651	6.0090	1.00	9.00
SpLD+	40	4.6000	2.47863	.39191	3.8073	5.3927	1.00	9.00
Total	133	4.7293	2.44989	.21243	4.3091	5.1495	1.00	9.00

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.374	2	1.687	.278	.758
Within Groups	788.881	130	6.068		
Total	792.256	132			

Table 26 shows students who took the drawing tests, but not the CAT3 tests. The results show that there were no significant differences between non-SpLD students, SpLD students and SpLD+ students. The bar chart shows this and the cross tabulations show the proportion of students in each group with high drawing scores is not significantly different, about 15%. As a result this does not change much the findings from the first group where other spatial scores were available in the form of the CAT3 tests.

Table 26: The proportion of students in each group with high drawing scores



Dyslexia * drawstan2 Crosstabulation

		drawstan2									Total	
		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00		
Dyslexia	no SpLD	Count	9	7	8	7	6	12	8	5	4	
	% within Dyslexia		13.6%	10.6%	12.1%	10.6%	9.1%	18.2%	12.1%	7.6%	6.1%	100.0
SpLD	Count	3	2	3	2	4	7	1	2	3		
	% within Dyslexia		11.1%	7.4%	11.1%	7.4%	14.8%	25.9%	3.7%	7.4%	11.1%	100.0
SpLD+	Count	5	5	7	2	3	9	4	2	3		
	% within Dyslexia		12.5%	12.5%	17.5%	5.0%	7.5%	22.5%	10.0%	5.0%	7.5%	100.0
Total	Count	17	14	18	11	13	28	13	9	10		
	% within Dyslexia		12.8%	10.5%	13.5%	8.3%	9.8%	21.1%	9.8%	6.8%	7.5%	100.0

Discussion

The tests

The battery of tests comprised two verbal reasoning, two quantitative and two non-verbal battery tests. The interest for this study lay in the results of the verbal and non-verbal batteries. The quantitative element of the battery tested mainly mental arithmetic skills and this was not seen as an essential element for this study. However, it was anticipated at the outset that the students studying 'A' levels and art would score more highly on these tests than those on the other vocational courses. As predicted the results showed that those with SpLD and SpLD+ had lower scores for verbal reasoning. The importance for this study was the two non-verbal reasoning tests both of which tested inductive and deductive reasoning powers and the ability to understand the concept of mental rotation. Non-verbal batteries require no prior conceptual or factual knowledge and the answers are embedded in the questions themselves. This means that students with SpLD or SpLD+ are not disadvantaged.

Figure analogies (Appendix 20(5)) uses both inductive and deductive reasoning. Inductive reasoning infers the relationship between pairs of geometric pictures while deductive reasoning implies the inferred relationship to the choice of answer, it also assesses visualisation because the participants have to imagine the effect of hypothesised transformations upon the stimuli.

Figure analysis uses a series of diagrams showing a square piece of paper being folded and holes punched in the paper. Students had to select (from 5 answer choices) the figure that shows what the folded paper will look like when it is unfolded. The difficulty of the question depends on the number of folds. Again, this is a test of both inductive and deductive reasoning. Both are tests of spatial visualisation (Vz) (Lohman, 1993).

The drawing test was a test of Visual Realism (Smith, 1964) that aimed to establish how many students were able to draw four everyday objects from memory in three dimensions. This was used in collaboration with the FERT tests, which also included a non-verbal element in English and mathematics. This gave an overall picture of spatial realism, spatial visualisation skills and non-verbal skills for each student and the opportunity for all the test results to be correlated on one result sheet.

The students who participated in both the FERT and drawing tests completed two factual questionnaires. The first produced details of GCSE's gained before College and any reading problems, the second questionnaire establishing subjects and activities enjoyed in primary school and out of school pastimes. The results of these aimed to correlate with the experiences of the five case studies.

A disappointment of the study was that whereas 133 (n=133) students had volunteered for the research only 74 actually completed both tests. This was due to timetable problems and the reluctance of 'A' level tutors to release students to do the second computer test, although they had originally given their consent. Additionally, some art students did not do the computer test because of external assessment procedures, which were not timetabled at the outset. However, this illustrates the complexities of access, especially in Further Education Colleges.

Informal interviews

Following the completion of the drawing tests and the factual questionnaires, the researcher had timetabled five minutes with each group for them to ask questions or to try to understand their feelings about their school careers. The motor mechanics were the most vocal about their time in school and willing to talk about how they felt. The electrical engineers were also able to discuss their feelings, and the art students and 'A' level students showed less interest in discussing school. The researcher gained the impression that for the latter two groups school had not always been easy for some but difficulties had been overcome either by extra help or by supportive teachers. The motor mechanics on the other hand were largely resentful about school and Appendix 19 shows a handwritten note taken from group interviews with three groups of motor mechanics. From these it is clear that many of them felt school had not identified their problems early on, that they had not been recognised for what they could do and that the college course supported their practical abilities in that their tutors were understanding of their needs. The qualitative data in the form of notes were collated after informal discussions with the motor mechanics at the end of their drawing tests. Table 27 shows this.

Table 27: Analysis of qualitative data relating to the formal interviews with the motor mechanics.

Results of informal interviews with motor mechanics	Numbers n=49
Those who did not like primary school and those who did not like secondary school.	12 14
Those who enjoyed college.	49
Those who felt they did not fit in at school.	12
Those who said they liked College because it gave them choices.	30
Those who said College allows them to work within their own parameters.	15
Those who said at College 'We are respected for what we are'.	30
Those who thought that there should be more practically taught subjects at school.	20
Those who said teachers were never interested in what you could do.	10

Factual questionnaires

The factual questionnaires provided information about students' reading and reading-related difficulties and any difficulties with hearing, vision, listening in class and asking questions. These were entered into the SPSS database as additional variables. Table 23. Using a self-completed questionnaire with the students proved to be an effective method of collecting data particularly about reading problems because they completed them in their own classroom environment making them feel at ease and in addition by writing their responses the researcher got the impression that they were able to take more time to reflect, rather than answering on the spot questions. In this way they provided a more accurate response.

This highlights the issue of 'cut off points' in deciding whether a student is dyslexic or not dyslexic. The students in this study for example who reported that they had either reading or writing problems but did not say they were dyslexic could well have been identified as

such in particular settings. Students and pupils in school are very much reliant on the assessment of needs process in identifying their reading problems.

How the different groups were categorized was a key issue to the validity of these findings because the study was relying on the self-completed questionnaires and not on evidence from school records. Any research collected from a College of Further Education will come across similar difficulties because of the wide catchment area and because many students may have come from outside the U.K. As a result, school records are not always transferred and in this instance the College relies on a skills test on entry to make decisions about those students who may have specific reading difficulties. The skills test also demonstrates abilities in English and mathematics. The results of the verbal reasoning tests administered in this study indicate that the SpLD and SpLD+ distinction was reinforced by this other self-reported data.

The results of the data from the factual questionnaires showed that of the original 133 students 50% had reading problems Table 21. This is a high figure and representative of the 55% of pupils estimated to have reading problems and poor SAT results through low reading ability highlighted by the SPLD Trust, which also looked at teenagers and vocational skills (Defries, 2010). Discussion with students vocational Tutors at the College after the administration of the drawing test and before the completion of the factual questionnaire revealed no surprise at these figures. The standard response from the College Tutors was, 'this is why they are at a College of Further Education.'

Second factual questionnaires

Seventy-four students who took part in the FERT tests (Appendix 18) completed the secondary factual questionnaires. The aim of these was to establish what the students liked doing in primary school and at home. By asking them questions about their early primary school years and the subjects they liked, together with their out of school pursuits, it was envisaged that the results might correlate with the same questions asked of the five case study children. The time allowed to me by the College meant that it was not going to be possible to interview students as closely as the five children, therefore the questionnaires aimed to ask, as far as possible, the same questions.

Sixty-nine of the seventy-four students completed second factual questionnaires. The reason that five students did not complete the second questionnaires was due to a time factor - they took longer than the others to complete the FERT tests and as a result had no time left in which complete the second questionnaires.

The results from the second factual questionnaires provided rich data and a larger picture of the primary school profile of the students. The tabulated results are shown in Tables 28 to 30 below.

Table 28: Table of results - Motor mechanics and electrical engineers

Ref	GCSE	Reading Problems	Drawing score	Handwriting	School favourites	Best school subject	Home pastime
M2	3	Yes	25	Printing	Construction toys	-	Lego®
M6	8(F2)	Yes	28	Printing	Painting Modelling	Art/maths	Cars Airfix®
M10	5		17	Good	Going home	Hates all	-
M18	5		29	Good	Playtime	R.E.	Nintendo®
M21	9(F1)	Yes	25	Printing	Playtime	-	Connex®
M22	5(F2)	Yes	23	Printing	Making Sport	-	Bikes/radio contr'd cars
M23	7	Yes	20	Printing	Playtime	-	Action men
M26	5(F3)	Yes	34	Printing	Sport/P.E.	-	Hot wheels
M29	9		12	Printing	Playtime	-	Meccano® Bikes
F34	3(F2)	Yes	11	Printing	Hates school	-	Play station games
M39	-	Yes	13	Printing	Playtime	Maths	-
M42	5(F1)			Good	Football	-	Football
M44	-			Good	Maths/P.E. Dinner	Music P.E.	Big outdoor Toys.
M45	10	Yes	25	Printing	Football	Maths, P.E.	Cars Playstation
M46	7	Yes	33	Printing	Playtime	History P.E.	-
M47	10		33	Good	Sport	Maths, P.E.	Kits/models
M52	7(F4)		34	Capital letteri	Going home	-	Cars Meccano®
M58	-	Yes	0	Printing	Football	Maths, P.E.	Football
M60	6		30	Printing	Playtime	P.E.	Cars
M62	-	Yes	9	Printing	Hates school	-	-
M63	-	Yes	5	Printing	Going home	-	Connex® football
M69	7(F4)	Yes	4	Printing	Hates school	-	-
M71	7		37	Printing	No interview	-	-
M72	7	Yes	24	Printing	Hates school	-	Football
M7	7		31	Printing	Design technology	Sport	-
M20	10		30	Good	Making things	Science	Lego® Meccano®
M30	10		36	Good	Sport	Science	Sport
M73	10		33	Good	Science	Design	Computer

- = No recollection

Table 29: Table of results - Art students

Ref	GCSE	Reading Problems	Drawing score	Handwriting	School favourites	Best school subject	Home pastimes
M3	5		30	Good	Drawing	Cookery	Drawing
M9	8	Yes	11	Printing	Sport/mobilo®	-	Visual games
F14	9		33	Good	Art	Art	Board games
F15	11	Yes	33	Good	Modeling and design	Art	Lego®
M16	10		24	Good	Playtime Drawing	-	Lego®
F17	9		36	Good	Making things Drawing	Music	Making things
F19	-		37	Good	Drawing	Reading	Colouring
F24	10		35	Good	Art/painting	Art	Outdoor play
M27	11	Yes	37	Good	Model making	Art	Lego® Duplex®
F32	12	Yes	38	Good	Drawing Model making	Art	Lego® Toy cars
F33	*		40	Good	Drawing	Art	Dolls
F35	10	Yes	36	Printing	Making things	Art/maths	Trains Dolls
F38	10		22	Good	Painting Drawing	Art	Outdoor play. Art
F40	12		33	Good	Drawing	R.E., P.E.	Outdoor play.
F41	10		31	Good	Art. Drama	Art. Sport	Dolls
F43	7	Yes	24	Printing	Painting	Art/maths	Lego® Duplex®
F48	10		2	Good	-	History	-
F49	11		31	Good	Drawing painting	Art	Outdoor play
F50	11		35	Good	Make believe Play	English	Lego®
M64		Yes	25	Printing	-	Art/maths	Remote contr'd cars.
M66	10		32	Printing	-	English, art, P.E.	-
F70	9		36	Good	Playtime Story time	Art	Drama Dressing

- = No recollection

* = No UK qualification

Table 30: Table of results - 'A' Level students

Ref	GCSE	Reading Problems	Drawing score	Handwriting	School favourites	Best school subject	Home pastimes
F1	10		25	Good	Playtime	Art, Maths	Board games
M5	8		21	Good	Ball games	Sport	Computer games
M11	7	Yes	0	Printing	-	-	-
F12	12		27	Good	-	-	-
M13	11		20	Good	-	Maths, Science, English	Model making
F28	*		33	Good	Sport	Sport	Lego®
M31	*		15	Good	Going home	-	Lego®
F51	10	Yes	32	Printing	Hated school	-	Barbie® dolls
F53	10		33	Good	-	-	-
M54	10	Yes	36	Capital letters	All subjects	-	Computer games
F55	*		36	Good	English/art	-	Barbie® dolls
F56	*		37	Good	English/art	-	Barbie® dolls
F57	10		36	Good	-	History, P.E.	Barbie® dolls
F59	10		20	Good	Reading. Sandpit	English, History	Barbie® dolls
F61	10		15	Good	Sandpit Painting	English, Art	Cooking
M65	10		22	Good	-	-	-
F67	11		32	Good	Playtime	English, Music, Maths	Skipping
M68	7		27	Good	-	-	-

- = No recollection

* = No UK qualification

From the results of the questionnaires a picture has emerged which shows the following:

Printing

Twenty-eight (37%) students who self-reported reading or dyslexic problems used print or all capital letter handwriting rather than cursive legible handwriting used by the other

students. Work by Silverman (2004) found that handwriting appears to play a significant role in underachievement.

Montgomery (2007) says that pupils with handwriting problems (from whatever cause) tend to avoid written tasks whenever they can. In a survey of secondary school pupils Roaf (1998) found that 25% of Secondary School children were unable to write faster than 15 words per minute and the majority of these had spelling problems. As a result their written work suffered, particularly at Secondary School age, because they simply could not keep up in class.

Favourite school activities

The results show conclusively that all the motor mechanics and all except one of the electrical engineers enjoyed activities in school that were either practical, sporty or involved going home or playtime. The results from the art students show that all except one listed painting, drawing, model making and construction tasks were their favourite activities while the results from the A level students show a more varied picture. Only one student gave creative activities as their favourite activity and two gave sport as a favourite.

Favourite school subjects

The most popular subject for the motor mechanics and electrical engineers was mathematics, followed by sport or P.E. Fourteen could not remember and of these nine had claimed going home or playtime as being their favourite school activities. This is a significant finding.

The majority of the art students cited 'art' as being their favourite subject at school and this is not an unusual finding. The responses of the 'A' level students were mixed from sport and history to English and five did not know what subjects they liked. These latter results may be indicative of their choice of a Further Education College to do 'A' levels after school leaving age, they simply did not know what subject they liked the best.

Favourite home activities

The results from the motor mechanics show that their out-of-school pursuits fell into three main areas a) construction toys, b) computer games, c) football, sport and outdoor pursuits. By contrast the art students all reported either creative activities and outdoor play or Barbie® dolls. The 'A' level students reported a mixture of pastimes from skipping, Barbie® dolls, Lego® to computer and board games.

Drawing scores

The drawing scores show that the Art students had the overall high scores of 30+, which would be expected. The drawing scores of the other two groups showed high scores and showed that students with lower results in GCSE's could compete at the same level as those with high numbers of GCSE's, a fact established from the FERT tests, and thus validating those results.

Reading problems and the students in the College survey

The introduction of the National Literacy Strategy (DfEE, 1997) did not address the needs of pupils who experienced particular difficulties in a specific manner. Before the inception of the strategy it was acknowledged in the Literacy Taskforce Report (1997. p.14) that a significant number of children would need individual support (Wearmouth & Soler, 2001). It was not until 2002 however, that the Department for Education and Skills (DfES) published guidelines about meeting the needs of individuals within the National Literacy Strategy with provision in the form of the Wave Three initiative (DfES, 2002. p.3).

This may have had implications for all children in English primary schools during the years 1997-2002 who may not have had adequate structured support for their reading problems and this applies to the students who took part in this College Survey. The results from the self-completed questionnaires about provision and support students received during that time showed there was a lack of consistency of provision for the students reading problems.

The College Survey was carried out during 2007-2008 so that the majority of the students would have been in primary schools during those years. The following table shows the results of provision made for students during their primary and secondary years. Students in the College survey who reported that they were educated abroad during their school years were omitted from these findings, even if they had had reading problems because these would have been addressed in their own countries.

The results show that out of the total of fifty-nine students with reading problems thirty-five reported that they got help in school. Conversely twenty-eight students reported that they did not get help in school. Interestingly, thirteen the largest number of students who self-reported that they did not get help in school, were motor mechanics.

This was also the group who were vocal in their informal interviews about their dislike of school and the responses of some of those students are shown in Appendix 19 and backed up by the three tables of results. It was also the group in which the researcher was actively encouraged to spend more time by the tutors. The results may be indicative of a group of pupils for whom school did not hold much perceived opportunity or in their eyes, recognition of what they could do. This could also have social implications whereby the pupil's parents may not have been able to relay their concerns to the schools in order to secure more provision for them.

This is a small survey and to understand the implications of reading problems and social background more, Further Education Colleges would need to be involved, and students from those Colleges engaged on similar vocational courses to those in this survey.

Table 31: Provision made for students during their primary and secondary years.

	Motor Mechanics	Electricians	Art students	'A' level students
Students who had reading problems and got help in school.	8	4	2	4
Students who had reading problems and did not get help in school.	11	1	4	4
Students with dyslexia who got help.	4	1	5	4
Students with dyslexia who did not get help.	2	0	5	0

Drawing test

The results of the drawing test alone did not show a significant difference of ability between those with SpLD+ and those with no reading problems but equally it showed that students with SpLD+ can compete at the same level in a drawing task as those without problems and also score highly, thus adding weight to the argument that strengths such as these should be recognised. In Figure 18 the bar chart shows a difference of 3-D drawing scores between the SpLD+ and the SpLD groups. The SpLD group scored more highly than either the SpLD+ or the non-SpLD groups. This is hard to explain but may be accounted for in the self-reporting questionnaires. The SpLD group did not self-report dyslexia, yet they too could have been dyslexic if they had been assessed or identified as such in school.

In this study the students were asked to draw real world objects, which would give them the opportunity to draw in three-dimensions if they were naturally able. The outcome of the tests was simplified by using a numerical scoring criteria suggested by the independent art advisor.

The strength of the results of the drawing scores lay in the fact that by scoring each picture individually and thus obtaining a possible total score of 40 points for each student,

it was possible to see the importance of the individual criteria on each drawing. This is illustrated in Figures 19 and 20 where the latter is clearly three-dimensional.

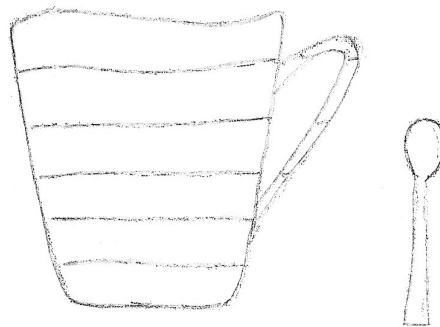
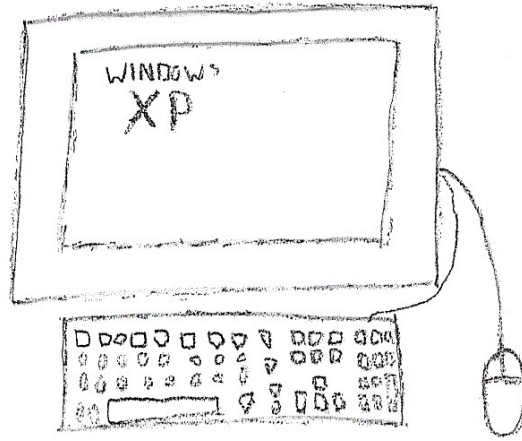


Figure 19: Drawings by student X

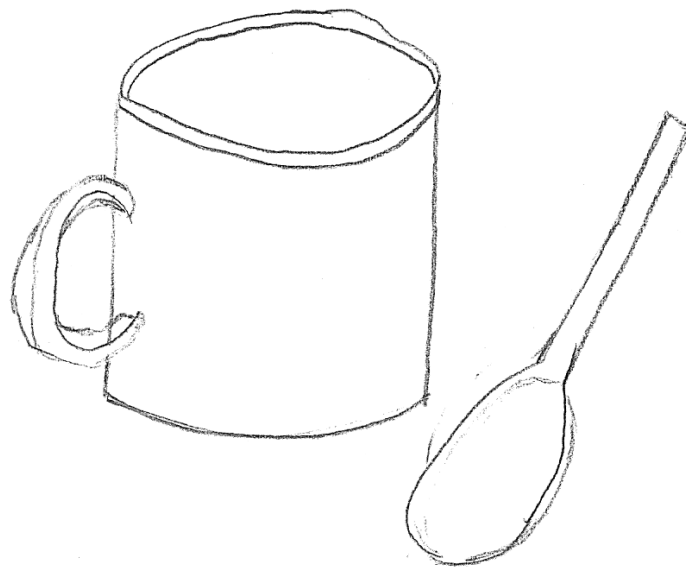
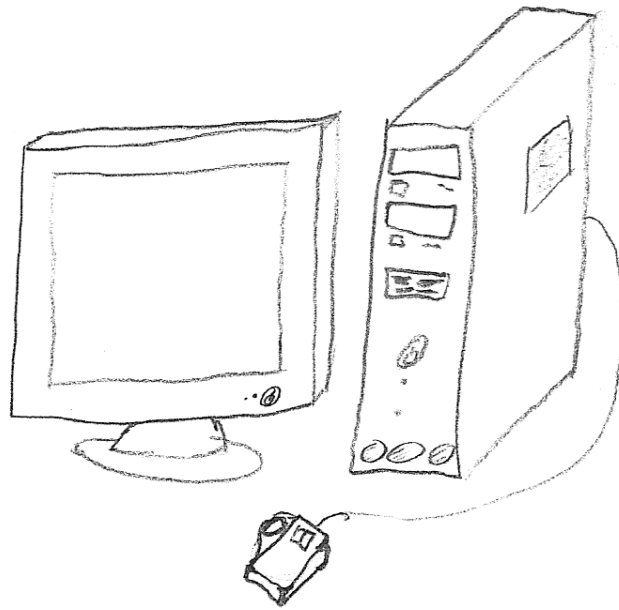


Figure 20: Drawings by student Y

The scoring system authenticated by the independent advisor gave the student in Figure 19 20 points and the student in Figure 20, 33 points. However, the two sets of drawings are very different. In Figure 21 the student X, a male motor mechanic SpLD+ has drawn the pictures showing the right height and size for the objects, thus having some

understanding of scale whereas the student Y, also a male motor mechanic SpLD+, has in Figure 20 drawn the pictures with more realism giving the drawings a good sense of three dimensionality, and reality. Conversely, Figure 21 drawn by Student Z, a male motor mechanic with no SpLD is neither drawn to scale or shows evidence of the understanding of 3-D and drawing.

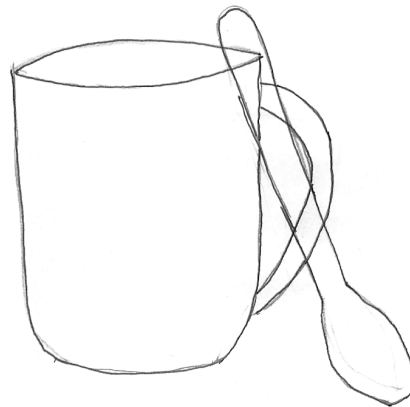


Figure 21: Drawings by student Z

This, it could be argued, is a key finding for any future research and links back to the study by Winner et al., (2001). What is being assessed as spatial? This study aimed to address the question of children drawing in three-dimensions and the three drawings highlighted in Figures 19 - 21 show the complexities involved in scoring and identifying aspects of

visual realism. However, even within these basic drawings there is room for improvement on the measurement of the scoring system. In the administration of the tests the researcher gave the students no clue as to what she was looking for in the drawings. This was deliberate because the results had to be unbiased and additionally the time allowed for the administration of the tests was limited. But future tests could be designed to look more closely at these two areas of drawing, dimension and scale because these are the areas where spatially talented pupils with SpLD+ are more likely to excel.

The significance of examining just one or two aspects of an observed spatial skill gains significance in relation to the study by Karolyi et al., (2003) which again looked at dyslexia and 'global' spatial ability. Building on the work of Winner this second study found that by giving the students the 'impossible figures' test the dyslexic students were able to compete with the non-dyslexic students, and to complete the task more rapidly. This was a task that looked particularly at one aspect of spatial understanding and like the drawing tasks was actually assessing a spatial skill that had real world application. This study substantiates the case that this concept of practical real world application is crucial to understanding particular spatial abilities and reinforces the point made above that SpLD+ students may have a preference for the 'real life' context of the task as opposed to the planning and preparation process.

This concept of a real world task has significance for this research and for future study because in the Karolyi study students were asked to mentally solve problems of visual construction in their minds. This is the skill originally identified by the researcher in the classroom with her infants - the ability to construct models in three-dimensions from memory. It was this skill, as well as drawing skills, that influenced the career choices of three of the case studies, children A, B and C. Child D uses creative spatial ability in her work as a beautician, which requires her to be able to understand how a face will look when it is made up, and the same would apply to those working in make-up on the stage and television. The skill involves being able to visually recognise an alternative position.

It can be argued therefore, that the visual-spatial ability that may be relevant for future research is in the area of a) 'real world' spatial ability that requires participants to reconstruct, visually understand and represent objects in three-dimensions and b) that any tests used are designed specifically for this purpose and c) tests of spatial visualism

investigate what strategies students are using mentally to be able to reproduce three dimensional figures from their memories.

Whilst the drawings did not identify a group of students with strong spatial skills and reading problems the drawings showed that the students, in all groups, could compete at the same level of drawing skill. Figures 22 - 24 show this. Figure 22 that scored 36 points was drawn by a motor mechanic with reading problems, Figure 23 was drawn by an art student with no problems and scored 33 points and an 'A' level student drew Figure 24, again with no problems and also scored 33. This shows that some students who are not as strong verbally are able to compete at the same level as students who have had no problems. Could the motor mechanic have been helped more in school through teaching to his strong spatial ability?

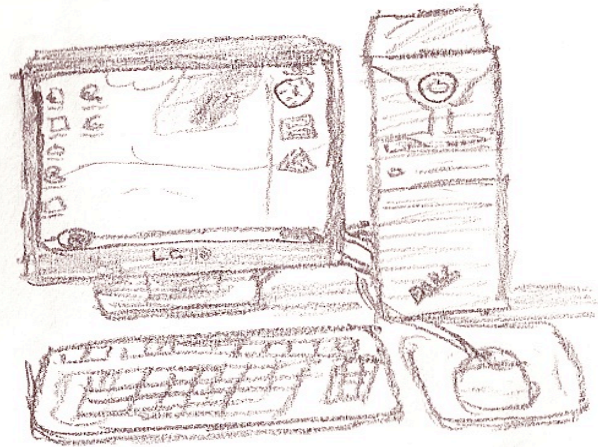
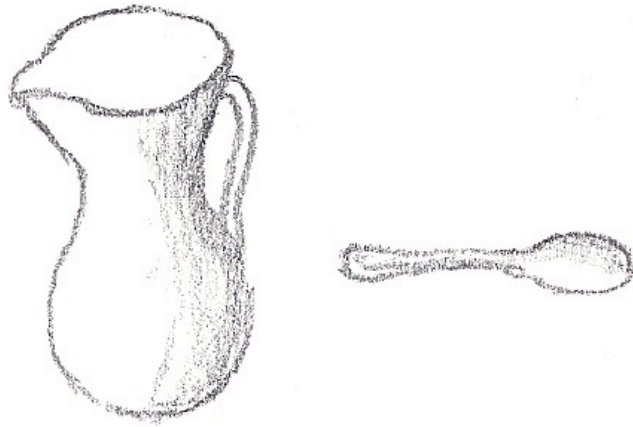


Figure 22: Motor mechanic



Figure 23: Art student

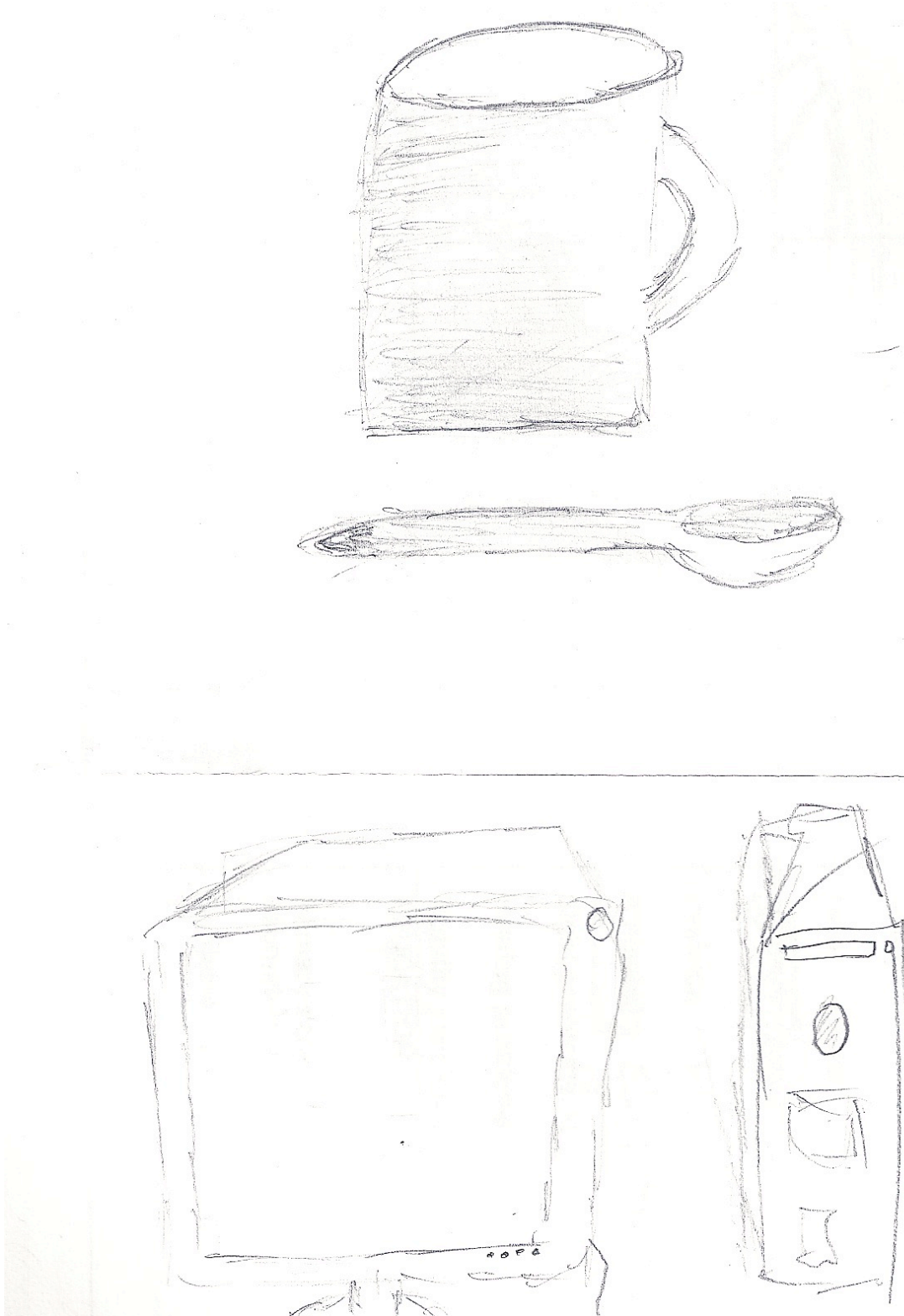


Figure 24: 'A' level student.

The College Survey and the Five Children

The results of the second factual questionnaire produced interesting and relevant results. They showed that the choice of College vocational course by the students was not by default (Winner et al., 2001) but by choice and by the students understanding of their own strengths and weaknesses. It also showed that just as in the case of the five case study children, the College students were choosing as favourite activities in school subjects that bore relevance to their choice of vocational courses. This was an important finding. The results of the questionnaire also showed that the College students followed their intrinsic interests out of school in the same way as the five children. Again this is a relevant finding, because if children understand and are motivated to learn in subjects they find easy, then the teaching they receive should acknowledge these strengths.

In the case of those College students interviewed however, this was not the case. The fact that they understood that they were good at practical tasks or creative tasks was not acknowledged and certainly not used to support their learning, even though those students with reading problems did have their problems identified.

CAT 3 tests.

The CAT3 tests comprised two spatial tests, the spatial analogies test and the spatial analysis test.

Spatial analogies test

The results of the figure analysis test showed that there were no significant differences between the non-dyslexics and the dyslexics. While they did not show that dyslexic students scored higher than the non-dyslexics it showed that they performed at the same level. The Winner study did not include a spatial analogies test. Appendix 20(5)

Spatial analysis test

This test of mental rotation ability, assessed by GL Assessment as being equivalent to the Vandenberg Test of Mental Rotation has interesting results for this study. On this task the

dyslexic group and the non-dyslexic group scores were almost identical. Whereas the Winner study showed that the dyslexics scored significantly lower on all three Vandenberg tests the students participating in this study who were dyslexic scored equivalently to non-dyslexics. Appendix 20(6).

The Winner study used mainly standardized spatial ability tests to try and establish a link between spatial ability and dyslexia but failed to find any visual-spatial talent associated with dyslexia.

The findings from this research study further added to those findings by showing how difficult it is to use standardized tests unless they are specific to what is actually being examined (Vandenburg, 1975). Here the results of the mental rotation test showed comparative results across the groups. This may be because the participants in this study were predominately taking practical or spatial courses whereas the students in the Winner study were mostly psychology students.

These tests for students with SpLD+ could be indicative of the choice of test. The researcher specifically chose them because of all the standardised tests available these do test mental rotation ability that was the perceived strengths of the five children in the case studies. However, as in the case of the Winner et al., (2001) study the precise spatial ability that the researcher was investigating may not have been the ability to mentally rotate and transform objects from memory but other spatial ability, as yet unidentified.

Do students with reading problems choose spatial careers by default?

Winner et al., (2001) claim that the reason students with dyslexia work in areas of employment that require spatial understanding is because they choose such careers by 'default'. That is, such students know their limitations with literacy and choose careers where written skills are not a dominant feature. But the results of the notes from the group interviews with the College students and the results of interviews with the mothers and the children in the case studies shows that this may not necessarily be the case, that children may have had a predisposition towards visual tasks at an early age, independent of their ability to read.

As such this study puts forward the case that the reverse could also be true, that instead students do not enter creative professions by default but because they are aware of their strengths (possibly at an early age) and four of the five case studies show that this may be true. Each mother remembered their children being independent and creative at an early age, this creativity was recognised and encouraged at home and in school for children A and C. This built on their strengths and supported their reading problems by showing students that they could succeed in areas where they were strong, eventually leading to careers that used creativity. The notes from the College interviews also show that the students remembered being creative in primary school and being easily able to build models, but nobody recognised their strengths.

Whether students enter spatial careers is not an either/or situation. Some may enter these occupations by default but others have found spatial strengths as in the case of the five case study children. Supportiveness on all fronts is probably a key issue and may result in some children from dysfunctional families not having the same opportunities to show their creativity in the home. However, creativity can be taught and teachers should be creative in their teaching (Sir Ken Robinson, TED Talks, February, 2006).

This would bear out the assumptions of the Winner study. However the results of the interviews of the five case studies and the recorded notes taken at the time of the drawing tests with the motor mechanics show that this may not necessarily be true. These findings show that in early childhood some students were able to identify their spatial strengths, being understanding of the fact that they were better at practical spatial tasks than verbal written tasks. Yes, they could enter spatial careers by default, but conversely this study would argue that the question of hemispheric lateralization (Geschwind & Galaburda, 1987) could hold more interest for future study, a point also addressed by the Winner study.

CONCLUSIONS**Introduction**

The aim of this research was to examine motivational failures related to 'possible' unrecognized potential, particularly in the area of non-verbal spatial abilities with five individual case studies and a Further Education College survey. The longitudinal retrospective case studies showed that when non-verbal spatial abilities were recognised and encouraged, particularly during out of school pursuits, this led to a feeling of well-being and confidence among the five children that resulted in them understanding what they could easily achieve while having an understanding and acceptance of areas that they found more difficult, namely reading, writing and spelling. The role of supportive adults both in and out of school proved to be crucial.

In the College survey a particular sub-set of students with strong spatial ability and poor reading skills was not identified. However, results from standardised tests and drawings showed that students who were poor readers performed well on both the spatial and drawing tests and that this was an important finding that should be acknowledged and built on to support learning. Additionally, during the College survey it was found that students could remember being good at spatial skills in primary years and importantly these spatial or creative interests were often reflected in the subjects they enjoyed at school and in their out of school pursuits.

As a result, the findings from both parts of the study found an association between what all the participants understood they enjoyed at an early age and their future vocation or career choices. This finding could be significant in that students may select certain occupational spatial routes because they are aware of their strengths in these areas at an early age. Additionally, they may select spatial practical vocations because they are aware that these areas may be less reliant on the use of literacy (Winner et al., 2001). The subjects in both parts of this study were aware of their spatial practical ability and used this in career choices, specifically because they knew that this was an area in which they could succeed.

The choice of tests used in this study may not have established the particular spatial skills that were originally being identified and this confirms the need to use tests that are specific to the skills being observed (Vandenberg & Kuse, 1978; Karolyi et al., 2003) and more work is required in this area. However, this research built on the findings of others (Winner et al., 2001; Karolyi et al., 2003) and in this instance the findings confirmed the specific spatial abilities from a theoretical standpoint to be visual realism and spatial visualisation skills. The interviews suggested that these inherent skills were good hand/eye co-ordination and good visual memory skills. Both of these could be considered part of visual realism and spatial visualisation however, there is an opportunity here for future research to look more clinically at both of these skills on an individual basis relative to identifying particular spatial abilities in young children.

Motivational failure relating to unrecognised potential in the area of non-verbal spatial ability was important in the way that the five case study children responded to reading problems in school, particularly in their early primary years. However, increased maturity particularly in upper school meant that they were able to see the 'bigger picture' and realize that their creative potential could be used in career choices. For some students in the College survey motivational failure occurred that resulted in a negative attitude towards school generally. Again, these are important findings that demonstrate that identification, support and encouragement of what children are good at, by the help of significant adults and a school system that recognises such talents, can result in children appreciating their own strengths and acting on them early on in their school careers.

Discussion

The literature review (Chapter 2) shows that research in the areas of spatial ability and art and technology with children in Key Stage one is scarce (Anning, 1994). Research looking at spatial ability as an unrecognized potential, particularly in the area of poor reading, is equally scarce and shows the need for further research. While much is written about children with dyslexia having strong spatial skills (West, 1991; Wilson, 2009) much of that evidence is anecdotal and relies heavily on the work of classroom teachers quite rightly identifying spatial and creative abilities and using them to promote reading.

My reading shows that, to date, much of the previous research into this subject lies in the area of 'creativity'. That evidence is far more likely to report on children's 'creative' expertise than their specific spatial abilities and this was particularly true of young children (Fleer, 2000). Again this is an important finding that emphasises the value of this research.

However, the fact that the nature of creativity is becoming a more prolific area for research is equally important and the work of Sternberg (2006) shows this to be the case. That study was interested in the work of the Reggio Emilia Approach to Early Childhood and the techniques used by their teaching theories that encourages and supports creative skills in all areas of learning. 'All our Futures' (1999) looked at the importance of recognising that children should be acknowledged for what they can do and that these skills should be used to promote learning. Despite this the results of this College survey show that this is not always the case and much work has still to be done in this area.

The choice of participants

The five case study children were chosen at the outset because of their understanding of the research and the fact that they were old enough to decide on their future career paths, proved to be the correct method. At the time of the interviews it would have been possible to approach several pupils who had attended the after school club to take part (Table 1, page 92). The choice of older students showed their career preferences and shows that child E did not in fact choose a spatial career. Follow-up questioning of the children in 2009 showed them to be working in their chosen careers and this is seen as a particular strength of this study because an all-round picture of achievement has emerged.

Table 1 also shows up-to-date information (as far as is known in 2010) of the career choices of the other pupils at the time the five were selected. This shows that some other children with reading problems also moved into spatial careers, but equally some with reading problems did not choose this option.

While the five children clearly had reading problems, as confirmed by their schools, the exact nature of those problems has remained difficult to define. Each child showed similar characteristics, slow reading, no phonological knowledge and a reluctance to produce early emergent writing (or later writing without the support or scaffolding of an adult).

However, they all responded to additional support both in and out of school, indicating that these were far more likely to be characteristics of a certain stage of reading development rather than representing any pathological features (Elliott & Gibbs, 2008).

Although the children remembered that they had had literacy difficulties in primary school, the mothers remembered that they had to come to terms with the fact that their children would not read and spell easily compared to their older siblings. Additionally, their concerns centered on their worry that their children would not get the necessary support in school. The mothers of children B, D and E reported worry and unhappiness at being unable to make class teachers aware of their concerns and the children's perceived needs. Their comments reveal that in all cases the transition to school from playgroup had not been smooth and left them feeling vulnerable and unsure of the course of action they should take. Whilst the mothers considered their children to be 'bright and ready for school', they were unsettled when they did not find reading easy.

Today, it is known that collaboration between parents and teachers at this time is an integral part of transition (Margetts, 2002). The conclusion reached in this study is that the five children moved from an environment, where the concept of play was understood to a lesser or greater extent, to an environment that emphasized measured achievement against pre-determined outcomes (Dunlop & Fabion, 2007). That is that the five children excelled at creative, practical independent play before school but in the classroom situation, which in all the children was formal, did not offer enough opportunities for play and the rewards that play can offer. Whereas today the Early Years Foundation Stage highlights the need for parents to be kept informed about children's progress to reduce stress, this did not happen in the case of the five children.

This was problematic for the children's learning progress in that the skills they were adept at in their play went unrecognized and their problems with reading became more urgent. A Reggio Emilia approach to learning may have helped them considerably, by identifying their strengths and using them to support any weaknesses. By using their creative abilities to the full and letting them illustrate their work, use graphical representation and write through different mediums, from paint to puppets to cartoons, may have made them more inclined to want to write (Wilson, 2009). This was especially the case because it was proved that this method of encouraging writing was successful in their additional support.

As a result, the findings from this study suggest that what happened to the children was linked closely to motivational-emotional vulnerability (Poskiparta et al., 2003). This is defined as deterioration in performance under stressful conditions such as competition and performance obstacles. The five children became vulnerable learners in school, unable to master reading easily and their understanding (in their own words) was that 'you were at school to learn', as a result entry into primary school exposed them to potential stresses uncommon in their previous milieu. Their unrecognized potential was lost in an emphasis of formal learning (Moyles, 2005) and play became relegated to out of school activities.

Conversely, outside school and with no encouragement from parents, all five children developed their spatial ability and used it to promote their own learning. There is no doubt that they received the support and praise from their families, in particular their mothers, in their respective interests in art/design/ice hockey/dance and music, something found to be crucial to developing children's creative ideas (Ring, 2006). But, their development in learning, particularly in reading and literacy, would have been further enhanced if they could have been taught holistically from the early years according to their individual needs (Long, MacBrain & MacBrain, 2007).

This point was not lost on the College students, notably the motor mechanics, who were greatly saddened that their creative and practical abilities had not been acknowledged early on in school.

A surprising result from the College survey was that a large number of students listed outdoor play with big toys as being something that they remembered from their primary school years. This was particularly true in the case of the motor mechanics. This type of play was also reported by the five children and their mothers as being an important part of their early and primary school years. My reading of the literature following the collection of the data has shown that this may have been an important finding. Outdoor play can promote a sense of well-being in a child and can give them control over the way in which they want to play; no demands are made on them and as a result they are free to choose how to play and this allows them to make their own decisions (Duffy, as cited in Moyles, 2005).

Physical play is also a 'release' to the body, for children who become restless in the classroom and find it difficult to sit still for long periods, (Smith & Hagen, 1980). While it is not the aim of this study to investigate play, it is worthy of inclusion here because it may be another indicator of why children are not motivated towards reading. For example it has been established that boys engage in physical play more than girls (Pellegrini & Smith, 1998) and that in particular outdoor play provides a non-threatening framework for children to learn about the world and gain skills necessary for adult life (Bjorkland, 1997). Early school can sometimes take physical challenges away from children and as a result confidence in their own abilities (Stephenson, 2003) combined with early exposure to a curriculum built on observable testable learning outcomes such as the National Curriculum can mean that children become disempowered and do not have a disposition towards learning (Dunlop & Fabian, 2007).

Considering that a number of students at the College cited outdoor play as being important and this was replicated in the five case studies, would strongly suggest that as well as vulnerability to learning the children became, to a certain extent, 'switched off' learning because what they considered to be important did not exist as part of the school curriculum. However, while the five children could remember no play of this type in school, there was no opportunity to ask the College students the same question, the evidence therefore being in their questionnaires rather than 'knowing' this to be a fact from interviews.

Sternberg (2006) explains his investment theory of creativity as encompassing intellectual skills, thinking styles, personality, motivation and environment, explaining that creativity requires a confluence of these interrelated resources. Linked closely to these are understanding of the 'individual' as a learner and of pupils who can think independently, creatively and out-of-the-box. However, to accomplish this, these learners need their particular abilities to be recognised and understood. Encouragement in helping them to develop intrinsic motivation, by provision of an environment that is supportive and rewarding of creative ideas is the ethos of 'All our Futures (1999) the aims and objectives of which are closely linked to this way of viewing creativity. For children with reading problems, who may have other possible non-verbal spatial skills, understanding that a different method of teaching them using a holistic approach that encompasses their

strengths, would, it is argued, make a significant difference to their motivation and willingness to 'want' to learn.

The significance of this is found in the results not only from the case studies but also importantly from the College survey. Here, the results from the second batch of factual questionnaires found that 23% of students who enrolled on creative and practical courses identified these strengths in their primary school years. This figure is important because it indicates that, a) children understand what they are good at, at an early age but, b) that they go on to choose courses at the end of their schooling in areas that they consider themselves to be good. This has huge implications for teaching because the figure is indicative of the fact that a large number of primary school pupils at any one time may benefit from having their strengths recognised early on and being taught in such a way that these strengths are supported.

While the importance of creativity has been recognised in the early years and that The Primary School Strategy (2003) and the Early Years Foundation Stage (2007) promote creativity as a powerful way of engaging pupils with their learning, little has been done to establish assessment and identification of spatial or creative ability in these early years to support learning. Duffy (as cited in Moyle, 2005) suggests that the reason for this is that defining 'creativity' is not an easy task and that there is much debate about how it is characterised and identified (Bruner, 1996; Gardner, 1993; Fisher, 2003). However, the results from this study show that children are able to understand their creative ability early on therefore it is surely important to identify, encourage and use it to support learning.

The actual spatial ability

The spatial skills identified by the mothers and children of good hand/eye co-ordination skills and visual memories supported the fact that the correct skills to test in the College survey were spatial visualisation and visual realism skills. Work by Burrows and Wolf (1983) and Moran and MacIntyre (1998) say these skills can be applied to both art and sport. Lohman (1993) says that these specific skills allow individuals to interpret design or movement in three dimensions. Therefore, this confirmed that the correct spatial tests to use in the College survey were tests that included a strong element of spatial visualisation skills, which the FERT tests provided. The figure analysis test and the figure analogies test

provided this. The figure analogies test was reported by the provider as being the strongest predictor of mental rotation abilities for this specific age group available.

The results of the tests were disappointing from the point of view that these particular spatial skills did not emerge from the test results as being indicative of either poor readers or confirming a particular sub-group of students with these abilities. However, the importance of the tests was that they showed that those students with reading problems achieved scores in line with those without reading problems on both the figures analysis tests and the figure analogies test. This shows that students with reading problems can compete at the same level as students without reading problems on tests of spatial ability. This is a significant finding and one that shows that spatial skills should be identified and acknowledged in school and ideally used to support learning.

According to Solomon and Hall (1996), a significant factor in working successfully in technology requires specific spatial abilities in children, the ability to think in terms of space and shape and the ability of children to think in terms of a series of mental operations. In classroom terms this can be described as children understanding how flat shapes can be folded or bent so as to make space-filling objects or the ability of children to understand how moving parts work.

These highly technical skills (Fleer, 2000) may be present in children (with or without reading problems) and the results of the tests in the College survey show this to be true. However, technical skills present in children who have reading problems indicates two things, a) they may benefit from a holistic creative learning environment and, b) the skills remain constantly there throughout childhood and schooling, but are not used to their fullest potential, and the results from the college survey show this to be true.

In this College survey of seventy-four end result students, a minimal variation was found between the spatial scores for any of the groups on spatial skills. Figure analysis and figure analogies show that the scores are almost identical for all three groups. This is very notable and confirms the need for educationalists to understand that a high percentage of students could be accessing education through a highly verbal environment at a detriment to a preferred holistic/spatial learning style. Figure 18 (Page 221).

Results from the second factual questionnaire give further evidence to support this. The tests show 'A' level students as having spatial skills of a comparable level to the students with reading problems, but their self-completed questionnaires show that their preferred choice of in and out-of-school subjects and pursuits do not reflect spatial interests as may be anticipated. On the other hand the 'A'- level students comprised 24% of the total students. If these results could be generalized to other Further Education settings then the implications are important because it would indicate that 76% of all students would respond to a learning environment that supports their creativity and spatial ability.

During the interviews with the five children I specifically asked each of them how they thought that their teaching in the early years in particular, could have been improved. Without hesitation all five said they would have liked far more practical hands-on teaching. This resonates with the outcomes of both the test results and the self-completed questionnaires in the College survey that it is highly likely that children with good spatial visualisation skills would respond and be motivated towards a learning environment that understood and taught to their needs.

Methodology used in the study - discussion

This study originated from my own observations as a teacher of pupils with reading problems some whom appeared to have strong spatial ability at a variance with their reading able peers. The drawback to this was the question of 'objectivity'. Was I jumping to conclusions just because there was some evidence that seemed to lead in a certain direction? In order to avoid this Silverman (1993) states that the researcher needs to 'subject' the evidence to every possible test and to be aware that the knowledge gained is provisional and subject to subsequent study that may come up with disconfirming evidence.

This was the reason for the combined methodology approach. By using two methods of data collection, which both addressed the same issue, helped with reliability and validity of the findings. It was seen as essential to the outcome of the study that the results of the study did not rest solely with the researcher's teacher observations and out of school tutoring of the five case study children. If this had been the case it may have been shown to be biased and as such untrustworthy. A dual method approach meant that data taken from students unknown to the researcher supported the findings in the five case studies in

several respects. Whereas the case study methodology provided in depth knowledge through interviews, teacher notes and observation over time, the college survey not only tested students for spatial and non-verbal skills, but also allowed time for the researcher to give students two factual questionnaires about their early childhood play and activity preferences and details about their reading problems.

This combined method was therefore seen as giving strength to the research. At the same time the 'longitudinal' aspect of the five case studies also strengthened the results of the study. The fact that four out of the five children chose careers which meant that they used spatial understanding and skills, gave credibility and support to the results of the interviews and my original tentative observations.

Case studies

Choice of pupils

Silverman (1993) states that cases will be often chosen because they allow access that was the case in this study. The five mothers and children were very willing to contribute to the research, and equally geographically they were also well placed for easy access. As a full time teacher at the time this was important. However, this might question how representative the case studies were as a sample of the population from which the cases were chosen.

The choice of the five children was made clear in the methodology (Chapter 3) in that other children at the after school club could have been chosen but it was considered, by the researcher, important to interview children who could understand the nature of the research as far as possible. Additionally, by choosing the older children in the groupings meant that I was likely to ascertain what they intended to do as future careers, thus providing a longitudinal aspect to the study. Equally, Table 1 (page 92) shows that the researcher understood that not all children with reading problems would be good spatially or go on to spatially dominant careers.

To eliminate this Hammersley (1992a as cited in Silverman, 1993), says the problem can also be addressed by using a survey alongside the case study. Further validation can be

ensured as far as possible by comparing different kinds of data i.e. quantitative and qualitative data, interviews and observations and in this study questionnaires and tests. The results, should, as has happened in this case, corroborate each other (Silverman 1993).

Validity of the case studies

The interviews

To provide consistency in the findings from the five children, the College students were asked about their favourite subjects in primary school together with their out of school interests. They showed that the out of school interests of the college students who chose creative or practical courses resembled the interests of the five children. This therefore aligned with what Silverman (1993) describes as corroboration of findings and adds validity to the results.

Timing of the interviews was considered to be another crucial factor in ensuring validity and trustworthiness. Before the interviews with the parents and the children the researcher had had no contact with them for the preceding three years and this meant that I was unaware how they had progressed or what qualifications they had gained or were in the process of gaining and as such she came to the interviews 'cold'. Equally, the researcher had no prior knowledge of the pre-school years of any of the pupils, which meant she had no understanding of different playgroups attended or play preferences of the children before teaching them.

The interviews with mothers and children were considered the best way to elicit data in the shortest period of time. As a research method it was difficult to remain aloof and removed from the parents, particularly as the researcher had taught the children. Although this could be considered to be a risk to validity the parents, in particular, understood the need to be honest and they all considered the research to be important. As a result, in all cases, the interview time of one hour was adhered to and no further remarks or conversation was encouraged at the conclusion of each interview. The researcher assumed the role of a 'removed' interviewer as far as possible to ensure trustworthiness.

The interview questions were framed in such a way that all the participants would easily understand them. Notes and tapes made at the time do not show that the researcher needed to repeat the questions, although sometimes she needed to reinforce them. This understanding (of the questions) asked of participants Silverman (1993) says makes for valid responses. The results from the questions were coded and this provided inter-rater reliability checks that proved mostly successful but did not result in all the five children offering similar responses to their reading or spelling problems. The same applied to their mothers, showing the complexities of reading problems and the difficulties encountered as the interviewer in being unable to necessarily elicit the exact question format required.

This was considered to be a weakness of the interview process. None of the mothers or the children could be explicit about why they or their children could not read and spell easily and my responses were not sufficient enough to give them support to talk further about this. On the other hand all the participants found it easy to talk about what they or their children were good at. However, given the complexity of opinion about the nature of reading and reading problems generally, it is not unexpected that the results were as they were in this area. It is very difficult to explain either as an adult, teenager or young child why you find it difficult to read or spell.

Observations

Observations resulted from classroom teaching and noticing that some pupils with reading problems had spatial skills and the limitations of this as a research method has been highlighted earlier, particularly in respect of objectivity. However, my observations were substantiated in the interviews with both mothers and their children and in respect of four of the five children in the career paths they eventually chose. Whilst at the outset of the research the observations may have been considered at the most 'persuasive' (Silverman, 1993), the intuition of those early observations has shown that in some cases children with reading problems can excel at spatial tasks and go on to gain careers using those talents.

The weakness of including observations in that context in the early years was that at best the observations were teacher notes and as such were not specific, nor did the notes provide succinct information about what exactly was being observed, from a theoretical

standpoint, and as such could only be described as intuitive. Kirk and Miller (1986, p. 52) reinforce this weakness by saying contemporary search for reliability in qualitative observation revolves around detailing the relevant context of observation.

The College survey

Choice of students

In contrast to the five children, the researcher knew none of the college students and this provided an element of trustworthiness to the results. The drawing tests and factual questionnaires were completed individually with the tutor present, therefore the findings are considered trustworthy. Equally, each student completing the FERT tests used a computer and their individual results went directly via the Internet to the test provider. Therefore, the students did not get a print out of their results until some time later when the researcher met with them to discuss the results. Additionally, after completing each test they could not go back and change their answers.

The restriction of available time meant that students had to stay focused on task for the duration of the computer tests and there was no opportunity to discuss answers with colleagues and this again ensured trustworthiness of results. Additionally, as each group was tested their tutors accompanied them to help students at the beginning to read the instructions and to be with them during the test, if they needed reassurance and to help me with the administration of the tests.

The two parts of the College survey provided evidence about verbal and non-verbal spatial ability. The drawing test was devised with the assistance of an independent art advisor. The tests as outlined in Chapter 6, had a clear set of marking procedures/rules and the scores were compared between the two raters – the researcher and the art advisor. As such it was a test of reliability that helped with validation. There was no intention to score the drawing test in terms of predicting how children draw in some other context. As such it has content validity because the art advisor helped to design the test.

The test was easy to administer and all the students were pleased to complete the drawings. The ease of the scoring system (2 points for each criteria) allowed the mark of

one point for students who had not quite reached the required level. Accumulated scores of all four drawings were added and inserted in the results table. (Appendix 15).

Following the completion of the drawings the researcher scored each drawing and recorded the results. Following this the art advisor also looked at all the drawings to authenticate the marks given. He signed ten per cent of the drawings to show authentication. (Appendix 23 shows one of the drawings that he marked) and in fact he disagreed with marks given to two students because he considered that the marks awarded had been too high. After discussion the scores were adjusted accordingly.

Discussing testing, Robson (1993) says that in choosing a test the 'least suitable alternative is to devise a test yourself'. Initially, this was considered for this research, but as Smith (1964) had used a drawing test a middle way was chosen to change his existing instrument to fit the needs of this study. This was achieved by using up-to-date everyday objects that students would see in college and by choosing four items for students to draw rather than the six chosen by Smith. As the work by Smith (1964) did not provide any reliability or validity norms this did not apply and, as stated previously, it was not a test of prediction but a test of content validity.

The spatial tests

The standardised spatial tests were chosen because they analysed spatial ability (particularly mental rotation skills) and also non-verbal reasoning skills for the post 16+ age group. The specificity of the test requirements for this research, and with this particular age group, taking into account the time restrictions imposed by the College, meant that this test was the only realistic one to use. The results could be correlated with the drawing test and would allow for the inclusion of information about those students with reading problems on the final database.

The question of validity of results is difficult to assess. The combined verbal and non-verbal tests used in the computer test was accessed by each student without third party help although each group (of students) taking the tests had a tutor present, in addition to the researcher, to assist with reading questions if needed. As outlined in the chapter 3,

the researcher was given access to ten computers therefore all the tests were done in batches of ten meaning that supervision was easily managed.

All of the students completed the tests. The majority (80%) found them difficult, with the two mathematics tests and the last spatial test being the most difficult. There were six tests and the students needed to be 'on task' for an hour and ten minutes in order to complete them all. This itself was a test of trustworthiness, because there was no time to ask a neighbour or a tutor if unsure of the answer.

Robson (1993) discusses the problem of reliability in testing and says that test results may vary according to how a person is feeling, that is not motivated towards the test, feeling unwell, or simply upset about an issue that is out of the control of the tester, student or college. One way to address this issue is for students to complete parallel tests, taken at different times. To a certain extent this happened because the time between the standardised tests and the drawing tests was three weeks to a months difference because of timetabling issues.

However, Robson (1993) also points out that standardised tests are usually reliable, especially if the associated manual accompanies them, as were the tests in this case.

Validation of the tests

The standardized FERT tests allowed for non-verbal spatial ability scores to be correlated with verbal English and mathematics scores. The theoretical framework for the construction of the tests was based on concepts drawn from two theoretical models of human abilities-Vernon's (1961) hierarchical model and Cattell's (1987) fluid-crytallised abilities model. Both of these are factor analytic and hierarchical in that they provide for several strata of factors ranging from very general to very specific (Manual of Development of Cognitive Abilities Tests – Third Edition (CAT3) p.1)

The tests assess a 'cluster' of cognitive variables general reasoning abilities and a pupil's capacity to apply these abilities to verbal, quantitative and non-verbal tasks. The limitations of the tests to test all cognitive abilities assumed by the Vernon and Cattell

models is understood in the manual, to do so would require between 8 and 10 hours testing per pupil.

The drawback of the standardised tests was that they were just that, 'tests'. They would provide a 'thumbnail sketch' of ability of verbal and non-verbal skills at a point in time. However, by using them a large number of students could be tested in a period. Other studies of strength-versus-deficit namely the Winner et al., (2001) and the Karolyi et al., (2003) studies used spatial tests on subjects who had been diagnosed as dyslexic. While the strength of this type of testing lies in the fact that spatial tests can be assessed test by test, the downside is that in none of the tests did the researchers identify the specific reading problems (in the dyslexic students) and the control sample students were only chosen from psychology students.

In this study the researcher had no choice, the College was only prepared to release students for two one-hour tutorial sessions and this lack of time meant that only standardised tests could be used. One strength of this method of testing is that the results identified spatial skills scores alongside verbal scores that could be incorporated on score sheets encompassing those with reading and non-reading problems together with their drawing scores. As such the results have significant outcomes as rarely do researchers have an opportunity to look at such a large group in this way.

The use of spatial tests in this study emphasized the need to use only tests that matched the specific skills identified at the outset (Vandenberg, 1975, as cited in Eliot & Salkind, 1975). Visual specialisation skills were the specific spatial skills as outlined earlier

Because Smith (1964) had used a drawing test similar to that chosen for this study to assess ability in drawing three-dimensional objects and no other comparable specific drawing test could be found, a drawing test was devised for this study to examine similarities. The clear set of marking procedures that enabled the scores to be compared resulted in a reliability of scores that helped to validate the results. The scores could be entered with other results and as such was a test of reliability. Whilst the drawing test was not scored in terms of replicating how children draw in some other context, it had content validity as the art expert had originally helped to devise it.

Again, a restriction of time in administering the tests did not allow students the opportunity to copy or discuss the outcomes with their neighbours. In both the drawing test and the spatial tests, each group of students comprised small groups of no more than fifteen and in the case of the motor mechanics and electrical engineers this number was reduced to ten in each group. As with the spatial tests, tutors were present during the drawing test and were interested to see how the students would approach the task. The combination of time restriction, small groups and tutor observation meant that as far as possible the test conditions were ideal. Comments made after the tests such as, 'That was good' and 'Yeah, we could see the point of that' suggest the students enjoyed the drawing test. The added responsibility on the part of the students to complete the written questionnaires meant that the allocated one-hour period was easily taken up.

Hopefully this conveys that the results obtained were trustworthy. Could the results be generalised to a wider population? This is an important criteria for social world research (Robson, 1993). From the administration of the tests this would be easy, provided that two-hours time is allocated. Gaining access and support for such large numbers is less clear-cut in situations where a researcher is unknown. However, in this case all the tutors were co-operative and interested in the study, but the pressures of working and the commitments to learning in a Further Education college environment means that sometimes, research is unable to continue because of tutor perceptions of more immediate needs (of the students) as happened in this instance with the second group of 'A' level students.

In a F.E. college there is also a high turn around of students who leave, change courses or unfortunately are asked to leave. This impacts on a researchers time tracking them down for example and this wastage has to be taken into account. The F.E. College in this study served a 'wide' socio-economic area although it is in a rural setting, because students travelled large distances to attend. However, it was not a survey conducted in an inner city area. The drawing tests could remain the same in any future study (whatever the college setting) because they were objects that could be assumed to be seen everyday by students in all F.E. colleges. Therefore they were not culturally or socially economically biased.

The technical manual for the FERT tests explicitly makes the point that during the development of the CAT3 tests, procedures were followed to ensure that they were fair to both genders and to all ethnic groups. Equally, according to the technical manual, the number of questions that were gender related, particular in the English tests, were included so that an equal number of questions related to boys as to girls. The question of ethnicity difficulties relating to the tests was discussed and it was concluded that any differences favouring white pupils as opposed to non-white pupils were evenly spread between the three sub-sets with none showing a stronger imbalance of difficulties towards the other groups.

No discernible differences were observed or reported (by me or any of the tutors) during this study in the way white students accessed the programme or subsets compared with non-white students. This applied to both reading of the questions and accessing the visual information. As such, from the results of this study, it is judged that both the drawing tests and the FERT tests could be used in any F.E. college setting and the key to getting trustworthy results and good interest in the project is the way a researcher gains access.

The relevance of this research

Unlike either the Winner et al., (2001) or the Karolyi et al., (2003) studies this research aimed at looking at just two spatial abilities. The Winner study addressed this question as part of its study findings and acknowledged the fact that a large number of students access spatial professions not because of a specific spatial talent but by default because verbal professions are closed to them (Winner, Casey, DeSilva & Hayes, 1991).

However, the results from these five case studies and the informal interviews with the motor mechanics found that children were aware at an early age of their strengths, which were for the most part spatial. The five children had a need to be independent and to be allowed to make their own decisions about their creativity. The motor mechanics knew their spatial strengths in primary school and resented the fact that their teachers did not recognise their abilities. This argues against the Winner study in which it assumes that students reach the end of the high school or college and choose professions because the need for verbal input is low. However, in fairness as far as can be ascertained, until now

no research has followed children through from childhood to adulthood to establish if this is in fact the case.

The aim of this research was to identify growing spatial potential alongside reading problems. It found that strong spatial skills were observable alongside reading difficulties, but that the learning environment was the most important factor in identifying the strength and supporting the weakness.

“Our consultations have suggested that the opportunities to promote creative and cultural education in schools are being increasingly restricted by the cumulative effects of successive changes in structure, organisation and assessment since the introduction of the National Curriculum. It is difficult to gather hard evidence about this. The QCA does not have conclusive evidence either way neither does OFSTED.”

(From All our Futures: 112, 1999)

Whilst this study does not claim to examine creativity in school, it puts forward the very strong case that the results of the research provide the ‘hard evidence’ from both the five case studies and the College survey that shows that opportunities to promote creativity in schools was restricted for many of the pupils. The five children were encouraged by family to pursue outside school interests that promoted their skill at spatial tasks. These were not interests recognised by their teachers, particularly in the cases of children B, D and E. For the college students, particularly those who were less inclined towards academia, motor mechanics and the electricians in particular, no evidence was found from interviews that any of their primary school teachers recognised their creative potential and that it was not until their college years that these two groups felt any recognition in this area. This is a fundamentally important claim for this study.

Whereas the case study children were interviewed ten years ago, the College students were interviewed more recently and this shows that the early recognition of creativity still remains an obscure part of the teaching process, whereas English and numeracy remain high priority teaching areas. The disappointment of both ‘All our Futures’ and the National

Strategy for Early Years, 2010 was the missed opportunity for looking at spatial skills and creativity at an early age. 'All our Futures' recognised that for creativity to be given a high profile status within the National Curriculum, 'a radical change to the current structure would need to be fully included and undertaken over a proper timescale.'

The results of this research show that in fact children with such skills demonstrate these at an early age and the argument is that there needs to be a proper assessment and importance attached to these skills. Disappointingly, the Draft Early Years Strategy (0-6) 2010 still places art and creativity at the end of its early years curriculum objectives, whilst it could be argued that it is inherent in all areas of the early years curriculum it is not implicit. This is especially significant for those young children who excel at design and technology, or drama and dance at a very young age and then show early signs of poor reading skills. If assessment criteria fail to link strong spatial strengths and creativity to poor reading skills then the opportunity for teachers and parents to use and encourage compensatory strengths to support poor early reading is lost.

As a result, the possibility to support both their motivation towards learning and their confidence to tackle tasks is also lost. In the wider society, technical design and spatial skills in general risk being lost. The results from this research have shown disappointingly that despite the fact that the pool of ability recognised by McIntosh (1958) and Smith (1964) is present in schools today, it is not being recognised at an early stage in some children's education. The results of this research show that for some children this leads to rebellious behaviour, truanting and apathy towards learning. The five children in this case study were supported by their families and encouraged to pursue the subjects and pastimes they enjoyed and as a result now work in creative environments where they appear happy and content. Recognition of early spatial skills is essential not only because they could be used to support learning in less secure areas but also because research has shown that children are motivated in areas they enjoy. Finally, because non-recognition of a specific spatial ability may mean that this particular expertise is lost to the technological world in which we live.

As Professor Sir Harold Kroto, Nobel Prize winner for Chemistry, says, "It must be obvious from the plethora of serious problems facing the world today that our very survival in the

twenty-first century will depend on a quantum leap in real understanding of science and technology by anyone in a position of any responsibility.” (NACCCE Report, 1999)

Conclusions and Recommendations

Key findings

This study assumed that some children with reading problems had strong spatial abilities that should be recognised and used to promote and motivate learning. The outcome of the study found that children are able to identify what they are good at early on in their school careers and can understand that they are good practically, spatially or verbally. That many students in the College survey and four of the five case studies recognised their spatial or practical abilities early on and continued interest in these, either in or out of school, on into careers that used these abilities is a key finding.

All children should be identified and assessed during their first two years in school for specific spatial creative abilities, as these could be used to enhance learning and motivation towards learning both in and out of school. This is particularly relevant for children who have reading problems, because acknowledgement of what they can do easily as opposed to what they find difficult improves their self-esteem and motivation towards learning.

Two specific spatial abilities were identified in this research, spatial visualisation and visual realism. This includes the ability to mentally rotate objects from memory and the ability to represent drawings and designs in three-dimensions.

- Children understand at an early age what they are good at but cannot understand why they cannot read easily.
- Children want what they are good at to be recognised and built on in school.
- Children with the two spatial abilities stated are likely to choose spatial careers, not by default as suggested by some (Winner et al., 2001), but because they know from an early age that they are more able practically and spatially and relatively less strong at literacy matters.

Parents should be encouraged in the pre-school and early years to identify the creative areas that their children enjoy and the type of play activities in which they take part. This information should be shared with schools.

Recommendation of the study

That emphasis be placed on recognition and acknowledgement that some children would benefit from holistic teaching methods focussed on developing and using spatial and practical skills and many children with reading problems would particularly benefit from these methods of teaching.

- That particular spatial skills be identified in the early years by teacher or LSA observations and that these are used to enhance learning.
- That parents be involved in this assessment of their child's abilities.

Suggestions for extending the scope of the study

These will be discussed within the three areas that have dominated this research: Spatial Ability; Reading Problems; Motivation and self-esteem in learning to read.

Spatial ability

The results of the study suggest that young children can identify what they are good at from an early age and it makes sense that schools identify these skills as well. The results, particularly from the case studies, found that the children would have preferred to learn literacy and mathematics from a more practical holistic standpoint. The study identified two spatial skills - spatial visualisation and visual realism. These two skills could be acknowledged, identified and assessed in the infant classroom through drawing and technology tasks.

Further research could look specifically at spatial visualisation and visual realism tasks in the early years and infant classrooms through routine activities that children carry out each day during drawing and construction play. The results of this study found that what

children most valued in early school was that they should be identified for what they could do as well as what they could not do easily.

The research found a link between early play before school that was independent, creative and constructive with children showing preferences for spatial tasks in school. Identifying these as strengths in Early Years and Key Stage one is seen as essential.

As young children in these areas regularly use construction toys, model making and drawing in curriculum areas such as mathematics, literacy and science, basic assessment could take the form of recording how children plan and approach technology tasks – for instance children making something that ‘moves’ the assessment could establish with individual children how much they can achieve without adult support. If they are building a car, can they make the axles and wheels, do they understand the need for more rigorous materials to achieve this, i.e. wooden wheels? So that it can move freely.

In the area of drawing, pictures are something children engage in everyday at school. Further research in this area could examine the way in which young children approach drawing:

1. Do they use the whole page?
2. Are their pictures realistic?
3. Are their drawings technically correct?

For both these areas a simple grid system such as that used in the College survey could be used as an assessment tool for each child’s school profile. This information could be shared with parents and used to enhance a child’s understanding of what they can do whilst supporting parents’ understanding of their children’s abilities. Looking at technology and drawing in the early years would build on the work of MacDonald, Gustafson & Gentilini (2007) and Anning (1997) who looked at the way young children planned technology projects and children’s difficulty in drawing oblique lines and acute angles in representing solid shaped structures.

Spatial tests specific to the skills being observed

Findings from the literature review showed that identification of particular specific spatial skills is still an area of further enquiry and research. Equally tests which establish particular spatial skills such as visual realism and spatial visualisation skills, particularly for very young children under the age of six-years could not be found by the researcher unless they formed part of a wider battery of tests.

Because, in the past it was assumed that the ability to draw and build in three dimensions was a skill rarely achieved by children under the age of nine years (Piaget 1958; Cox 1991; Anning, 1997) this research shows that these skills have been observed to be present before then. More research in this area could build on the work of Karolyi et al., (2003) to include the design of real-world spatial tests especially designed for young children.

Children's drawings

Further research into the area of children's drawings could take a longitudinal approach. A collection of year one/two drawings could be taken from children from a large number of primary schools in the United Kingdom. Children could be asked to draw pictures of everyday objects seen in school in a similar way to the objects chosen for the College survey in this study. Scores could be derived from the basic score sheet from which evidence of drawing styles would emerge. These could then be correlated against reading abilities and a much wider picture of drawing skills and reading problems may be identified not necessarily to identify a sub-set or group of children, but by producing pointers that substantiate the need to recognise early spatial ability alongside reading problems.

Equally, a wide quantitative collection of drawings collected from young children would not only identify the two issues highlighted above but would also show how important drawing is to young people. Research of this kind would follow on from the work of Hall (2009) who found that there was a need for educationalists to understand the potential for drawing skills outside the areas of creative development, art and design.

Reading Problems

Three-dimensional stand up letters

The use of tactile, multisensory resources to support children learning to read has shown to be successful over the years (Hornsby, 1984; Bryant & Bradley, 1991). However, the results from this research show that some children with reading problems may have stronger spatial visualisation and visual realism skills than other children. Wooden or plastic letters have long been used in schools to help children 'spell out' words. However, it may be that some children with reading problems may be helped by using three-dimensional stand up letters in preference to letters that lay flat. Stand up three-dimensional letters would benefit children by letting them handle them for longer thus gaining a more holistic understanding of the individual alphabet sounds.

Large print books and reading scheme books

This study found that the reading problems in children were exacerbated at the stage in reading scheme books when children have to move from one sentence on a page to two or more sentences and where the print becomes smaller. In the case studies, the children found reading to be more onerous when more words were printed in smaller spaces and that all five case studies found reading quickly and out loud were difficult. This was substantiated in the interviews with students during the College survey that also reported struggling to read when the words on the page became more prolific.

A study by Hughes and Wilkins (2002) looked at implications for the design of text in children's big books, and found that performance in children's reading improved when the spacing of words and the size of letters were greater than is typical in 'Big Books'.

Further research could look at this question in more detail, particularly in relation to early reading scheme books. Could the print be made larger for longer in early reading books, and the accompanying pictures made smaller? Could the pictures accompanying the readers be used for higher levels of readers and again for much longer? Alternatively, would some children with reading problems benefit from three-dimensional reading

scheme books and three-dimensional reading scheme and spelling computer programmes?

Creative writing techniques

The literature review showed that teachers in their everyday practice successfully identify poor readers who have creative abilities and use their spatial creative talents to support learning (Wilson, 2009; Olshansky, 2006; Brice-Heath & Wolf, 2005). The evidence from these authors is largely anecdotal and as a result there is an opportunity for more research into this area that looks specifically at the way in which encouraging art and design to support literacy problems works in the classroom and how it can be applied to other school and teaching situations.

Motivation and self-esteem in learning to read.

The results from both parts of this study show that children wanted what they could do easily to be recognised in the classroom as opposed to what they failed to do easily. In other words they wanted their strengths identified but understood that their reading problems needed support.

The Early Years Foundation Stage supports the need for children's creative abilities to be supported and encouraged. Research into the method of how this can be accomplished is seen as essential to future research into the area. Identifying what children can do as opposed to what they do not do so easily is seen as an essential part of future research and could encompass a revisit of the Early Years and Key Stage one profiling system. This could be achieved particularly in years one and two by children producing their own books entitled 'What I can do'. As children record by pictures, photographs, etc. what they can do, their books could incorporate 'What I can't do so easily'. This would allow a child to take ownership or responsibility for their own learning and show them, their teachers and parents what they know they are good at whilst acknowledging where they are not so competent. The involvement of parents in this process is seen as paramount. This would build on the work of Poskiparta et al., (2003) who found that before school many children had not learnt to fail, and were unused to having their learning assessed.

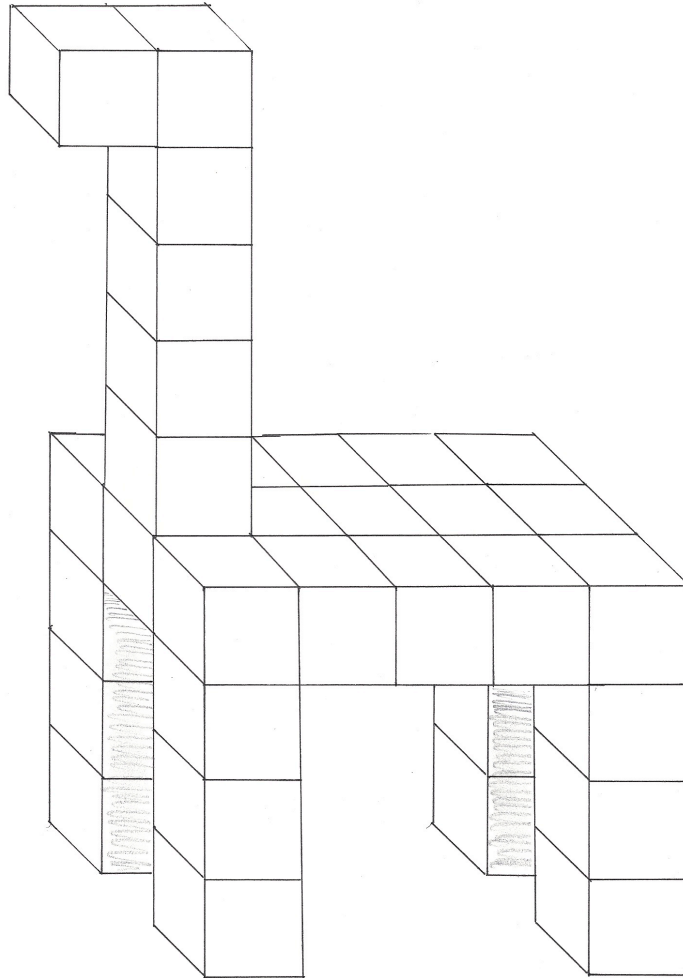
Early Play

Early play activities can be indicators of a child acquiring good hand/eye co-ordination skills. The significance of early play and how it impacted on children's hand/eye co-ordination skills had not been anticipated at the outset and the research in this area appears to be ongoing. However, the use of out-door 'big toy' play and manipulative construction and drawing play appears to have resulted in the five case study children having good hand/eye co-ordination skills. This area will benefit from further research and could also form part of the Early Years and Key stage one profiles.

This would follow on from the work of Solomon and Hall (1996) and Flear (2000) and their research into technology education.

APPENDICES

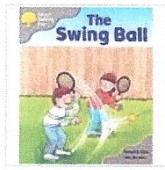
APPENDIX 1



Sketch of Unifix® cubes giraffe.

APPENDIX 2

Related searches: [spot the dog](#)



Miss Karina said : Hi this is
240 x 240 - 18k - jpg
eastburyprimaryschool...



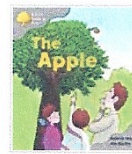
books about
300 x 400 - 30k - gif
redlands.notts.sch.uk
Find similar images



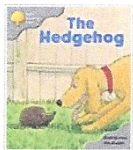
Biff, Chip and
212 x 250 - 19k - gif
fds.oup.com



Biff 'n'
216 x 242 - 21k - gif
electrical.com



Stage 1: Biff and
150 x 173 - 10k - jp
whsmith.co.uk



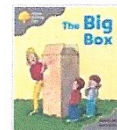
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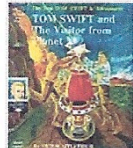
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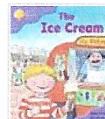
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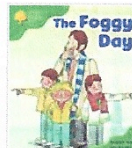
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educationtakeaway.com



One day Biff and
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prism.talis.com

Biff and Chip books

Child D Year 7 Tracking form.

YEAR 7 TRACKING FORM

Subject/Teacher	KS2 Result	Achievement Level		Effort in class		Homework Effort		Meeting deadlines		Participation		Behaviour		SEN Code of Practice	
		Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct
ART AR			4	5	3	5	5	5	5	5	5	5	5		
D & T EM		C	5	5	5	5	3	3	5	5	5	5	5		
ENGLISH CR		C	5	4	5	4	5	4	5	4	3	4	4		
FRENCH MJM		2/3	5	5	5	5	5	5	5	4	4	4	5		
GERMAN JK			5	5	5	5	5	5	5	3	4	4	5		
HUMANITIES YC		C	5	4	4	3	4	4	4	4	3	5	4		
MATHS RMM			4	5	4	4	4	4	5	4	4	4	5		
PERFORMING ARTS AD			4	4						4	4	5	5		
P.E. SG			4	5						5	5	4	5		
R.E. UC		C	5	4	4	3	4	4	4	4	3	5	4		
SCIENCE NY		B	5	5	5	5	5	5	5	2	3	5	5		

Key stage 2 Test average for Maths, English, Science _____

Notes for all categories

KEY:

- Achievement**
 - A = high achiever (NC band 6 - 8)
 - B = very good ability (NC band 4 - 6)
 - C = average ability (NC band 3 - 5)
 - D = low ability (NC band 1 - 2)
- Effort in Class/H/wk**
 - 5 = excellent
 - 4 = good
 - 3 = satisfactory
 - 2 = below satisfactory
 - 1 = poor
- Meeting deadlines**
 - 5 = always on time
 - 4 = usually on time
 - 3 = frequently late
 - 2 = always late/not done
 - 1 = poor
- Participation**
 - 5 = always makes valid contribution
 - 4 = usually makes valid contribution
 - 3 = sometimes makes valid contribution
 - 2 = rarely contributes
 - 1 = no contribution
- Behaviour**
 - 5 = excellent
 - 4 = some minor lapses but generally good
 - 3 = occasional lapses but not a problem
 - 2 = frequent lapses and a concern
 - 1 = poor behaviour and disrupts group: major problem
- SEN Code of Practice (code to be used if)**
 - C = Concentration
 - H = Handwriting
 - N = Number
 - R = Reading
 - S = Spelling
 - U = Understanding
 - W = Writing Skills

NAME OF FORM TUTOR _____

Pupil

Date

Lesson plan No 3 B's after school literacy club.

1. Start with reading book from school library

Problems.....
.....

2. Dictation from last weeks spellings : crab crib cry crisp crop
The crab ran over the sand.
The baby was in the crib.
Did you hear the baby cry?
I like to eat crisps do you?
There are crops in the field (help or give word field).
3. New spellings for this week look cover check write: drag, drab, drill, drop, drug, drum, dry/cry. Extra words *field, hear, over, under, there, five and get her to write her numbers to ten out and underneath to write the words, use standardised sheet for this.*

Break game of choice

4. Work on grammar this week question marks (use sheet for this)
5. Find out how school has been in the past week?
6. Start to make own book of dance (picking up on her interest) she can use the felt tip pens to make cover this week, and prepare contents page. Part of her homework can be to make a list of what will go in the book.
7. Sort out homework for next week...end up with game of choice.

Comments

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

After school literacy club lesson plan.

Observation sheet for Child Lesson 3

Child arrived on time and still keen to come to lessons. No problems settling down to work and had done all her homework from previous week. She had forgotten to bring a reading book, so I suggested we read George's Marvelous Medicine as she had heard about it but not read it herself. I explained that the book would stay with me and we would read a bit each week if she liked it and if she forgot to bring a reading book from home/school.

I read the first 3 pages to her and she read the next two pages, she used a ruler under each line to guide her reading and said that this is what she did in school. Obviously more ponderous, but this is early days so I let her continue. I was impressed by her reading ability, she was slower than an able reader would have been but only made a few reading errors (too early to record them I am more interested in these early weeks of getting her more enthusiastic to read) but the errors she did make she could not use phonetic understanding to work out the meaning. I read page 6 and she read page 7. I was surprised that she stayed on task here, the last two weeks she had been very fidgety maybe she is getting used to the after school club and less nervous.

Discussed with her the problems of reading out loud and said I thought she was quite confident. She said the books at school were harder The Lion The Witch and the Wardrobe was the class book of the moment and she said in a one to one situation she did not feel everyone was watching her and she did not feel embarrassed or judged. Fair comment we will work on this.

She had learnt all her spellings from last week well done.....

In her dictation she got the word cry wrong and as anticipated had to have help with spelling 'field'. She asked why I supplied the word field to her without getting her to have a go herself as they did in school? I said that at the moment I thought it was more important for her to get a feeling of success and not dwell on what she could not do, and that when she had learnt more spelling patterns and done more dictation she would learn to spell these sort of words. **Remember to include in dictation for next week and put in her register of words not known.**

I gave her the new list of spellings for next week including field and got her to look cover check and write them.

During the break she asked to play Connect Four we played two games and she won one me the other.

Question marks understood the concept and said they had been doing work on these in school this week...this was lucky.

She easily did the sheet and said that she would write more sentences for homework with question marks at the end of thembecause she said it was easy. One observation she was obsessed with the idea of putting thick round dots at the bottom

of the question mark, something lots of children do ... she will need to be persuaded to give up this idea.

We talked about school in the past week (Important part of her out of school tuition plan for this student). It had been she said OK. Teacher had been more understanding she said since Mum had gone in and said she was having extra help. Now found ways round asking her to read out loud in class like asking her if she could predict what would happen next? This proved successful for her and thank goodness teacher also got two others to do this too (presumably slow readers as well) so that she did not feel she was being highlighted for the task. She said she had fallen out with some girls as well that week, because one of them called her thick. She said she lost her temper, but this had also resolved itself by another girl in the class coming to her rescue and telling the others they were being stupid themselves. We discussed ways in which she would not need to lose her temper in the future, by answering truthfully that she found reading hard, but that she was really good at swimming.

Making the book of dance proved a successful move. She had lots of ideas about what would go in it and like talking about this and making the cover and the start of the contents page. Also good for her to understand that things needed an order, something that Mum says she finds difficult in school, tackling jobs and writing in a logical way.

Went through homework for the week and again no problems from her in wanting to do it. No time for another game this week more time spent on book.

NB Still keen to find out what is going on outside the room still fidgets, and talks through her work, can see that at school they may have a job encouraging her to sit at a piece of work. Need to discuss with Mum.

Good lesson and she left telling Mum all about book of dance.

So many things to address: sitting still, resolving confrontation issues at school.

Reading for meaning and improving speed

Spellings she obviously needs to go at a slow pace and gain confidence from what she is doing right.

Important to keep her focused and able to see that she will benefit from extra support.

APPENDIX 6

Lesson Plan for individualized teaching of pupils with specific reading and spelling difficulties

Session steps	Activity	Time
1	Pupil to read a familiar book either one from home or school. Tutor coaching and reinforcing of Phonemes or blends or word patterns learnt.	10 mins
2	Tutor makes running record	5 mins
3	Dictation of sentences of including words learnt in previous weeks	10 mins
4	Break and board game of choice not word related. Time to discuss issues	10 mins
5	Cut up sentences using sounds learnt	5 mins
6	Pupils does free writing either descriptive story of piece of homework	10 mins
7	New sound to learn for next session	5mins
8	New Grammar concept for example use of full stop, comma, speech marks, or nouns verbs adjectives	
9	Tutor notes	5 mins Total 1 hour

Test results

Schonell spelling Test.

see	cut	mat	in	ran ✓
bag	ten	hat	dad	bed ✓
leg	dot	pen	yet	hay ✓
good	till	be	with	from ✓
time	call	help	week	pie ✓
boat	mind	son or	year	dream ✓
sight	mouth	large	might	brought ✓
mistake	pair pair	will	skate	stayed ✓
island	nerve	join	care	iron ✓
direct	headache	final	circus	increase ✓
slipery	log	safety	view	library $\frac{52}{10}$
				S.A. 10.9
				C.A. 9.0

Interview questions for mothers and children

1. As you know I am researching the possibility that some children may have strong spatial ability but poor reading ability? Can you tell me what sort of play your child enjoyed before and up until their second year in school?.....
2. Did your child enjoy playing alone or with other children?
3. How did you support their play?
4. Do you remember their playgroup/nursery setting and the play they enjoyed there?
5. Was your child happy at playgroup?
6. Did your child have friends at playgroup?
7. Did your child interact with other children at playgroup?
8. How about play when your child started school?
9. How was the first year in school for your child?
10. When did you first become aware that your child may have reading problems and what were they?
11. What did you notice first?
12. What did you do about this?
13. What help did you receive?
14. Do you think your child received enough help?
15. Tell me how your child became interested in art/ice-hockey/design/drama and dance/music?
16. What particular spatial abilities do you think your child has?
17. Do you think their outside interests have helped them with school?
18. How have your child's problems with reading impacted on him/her?
19. What other strengths do you think your child has and what weaknesses?
20. Do either you or your husband have reading problems, or have you in the past?

Responses to interview questions child D

Mothers responses

1. Before D went to school she loved dressing up and doing plays for the family. She loved to watch Disney films and afterwards she would make up the story. She would get the costumes together and think out the story and show us all, she was a proper little show off. She also loved playing in the garden, and loved being noisy and getting grubby, the grubbier she was the better she liked it.

Researcher Did she like stories then?

Mum, Yes she loved listening to stories and watching the Disney Films and my husband and I used to read to her, but she was also full of energy and always on the go, so sometimes it was difficult to get her to sit still. Then if we got her to sit still for 10 minutes she would want to get down again, and sometimes the story didn't get finished.

2. My daughter did have little friends around when she started playgroup, but she was also happy on her own making up her own things. As long as we all watched her performances she was happy. She was a proper little show off. She still is!

3. Well we didn't say to her what a good idea it would be for her to do plays etc. She did that herself. We always watched the plays and helped her to find dressing up clothes. Sometimes her brother would help her make bits for the plays. Often we would watch the Disney Films with her and talk to her about the stories and she loved to dance to the music. There was a lot of clapping from us and I expect that made her more of a show off!

4. Our daughter went to the local playgroup, her brother had gone there before and it was fine. I didn't get involved. I remember them saying she was always on the go and she did have some problems sitting still when she was supposed to. I remember when we took her she had to have reins she was so boisterous. She wasn't unhappy there and she never said that she did not want to go. It was a playgroup attached to a church hall and

was run by supervisors not teachers, they all seemed nice, and we didn't have any problems with it.

5. Yes, she was happy at playgroup.

6. Yes, she had one or two friends but the thing with the playgroup was that it took children who would go to three different primary schools; it was like in the middle of the catchment area.

7. Apart from being noisy and always on the go, I think she played with other children, but she can be bossy but as I said she had children home to play, but she wasn't bothered if they didn't come. She was happy to go to school when the time came.

The researcher asked what Mum meant by this. Mum said I thought that our daughter was ready for school, she had so much energy and she seemed bright and happy, that school would be good for her. It had suited her brother. I think that has been a problem for me, I think I am like lots of Mums comparing your children and what they can do, its not right is it?

8. I don't remember play in school as such. Our daughter's first teacher was newly qualified and it was her first year of teaching. She was really nice and our daughter liked her a lot. She did a lot of art and drama with the children, but I felt at the time that it was because it made her life easier and not the children sake.

The researcher asked Mum what she meant by this. Mum said I think that was her specialist area and she found it easier to teacher than reading and mathematics.

9. The first year in school made me have doubts about progress. As I said the newly qualified teacher gave the children lots of art and drama, but did not focus on reading and number. But our daughter was alright with her numbers but she did not pick up on reading. In fact I think she made more progress in preschool than she did in the first two years she was at school. Also I told the newly qualified teacher that she was having trouble with words and asked her if it would be better if I wrote the words down or she did in class and she said, "Oh no, you must not take them out of context."

10. So this is when I thought there was a problem, and I went to my sons teacher to ask about writing the words down and she said, 'yes it would be a good idea to write them down'. She said, 'do what you can and help her with phonics and the alphabet'.

The researcher asked about how they helped Child D at home? We continued to read to our daughter and she loved this but when it came to the books from school it was a different matter.

The researcher...do you mean the reading scheme books? Yes, we would sit down together with the book and when she came to a word she did not know she did not have the patience to work it out, if the words weren't at her finger tips she would throw the book down and walk away, frustrated.

The researcher...did you have help from school on how to help her to read? No only the conflicting views of the two teachers. Looking back now I realize that because she was not taught phonics she was not prepared to use them at home, I think she thought the others can read so I should be able to read. Also her best friend at school for the first two years was really bright and had no problems at all, but this must have made our daughter feel very inadequate.

The researcher...so what happened about school and reading? I continued to read with her at home and started to break the words up for her, at the time it was the Oxford Reading Scheme. So if you had a sentence like Biff and Chip 'went into the park to feed the ducks' I would split up 'p-ar-k', 'f-ee-d' and 'du-cks'. If I did not use this approach she would not even start to read, and yet in school it was all about words in context. I think the early years were hopeless for our daughter.

The researcher .. what about the second year teacher? It was more structured in that class and the teacher was older, but by then our daughter had become restless, she was reading level 2 of the Oxford Reading Tree but she did not like reading and it was always hard for her. Again, the second teacher expected them to be able to do it and she was not that patient with D, but then our daughter was still noisy and boisterous and I expect she was a challenge to the teacher.

The researcher asked Mum how things progressed. Mum said we never really got any help about what to do and our daughter continued to make slow progress with her reading. By the time she came to do year 2 SATs she got level 2 but we were always dubious about that because I was working as an LSA in another school by then and no way was she really writing at level two.

At this point mother told the researcher about Child D's father who had become seriously ill during Child D's third year in school. He had been very ill for six months and later made a successful recovery. The family were very close and this had apparently devastated child D who kept asking Mum if he was going to die.

11. As a result Mum said that her daughters reading and writing problems were put on hold for a year because there were other things going on and she was making progress. By the middle of year 3 Mum said that they were aware that Child D was having real problems in her attitude to reading and in particular her writing and spelling. The reading was progressing and very slow, Child D hated to read out loud in class, because she was slower than the others. Her spelling tended to be at best haphazard Mum said and at other times mixed up words like house would be spelt 'hse', and liked would be spelt 'lked'. She mixed up was for saw but she did not reverse her letters Mum said. The problem was Mum said was that she had a good imagination but she could not spell the words right and then she got fed up and would not try. She always wanted to 'run at things.'

14. Mum said I kept asking the teachers to give her extra support all through year 3 and 4 but they said that she was not bad enough and in year 5 that's when we came to see you to get her extra help out of school. But as you know by then she was totally stropky and de-motivated.

15. As I said our daughter had always liked dressing up and drama and dancing so when she was six she asked if she could go to tap dancing lessons which she did for a while until Dad fell ill and money was tight. Then she had a break and when she was 8 she went to a tap and modern dance class that she loved. She seemed to be good at it and when she was 10 years old they made enquiries about sending her to a performing art school.

They spoke to school and were told that it may be a waste of time because this could have been a phase Child D was going through. So Mum said we let her continue with her lessons and then when she was about 12 years old she went to a drama school out of school hours with the local theatre group. Mum said as a result of this her daughter has appeared as a dancer in two large productions.

16. *The researcher asked Mum what particular abilities her child needed to dance and perform.* Mum said she loves showing off and performing in front of an audience, she is in no way shy. I think the skills she has are the ability to have good hand/eye co-ordination and the ability to remember dance sequences in her head. I think this is something that she is really good at and she knows she is. When her brother saw her performing in this huge theatre (in a well known production) it was the first time he had seen her dance and he was awestruck at how good she was, up to then he thought it was a joke. For the past two months she has had private singing lessons and her teacher is really pleased with her. We don't need to nag her to go or to practice like we do with schoolwork. *At the time of this first interview Child D was nearly fifteen.*

17. I think our daughters outside interests have helped to motivate her and give her confidence. They have made her realize that she can do things and be good at things, but these are not what school wants they just want results.

The researcher asked about drama at school. Anything in school was a 'no go' area for Child D. She went to school, did what she could and came home; she had become totally disinterested and had no respect for school or the teachers. *Mum got upset at this point and would not talk any more about Child D and school.*

18. Obviously our daughter knows she is not as good at reading as other children and she knows that this has slowed her up. However, she can be very awkward and her own worst enemy. She also knows her own mind and can be outspoken and dominant in the classroom. This has not helped the situation. The special needs department at her secondary school have been constantly on the case but there is only so much they can do. It's a no win situation really. I think we know that she can read and write to a good enough standard to survive in work and that's all we can expect.

19. I think our daughter is caring and understanding of others. I have said in the last question what I consider her weaknesses to be.

20. I think my husband found reading and spelling difficult but he never had extra help and was not diagnosed as dyslexic.

FACTUAL QUESTIONNAIRE

I am in the process of working towards a PhD with Exeter University. I am researching pupils who have or have had Specific Learning Difficulties alongside strong Spatial Ability. Is it possible that this could relate to?.....

This is a questionnaire for you to complete about....., which will give me an insight into his/her early childhood. Would you please complete this while I am interviewing.

NAME OF CHILD

DOB

Date of interview

1. Did you have a normal pregnancy? Y N
2. If you had difficulties can you say what these were?
3. Were there any problems with your son/daughter after the birth?
Y N
4. If so can you say what these were?
5. At what age did your son/daughter crawl?
6. At what age did your son/daughter walk?
7. At what age did your son/daughter talk?
8. Was your son/daughter a happy baby?
9. Did your son/daughter have childhood ailments other than colds?
10. Did your son/daughter have problems with eyes?
11. Did your son/daughter have problems with ears?
12. Did your son/daughter have any physical problems?
13. Did your son/daughter attend playgroup?
14. At what age did they start and for how long?
15. What age did your child start school?
16. At what age did you first notice that your child had reading problems?
17. Were either you or your husband dyslexic or have reading problems?
18. Did any other member of your family have reading problems?

Letters to mothers and children (specimens)

19th June 2000

Dear

I am moving forward in the research initiated four years ago into 'visual and spatial skills,' of dyslexic pupils. I am keen to promote through the research an understanding that children with dyslexia may have hidden creative talents. These skills could help to compensate in school for weak literacy skills, especially at an early age.

Exeter University has offered me a place on their M.Phil. course starting in September and I have accepted.

As you know _____ has been a pupil of mine. I should like to ask your permission to interview _____ informally, although notes will be taken. Additionally I should like to interview yourselves. I am particularly interested in any recollections you may have relating to the early years, regarding, play, art, construction, games, sports, or music and drama that interested _____.

As we are near the end of the summer term I envisage that the interview will take place in September or October of this year. I shall contact you nearer to that time asking for a convenient date.

If you are in agreement will you please sign the consent form below. Please also note that any information gained from an interview will be treated with strictest confidence, and will remain anonymous in the research. I shall notify you of the outcome of the research. I have sent a separate letter to _____ asking him/her if he/she would be willing to help.

Thank you for your help.

Sincerely,

Christine

I would be willing to help with this research by being interviewed about the early years of _____ life. I am in agreement to _____ also being interviewed.
Signed

DS 6 00

20th June 2000

Dear

I am doing some research with Exeter University to find out whether some pupils who ~~find reading and spelling~~ difficult to learn, can be helped in different ways in their class-rooms.

It is I am sure you understand very important that, at school, teachers understand how difficult it is for some children to write.

I should like you to help me with the research and I have written to your parents telling them this. I will need to come and ask you some questions about things that you like doing like art, sport, music, drama, reading for example.

You should also know that what you tell me will be treated as confidential and that your name will not be used in the research. I will need to write down your answers, and when the research is finished you will be able to know what has been written.

If you agree that you are able to help me could you sign the bottom of this letter and return it with your parents consent form in the envelope provided.

Best wishes

Chr. B.

I would be prepared to answer questions about school and outside interests to help with this research

Letters to and from College Principal

Christine Collins

15th October 07

Dear :

PhD research update

I am just about to go into College this Thursday 18th October to begin the pilot study with a group of Ben Preston's mechanical engineers. I have met with Ben and discussed fully how the time will be used. I intend, in this first stage of the Pilot Study to get one group of mechanical engineering students to:

1. Complete a factual questionnaire about themselves and about their qualifications. Eventually this questionnaire will go to all the students who take part in the study. At the end of the questionnaire is a permission slip which I will ask them to sign. I will reassure them of anonymity and explain that they are free to withdraw from the project at any time.

2. Then I am going to get the students to do 4 drawings of everyday objects which can be seen around college. Each student will be given 4 minutes for each drawing. I will be looking at the way in which they draw the objects.

Before I begin the tasks I will explain who I am ,and why I am doing the research.

Afterwards I will hand out chocolates and explain that they will be able to read what I have written and add comments if they so wish, although this will not be until next year, but it will be before they leave the college.

After this the results will be analysed by an art teacher and my tutor at Exeter and then I will follow on with a spatial test and 2 verbal tests which can be administered within an hour thus using only 2 tutorial sessions. These tests are from NfER Nelson. I have discussed this with Ben and will do the same with the other tutors.

I will need to plot these results against GCSE results or other qualifications and a picture of subset of ability should emerge, which will be of particular interest to the study.

I hope that this is clear and I will continue to keep you informed.

Would it be possible for you to write me a letter telling me you approve of the research. I do have one signed by Alan before your appointment to college and realise that I probably need one from yourself as well?

22nd October 2007
Tk/letters/Burgoyne

Dear Christine

PhD Research Update

Thank you for your letter of 15th October regarding your Phd
I have no objection to your continuing this project within the c

Please feel free to continue working with members of staff an
hope that they will continue to help.

Good luck and best wishes.

Yours sincerely

Principal

8th May

Dear

I am updating you regarding my PhD research.

I have almost completed the data collection from the students at College, and have just one group of AS students to go before the end of June. The process has taken far longer than I anticipated, for many reasons, but I met with my tutor at Exeter yesterday and he very pleased with the results.

I have sincerely thanked all my colleagues at College who have helped me and of course the students, who were so willing to help with the research. As a result I now have a data base from 5 groups of students which comprises:

Individual factual questionnaires
Drawings from each student
6 cognitive tests from each student

There will be a great deal to analyse, so now that my teaching on the FD has been completed, my time will be filled for the next four months writing up the results.

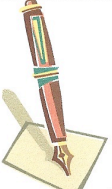

During the course of the data collection I have assured both the tutors and the students that I will share the results with them as soon as possible. For the students I anticipate that this will be at the end of June. The full completed piece of research, will, of course take much longer, although I would like to have my PhD completed by December 08.




I shall keep you informed as to the progress, and appreciate your support and help.

With best wishes

Christine Burgoyne

Factual questionnaires for students

AT SCHOOL HOW DID YOU FIND THE FOLLOWING ?	Very Hard	Hard	Easy	Very Easy	ABOUT YOU NAME D of B Course Tutor
 <p>Writing</p>					DO YOU HAVE or HAVE YOU HAD ANY Dyslexia A disability Sight problems. Hearing problems Mobility problems
 <p>Reading</p>					EDUCATION Primary School Secondary School Subjects studied for GCSE

	Very Hard	Hard	Easy	Very Easy	QUALIFICATIONS
 <p>Listening</p>					
 <p>Asking questions</p>					<p>EXTRA HELP</p> <p>I had help with ENGLISH</p> <p>MATHS</p> <p>SCIENCE</p> <p>Was this enough? Yes / No</p> <p>If no, why was this not enough?</p>
 <p>Spelling</p>					<p>PERMISSION</p> <p>I HEREBY agree to take part in this research with Chris BURGOYNE and the UNIVERSITY OF EXETER about Spatial Skills.</p> <p>I understand that I will be informed of the outcome of t</p> <p>I understand that I can withdraw from the research at :</p> <p>Signed.....Date</p>

Second factual questionnaire.

<p>Name and tutor group mv2 (22)</p>	
<p>What did you like doing at Primary school? What subjects did you like?</p>	<p>Science, Meeting with other people Reading P.C Science, English, Maths</p>
<p>In your primary years did you like: Sport? Music? Art? Drama? Making things? Reading? TV? Video games?</p>	<p>Making things Some Sports football Reading</p>
<p>What toys did you like to play with at home before the age of secondary school?</p>	<p>Bike, radio controlled cars P.C</p>
<p>How was reading and spelling and writing hard for you?</p>	<p>Reading. good Spelling. ok.</p>
<p>What help did you get in school? Was this enough? Who gave you this help? Was this in your classroom?</p>	<p>Spelling yes LSA NO</p>

Interview questions for mothers and children

1. As you know I am researching the possibility that some children may have strong spatial ability but poor reading ability? Can you tell me what sort of play your child enjoyed before and up until their second year in school?
2. Did your child enjoy playing alone or with other children?
3. How did your support their play?
4. Do you remember their playgroup/nursery setting and the play they enjoyed there?
5. Was your child happy at playgroup?
6. Did your child have friends at playgroup?
7. Did your child interact with other children at playgroup?
8. How about play when your child started school?
9. How was the first year in school for your child?
10. When did you first become aware that your child may have reading problems and what were they?
11. What did you notice first?
12. What did you do about this?
13. What help did you receive?
14. Do you think your child received enough help?
15. Tell me how your child became interested in art/ice-hockey/design/drama and dance/music?
16. What particular spatial abilities do you think your child has?
17. Do you think their outside interests have helped them with school?
18. How have your child's problems with reading impacted on him/her?
19. What other strengths do you think your child has and what weaknesses?
20. Do either you or your husband have reading problems, or have you in the past?

Example page of drawing score results

Names	Does it look ok	Is scale right	Does it have form	confidence	Techni correct	reading	spelling	writing	other
01 mv1	A 2 B 2 C 2 D 2	2 2 2 2	1 0 0 0	2 1 2 2	1 1 0 1 total 27	none	none	none	none
02 mv1	A 0 B 1 C 0 D 0	0 1 0 0	0 0 0 0	0 0 1 0	0 1 0 0 total 4	yes	yes	yes	no
03 mv1	A 2 B 2 C 1 D 2	2 2 2 2	2 2 1 0	2 1 1 1	1 1 2 0 total 29	none	none	none	none
04 mv1	A 2 B 1 C 1 D 1	1 2 0 1	2 2 1 2	2 1 2 2	1 0 0 1 total 25	yes	yes	yes	none
05 mv1	A 2 B 2 C 1 D 2	2 2 1 2	1 1 0 0	1 1 1 1	1 0 1 1 total 20	yes			
06 mv1 f	A 1 B 2 C 0 D 0	0 2 0 0	1 1 0 0	1 1 0 0	1 1 0 0 total 11	yes	yes	yes	none
07 mv1	A 2 B 1 C 2 D 2	2 1 2 2	2 1 0 0	1 1 2 1	0 1 1 0 total 24	yes	no	no	none
08 mv1	A 1 B 2 C 2 D 2	2 2 2 2	2 2 0 0	2 2 2 2	2 2 1 1 total 33	no	yes	no	none
09 mv1	A 1 B 2 C 0 D 1	1 1 0 1	1 1 0 0	1 1 0 1	1 1 0 1 total 15	none	none	none	none
10	A 2	2	1	1	1	none	none	none	ears

Instructions for students.

For all students to use

Go to:

<http://www.testingforschools.com/do/login/tuoex44qi/FERTO708>

SELECT YOUR NAME

USE THE PASSWORD HAT

Go to:

<http://www.testingforschools.com>

CLICK ON ENTER TESTWISE

SELECT The University of Exeter

CLICK ON THE student button

ENTER register FERTO708 and select your name

PASSWORD IS HAT

APPENDIX 17

Students who did drawing	But not CAT	SpLD	Score
A	No problems	0	9
B	Yes +	2	37
C	Yes +	2	20
D	No problems	0	18
E	Died Yes+	2	32
F	No Problems	0	36
G	Yes +	2	30
H	Yes +	2	30
I	Yes +	2	27
J	No Problems	0	29
K	Reading and spelling	1	33
L	Yes +	2	33
M	No Problems	0	14
N	No Problems left	0	35
O	No Problems left	0	33
P	No Problems left	0	36
Q	Reading and Spelling	1	33
R	No Problems	0	34
S	Yes +	2	25
T	Left no problems	0	35
U	Yes +	2	35
V	Yes +	2	34
W	No Problems	0	35
X	No Problems	0	22
Y	Yes +	2	32
Z	No Problems	0	26
A 1	No Problems	0	33
A 2	No Problems	0	16
A 3	Yes +	2	30
A4	Reading and Spelling	1	29
A 5	No Problems	0	25
A6	No Problems	0	30
A7	No Problems	0	34
A 8	Writing and spelling	1	2
A 9	No Problems	0	25
A10	Yes +	2	14
A11	No Problems	0	23
A12	Yes +	2	18
A 13	No Problems	0	10
A 14	No Problems	0	31
A 15	No Problems	0	9
A 16	Yes +	2	15
A 17	No Problems	0	15
A 18	No Problems	0	13
A 19	No Problems	0	7
A 20	No Problems	0	25
A 21	Yes +	2	35
A 22	Reading writing spelling	1	8
A 23	Reading writing spelling	1	8

A 24	Yes +	2	27
A 25	Yes +	2	33
A 26	No Problems	0	33
A 27	No Problems	0	35
A 28	No Problems	0	15
A 29	No Problems	0	16
A 30	Reading writing and spelling	1	18
A 31	Yes +	2	38
A 32	No Problems	0	25
A 33	Yes +	2	27

TOTAL OF YES+ students = 20

TOTAL OF SPLD students = 7

TOTAL OF students with no problems= 32

TOTAL NUMBER OF STUDENTS = 59

TOTAL NUMBER OF STUDENTS WITH YES + with scores of 30 and above = 11

TOTAL NUMBER OF STUDENTS WITH SPLD with scores of 30 and above = 2

TOTAL NUMBER OF STUDENTS WITH NO PROBLEMS of 30 and above = 11

Standard FERT reports

Organisation: The University of Exeter
Group: Unknown
No. of students: 74
Section: A, B, C

The following pages give a summary of the results achieved by your group based on the Verbal, Quantitative, Non-Verbal and the overall mean Standard Age Scores (SAS). A SAS comes from comparing a student's raw score with the national standardisation sample, taking chronological age into account. This shows how each student is performing compared to the national average for their age. The national average SAS is 100.

Section A - Comparison of group and national SAS mean scores

The chart shows the average SAS scores for each test battery with 80% confidence bands indicated by the vertical lines. If the vertical line overlaps the national '100' line the results for your group do not differ significantly from the national average.

Section B - Comparison of group and national SAS distributions

The bar charts show the percentage of students that fall within certain ranges of scores. The charts allow you to compare the score distribution of your group with the national standardisation sample. The distribution of the national standardisation sample is a "normal" distribution

Section C - Students' FERT scores listed alphabetically by surname

Scores for each student are shown as a Raw Score (RS), a Standard Age Score (SAS), a Stanine (ST), a National Percentile Rank (NPR) and a Group Rank (GR).

SASs cover a wide range (from 60- to 140+) and this range can be subdivided into nine standard bands called stanines (from 'standard nines') which some people find are a convenient shorthand form of SAS. It should be remembered that some detail has been lost in grouping the scores into Stanines; SASs are a more precise measure.

National Percentile Rank can help you assess your students in the context of the national picture. For example, a student achieving an NPR of 60 has a higher SAS than 60% of students in the standardisation sample (or, equivalently, 40% of students in the standardisation sample had an SAS higher than or equal to that of a student whose NPR is 60). Group Rank indicates a student's position relative only to the other students in your class/group, ranked according to SAS for each battery, or mean SAS (for example, 3rd out of 30).

You can view the **individual students' FERT profiles (Section D)** for a particular student by clicking on the student name. More details about the profiles are given at the start of Section D.

Further Education Reasoning Test

Notes from discussion with Mechanical Engineers.

Notes taken from informal interviews with the second group of mechanical engineers level 2 group.

1 A Student very laid back arrived late no apologies but nice hello. Good sense of humour. Very agitated about having to draw pictures, not because he minded the task but, because he was clearly concerned about the 'actual' skill or drawing, kept saying "I can't draw" "I've never been able to draw" Says he had dyslexia at school. He kept looking at other people's drawings. At the end of the session he said he was sorry for being late and said he had hated school and that is was 'useless'. Said now he was at College it was OK.

1 B Stropky at first could not see the point of the task. Admitted that he had lots of learning problems at school and he clearly wanted to talk more. He had a reclusive manner and kept learning on his coat for comfort. Said primary school was not good for him, he had never felt he had been able to ask questions, now at College he said he felt far more confident and able to ask what he wanted to "I can look after myself and say and ask the things that I want."

1C Another latecomer, quiet needed help to complete the questionnaire, very conscious about his reliability to be able to read and write. Quite happy for me to sit next to him and help him fill in his questionnaire. Kept rubbing his eyes and yawning. I asked him what he liked about primary school and he said "I liked making things like models and things with lego."

1D Loud and objectionable constantly trying to get the attention of his peers. (This was confirmed by his tutor the same thing happened in his classes. The student likes to be the centre of attention). Was reluctant at first to do more than one picture but in the end did all four drawings. I asked him what he liked about school and he said "Ihated it especially primary school, the teachers only wanted you to be able to read and write. I couldn't so I mucked around all the time."

1E Drew very carefully didn't want to finish his pictures he wanted to go on doing more drawing. I asked him about this and he said "I've always liked drawing but nobody cares about that do they?" I asked him about his written work he said, "I hated writing but did it reading I was awful at."

The results of the CAT3 tests as profiled by GL Assessment

The FERT reports

Provided with the tests from GL Assessment were a summary of the results achieved by the group based on the Verbal, Quantitative, Non-verbal and the overall mean Standard Age Scores (SAS). (Figure 7)

A comparison of group and national SAS mean scores Section A

A comparison of group and national SAS distributions Section B

A visual-verbal profile chart Section B

The summary of results for Section A shows that for all sections of mean scores for each group of results i.e. verbal, quantitative and non-verbal the scores were not significantly different, except for the scores for the mean standard age score where they were significantly above the national average. In the non-verbal test scores the national average does not exceed 20% but for this group of students it peaks at just above the 30% line.

The visual-verbal profile chart was interesting from the point of view that it showed the verbal and non-verbal scores plotted against each other for each student in the class or group. This gives an at-a-glance picture of the characteristics of the group according to where they congregate on the plot. The chart has been sub-divided into five areas: four quadrants: A B C D and E, of students learning characteristics. Figure 6

- A Students who are good with spoken and written words but who may be weaker with materials such as charts figures and diagrams.
- B Students who are strong in ability all round
- C Students who struggle with both texts and abstract concepts
- D Students who struggle with both texts and abstract concepts
- E Students who are average in terms of both verbal and visual abilities

The test providers point out that these are broad thumbnail sketches of broad learning types and should not be taken as classifying individual students. But, rather the intention

is that it forms the impression of the group as a whole, to assist in planning programmes of teaching and learning about the group.

The research acknowledges this, but notes that 5 students who appear within the A quadrant all had high drawing scores above 30 and 4 out of 5 had no learning problems which is to be expected, however one student was SpLD+, this student was female. This is indicative of SpLD+ students being able to perform at a higher level of verbal ability and drawing ability and yet have SpLD+. Of further interest is the results of quadrant D where of the 8 students who appeared 4 were SpLD+ and 1 was SpLD. Of the 4 SpLD+ students in this quadrant 2 were female. This is relevant to the concept of identifying learning strengths at an early age. Of the 8 students who appeared in the D quadrant 2 were electrical engineers 2 were motor mechanics, 1 was an A level student and 3 were art students. In other words 7 out of the 8 were on vocational courses that required spatial understanding.

These results from GL Assessment are by their own admission meant to be guidelines for teachers to use in their teaching strategies, and as such need to be treated carefully.

Directions

Each question has a sentence with one word left out. Look at the answer choices and choose the word that completes the sentence. Look at the example question below.

Read each of the answer choices below the sentence. Think about which word belongs in the sentence. Find the word that makes the best sense in the sentence. The right answer is **grow**. 'Apples grow on trees' is a sentence that is true and sensible. None of the other answer choices makes sense in the sentence. Click on 'grow' now, then click on 'next' to continue.

Example

Apples _____ on trees.

fall	grow	show	groom	spread
------	------	------	-------	--------

(1)

Help
Further Education Reasoning Test Part 2 of 6

Directions

For each question there are three words in dark type. The first two words go together. The first two words go together with one of the answer choices. Choose the word from the answer choices that goes with the first word. Look at the example question below.

Example

new → **old** : **wet** →

Look at the first two words, **new** and **old**. Think about how these two words go together. **new** is the opposite of **old**. Now look at the third word, **wet**. The word 'wet' must go with the answer in the same way that **new** goes with **old**. Since **new** is the opposite of **old**, you have to find the word that is the opposite of **wet**. The answer is **dry**, since it is the opposite of **wet**. Click on it now, then click on 'next' to continue.

rain	drip	hot	sun
------	------	-----	-----

(2)

Help nferNelson
understanding potential

Further Education Reasoning Test Part 3 of 6: Number Analogies

Directions

The question starts with two numbers that are linked together in some way. Next there are two more numbers that are linked in exactly the same way. You have to work out how the numbers are linked and then finish off the third pair. Look at the example question below.

Example

[2 → 3] [9 → 10] [6 → ?]

What do you have to do that gets you from 2 to 3 and also from 9 to 10? You have to add 1. So, 6 changes to 7. The correct answer is 7. Click on it now. This is just one example. In the test you might have to add, subtract, multiply or divide to get the second half of each pair. Remember that you must always check that what you decide for the first pair works for the second pair too. Click on **'next'** to continue.

3	4	5	6	7
---	---	---	---	---

(3)

Help nferNelson
understanding potential

Further Education Reasoning Test Part 3 of 6: Number Analogies

Directions

The question starts with two numbers that are linked together in some way. Next there are two more numbers that are linked in exactly the same way. You have to work out how the numbers are linked and then finish off the third pair. Look at the example question below.

Example

[2 → 3] [9 → 10] [6 → ?]

What do you have to do that gets you from 2 to 3 and also from 9 to 10? You have to add 1. So, 6 changes to 7. The correct answer is 7. Click on it now. This is just one example. In the test you might have to add, subtract, multiply or divide to get the second half of each pair. Remember that you must always check that what you decide for the first pair works for the second pair too. Click on **'next'** to continue.

3	4	5	6	7
---	---	---	---	---

(4)


Help nferNelson
understanding potential

Further Education Reasoning Test Part 5 of 6: Figure Analogies

Directions

Look at the first pair of figures - the large square and the small square. Think about how these two figures go together. The first two figures are the same shape, but the second one is smaller than the first.

Example



Click on 'next' to see the answer.

△

○

□

○

▭

Next >>

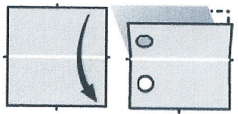
(5)

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Further Education Reasoning Test Part 6 of 6: Figure Analysis

Directions

Each question shows how a square piece of dark paper is folded and where holes are punched in it. You must work out how the paper will look when it is unfolded. Watch the example below to see how it works.



The first square shows how the paper looks before it is folded. The small black marks show where the middle of each side is. The white line shows the fold line, and the arrow shows the direction that the paper will be folded. In this example, the paper is folded across the middle with the top folded over the bottom. Now look at the second square. Notice where the hole has been punched. The dashed lines show the size of the paper before it was folded. When the paper unfolds it shows the answer.

Click on 'next' to continue.

(6)



Development of the *Cognitive Abilities Test – Third Edition (CAT3)*

Battery content

All three batteries in *CAT3* assess both crystallised and fluid-analytic abilities. Each battery has been designed to assess general inductive and deductive reasoning skills and also general cognitive abilities that are specific to the battery, such as verbal and quantitative reasoning. As chronological age and level of schooling increase, the more specific verbal and quantitative reasoning skills become increasingly important for learning and problem-solving in different areas of study. To understand the kinds and strengths of cognitive abilities that a pupil has, information is needed on both the level of the pupil's general reasoning abilities, given by the mean *CAT* score, and the level of her or his more specific reasoning abilities, provided by the scores on the separate batteries. These kinds of general and specific reasoning skills are fundamental components of an individual's ability to do the following:

- acquire, organise, remember and recall information;
- detect relationships;
- generalise, transfer and use previous instruction and experience to learn new tasks or to solve novel problems;
- form and elaborate concepts;
- adapt or invent strategies and tactics as the difficulty and complexity of learning tasks or problems increase;
- monitor, evaluate and adapt cognitive processes in order to achieve a learning goal.

Verbal Battery

There are three tests in the Verbal Battery – Verbal Classification, Sentence Completion and Verbal Analogies.

Each question in Verbal Classification presents a set of three words. The pupil has to discover the conceptual link tying the three words together and then select from five answer choices the word that belongs with the original set of three words. This test assesses inductive reasoning and general verbal reasoning, which are fluid-analytic abilities. Also assessed are general verbal knowledge, lexical knowledge and language development, which are crystallised abilities.

In Sentence Completion, each question presents a sentence with one word omitted. Pupils select from five answer choices the word that correctly completes the meaning conveyed in the sentence. This test assesses deductive reasoning and general verbal reasoning, which are both fluid-analytic abilities. Also assessed are lexical knowledge and language development, which are crystallised abilities.

In Verbal Analogies, each question presents a verbal analogy in the form 'A → B : C → ___'. Pupils have to work out the relationship between the first pair of words and then select from five answer choices the one that correctly completes the analogy. Although solving verbal analogies is usually classified as inductive reasoning, both inductive and deductive reasoning abilities are required to complete the questions successfully. Inductive reasoning is required to infer the relationship between the pair of words in the analogy, but deductive reasoning is required to apply the inferred relationship in selecting the answer. The questions in this test vary both in difficulty of content and in the subtlety of the relationship on which the analogy is based. In addition to inductive and deductive reasoning, this test also assesses general verbal and lexical knowledge.

Quantitative Battery

The three tests in the Quantitative Battery are Number Analogies, Number Series and Equation Building.

The questions in Number Analogies present three pairs of quantities, such as '4→6', '8→10' and '9→__'. Pupils have to work out how the numbers are related and then complete the third pair. The questions used in the test assess inductive and deductive reasoning, as do the questions in Verbal Analogies, their equivalents in the Verbal Battery. The questions in Number Analogies also assess quantitative reasoning and basic arithmetic knowledge.

For Number Series, pupils have to work out the rule underlying the progression in the number series presented in each question and then select the next number in the series from the five answer choices. This test assesses inductive reasoning, quantitative reasoning and number facility.

Each question in Equation Building gives numerals and one or more mathematical symbols, such as +, −, ×, ÷ or (). Pupils must combine the given numbers and symbols to make an equation whose solution is one of the five answer choices. For most of the questions, it is possible to combine the given numerals and symbols in several different ways, but only one way of combining them has a correct solution among the answer choices. The stimulus material used for each question is essentially unstructured, and so pupils have to organise and structure it themselves. Since there are several possible ways of combining the stimulus materials, pupils have to be flexible in working with them. The test assesses deductive reasoning, general quantitative reasoning, quantitative knowledge and number facility.

Non-verbal Battery

The Non-verbal Battery of CAT3 makes a distinctive contribution to the appraisal of a pupil's level of cognitive development. None of the tests in this battery require reading or the use of English, so bilingual pupils and individuals with reading problems have an opportunity to demonstrate how well they can reason and solve problems when these two influences on performance are eliminated. Unlike the questions in the Verbal and Quantitative Batteries, which require prior knowledge gained from general experience, the questions on the Non-verbal Battery require no prior conceptual or factual knowledge of any kind. All the information needed to answer a question correctly is embedded in the question itself. Pupils who have had very limited opportunities to gain general verbal and quantitative knowledge outside of school have a chance to show the levels of fluid-analytic abilities that they have when the need for such knowledge is eliminated. Since no reading, language or prior fund of verbal or quantitative knowledge is needed to perform well, the Non-verbal Battery is much less affected by acculturation influences than are the other two batteries. The types of cognitive tasks used on the Non-verbal Battery are much more novel and less like school tasks than those used on the other two batteries; therefore, they can assess how well pupils use their general cognitive skills to solve problems that they have not been directly taught.

The three tests on the Non-verbal Battery are Figure Classification, Figure Analogies and Figure Analysis. All the questions in these tests use figures, designs or geometric shapes as stimuli.

Development of the *Cognitive Abilities Test – Third Edition (CAT3)*

Each question in Figure Classification presents a set of three separate figures, designs or shapes. The pupil has to discover the conceptual link, or underlying characteristic, that ties the three figures together and then select from the five answer choices the figure that belongs with them. The test assesses inductive reasoning and a minor element of visualisation.

The questions in Figure Analogies present figural analogies of the type 'A→B : C→__'. Like Verbal and Number Analogies, this test assesses both inductive and deductive reasoning. Inductive reasoning is involved in inferring the relationship between the first pair of figures, and deductive reasoning is involved in applying the inferred relationship to the choice of an answer. The difficulty of the questions is varied by the number of transformations, that is, changes in characteristics of the figures, and the subtlety of the transformations used in the stimulus pair; that is, the A:B pair. Flexibility and fluency in generating hypotheses about the underlying relationship in the stimulus pair is introduced in questions that permit two or more possible hypotheses but provide a correct answer for only one of them. In addition to inductive and deductive reasoning, this test also assesses visualisation, since the test-taker has to imagine the effect of hypothesised transformations upon the stimuli.

Each question in Figure Analysis uses a series of diagrams showing a square piece of paper being folded and holes being punched in the paper. Pupils have to select (from five answer choices) the figure that shows what the paper will look like when it is unfolded. The difficulty of a question depends upon the number of folds, the number of hidden folds, and the number and placement of the punched holes. The test assesses inductive and deductive reasoning and, to a far greater extent than the other tests in the Non-verbal Battery, visualisation.

Mean CAT score

The mean SAS score that is reported for CAT3 is based on the pupil's performance on all three batteries. This score indicates the variety and strength of the pupil's own cognitive resources for learning and the effectiveness with which individuals can use these resources to accomplish a wide range of cognitive tasks. Pupils with an above average or very high mean SAS score have many strongly developed cognitive resources that they typically use effectively to accomplish learning and problem-solving tasks. They usually learn very quickly and need little or no special help to achieve educational objectives. Pupils with a below average or very low mean SAS score have few and weak cognitive resources of their own for learning and usually do not use the cognitive resources that they do have very effectively. They typically learn slowly and need considerable help to achieve instructional objectives.

CAT and CAT2E

The original form of the *Cognitive Abilities Test (CAT)* was developed in the early 1970s in the UK. The standardisation of this first edition took place in 1972, with a nationally representative sample of school children. It covered levels A to H.

After 12 years, it was decided to restandardise the test, taking into account feedback from schools that had been using the first edition. The questions remained unchanged and in their original order; but levels G and H were deleted as they were very rarely used in the first edition. This second edition (CAT2E) was standardised in Autumn 1984, with all pupils being given the newly introduced full-length practice

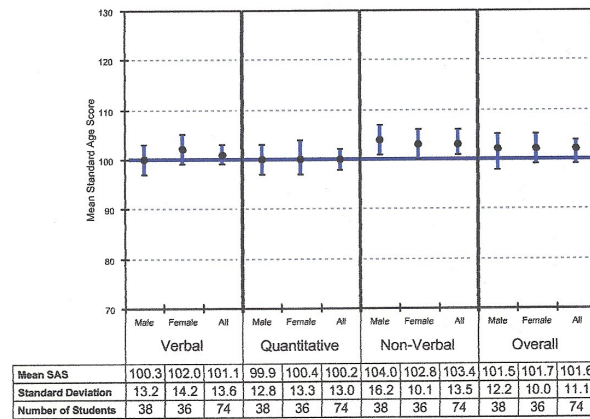
FERT

Comparison of group and national SAS mean scores

Section A

Organisation: The University of Exeter
Group: Unknown

Number of Students: 74

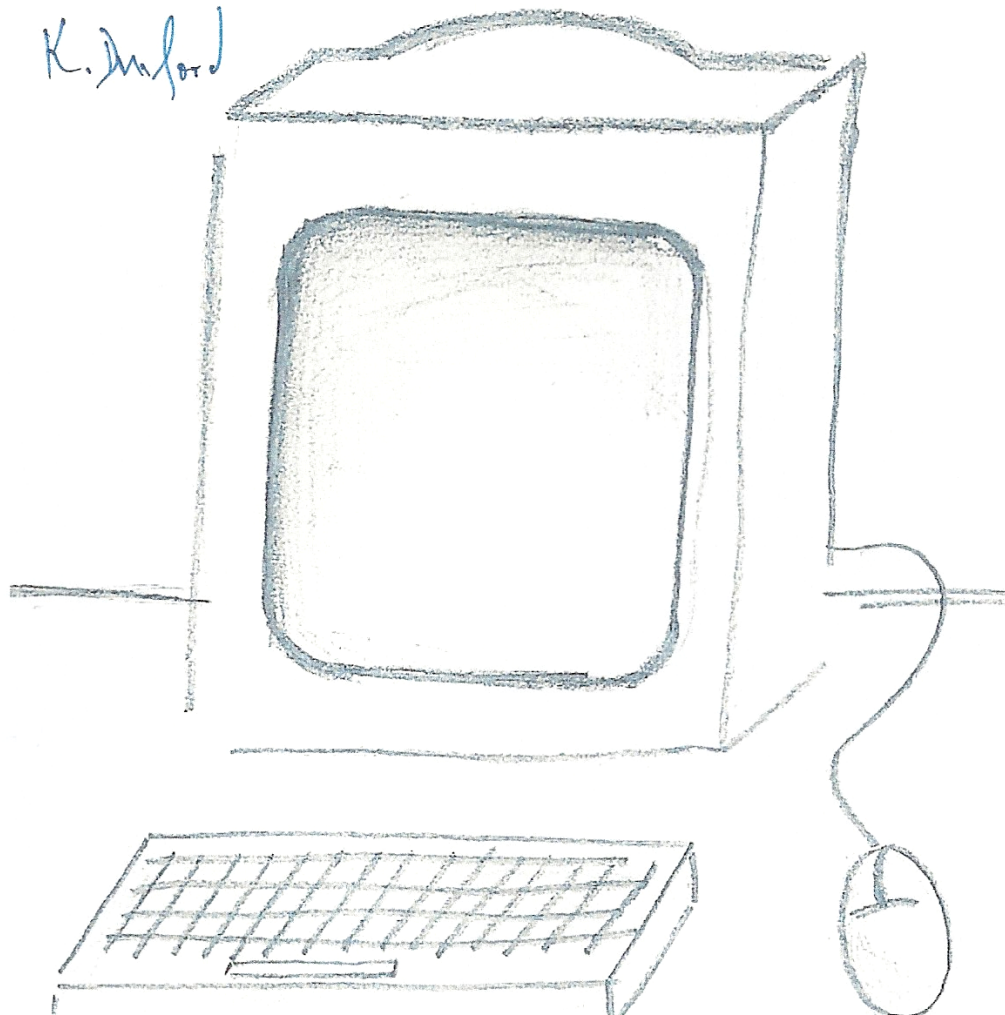


Notes:

Verbal	<ol style="list-style-type: none"> 1. The mean standard age score for this group is not significantly different from the national average. 2. The spread of scores for this group is not significantly different than the national spread of scores. 3. The mean standard age score for males is not significantly different from females.
Quantitative	<ol style="list-style-type: none"> 1. The mean standard age score for this group is not significantly different from the national average. 2. The spread of scores for this group is not significantly different than the national spread of scores. 3. The mean standard age score for males is not significantly different from females.
Non-Verbal	<ol style="list-style-type: none"> 1. The mean standard age score for this group is significantly above the national average. 2. The spread of scores for this group is not significantly different than the national spread of scores. 3. The mean standard age score for males is not significantly different from females.
Overall Mean	<ol style="list-style-type: none"> 1. The mean CAT score for this group is not significantly different from the national average. 2. The spread of scores for this group is not significantly different than the national spread of scores. 3. The mean CAT score for males is not significantly different from females.

Comparison of group and national SAS mean scores

Art experts authentication of sample drawing



FERT

Individual student FERT profile

Section D

Organisation: The University of Exeter
Group: Unknown

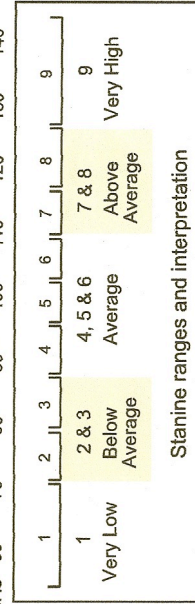
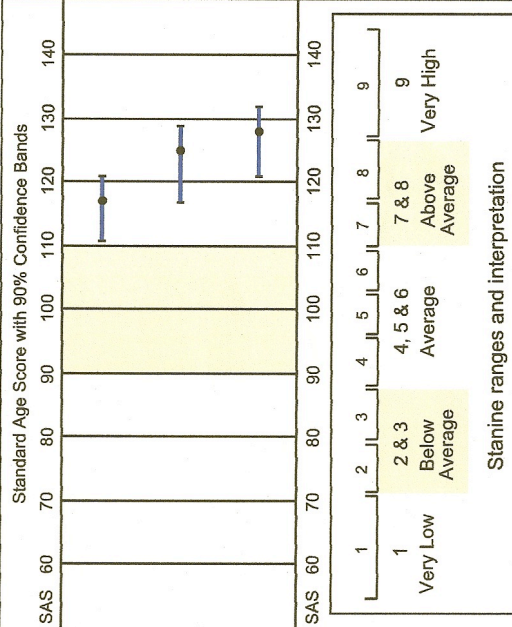
Student Name:
Age: 21:7
Sex: Male

Date of Test: 27-02-2008

Battery	Raw Score	SAS	ST	NPR
VERBAL (54 questions attempted)	46	117	7	87
QUANTITATIVE (39 questions attempted)	35	125	8	95
NON-VERBAL (42 questions attempted)	36	128	9	97

The overall mean SAS for all batteries taken is 123. Individual performance on each battery taken shows that this pupil is above average on Verbal Reasoning, above average on Quantitative Reasoning, very high on Non-Verbal Reasoning.

Key:
SAS - Standard Age Score
ST - Stanine
NPR - National Percentile Rank
! - Chance level raw score



Stanine ranges and interpretation

Note:

A student's SAS scores are only an estimate of true ability as performance on any one occasion can be affected by a number of factors such as mood, illness etc. So, on another day, the same student could get a different score. Statistical methods can be used to estimate the range of scores within which you can be 90% sure that the student's true score lies.

FERT

Students' FERT scores listed alphabetically by surname

5

Organisation: The University of Exeter
Group: Unknown

Number of Stud

Student Name	Date of Test	Mean		Verbal				Quantitative				Non-Verbal					
		SAS	GR	RS	SAS	ST	NPR	GR	RS	SAS	ST	NPR	GR	RS	SAS	ST	NPI
	17-03-2008	102	38=	32	100	5	50	41=	14	93	4	32	51=	27	112	7	78
	03-03-2008	89	61=	19	87	3	20	62	9	85	3	16	65	16	96	4	40
	03-03-2008	110	17=	36	104	6	60	34=	26	110	6	74	13=	29	116	7	86
	03-03-2008	91	59	11	76	2	6	72	21	104	6	60	31=	13	92	4	30
	17-03-2008	114	10	42	111	6	77	19=	27	111	6	77	11=	32	119	8	90
	28-03-2008	81	73	14	83	3	13	65=	6	78	2	7	72	7	81	2	11
	27-02-2008	107	23=	38	106	6	66	29=	25	109	6	72	19=	23	106	6	66
	27-02-2008	123	2	46	117	7	87	6=	35	125	8	95	2=	36	128	9	97
	10-03-2008	92	57=	25	94	4	34	49=	13	91	4	28	53=	13	92	4	30
	03-03-2008	106	27=	26	94	4	34	49=	19	101	5	52	40=	33	122	8	93
	31-03-2008	109	19=	45	116	7	86	10=	26	110	6	74	13=	20	101	5	52
	31-03-2008	103	34=	20	90	4	26	58=	32	119	8	90	6=	18	99	5	48
	31-03-2008	103	34=	40	109	6	72	25=	26	110	6	74	13=	12	90	4	26
	10-03-2008	106	27=	34	102	5	55	39=	21	104	6	60	31=	27	112	7	78
	28-03-2008	103	34=	34	104	6	60	34=	22	106	6	66	23=	18	99	5	48
	10-03-2008	121	3	45	116	7	86	10=	28	113	7	80	10	38	134	9	99
	28-03-2008	88	64=	22	90	4	26	58=	11	89	4	24	61	10	86	3	18
	03-03-2008	88	64=	34	102	5	55	39=	4	72	1	3	73	12	90	4	26
	28-03-2008	106	27=	45	116	7	86	10=	22	106	6	66	23=	16	96	4	40
	27-02-2008	127	1	48	121	8	92	3=	32	119	8	90	6=	39	140	9	99
	03-03-2008	107	23=	27	95	4	37	48	25	109	6	72	19=	29	116	7	86
	28-03-2008	78	74	8	70	1	2	74	7	79	2	8	70=	10	86	3	18
	03-03-2008	98	46=	30	98	5	45	44=	23	106	6	66	23=	11	89	4	24
	28-03-2008	95	52=	23	91	4	28	57	16	95	4	37	46=	18	99	5	48
	03-03-2008	109	19=	42	111	6	77	19=	20	102	5	55	34=	28	113	7	80
	28-03-2008	98	46=	26	94	4	34	49=	14	93	4	32	51=	23	106	6	66
	10-03-2008	101	41=	37	105	6	63	32=	12	90	4	26	57=	24	107	6	68
	17-03-2008	102	38=	29	98	5	45	44=	13	91	4	28	53=	30	116	7	86
	03-03-2008	85	68	20	88	3	22	61	8	83	3	13	66=	8	83	3	13
	27-02-2008	109	19=	48	121	8	92	3=	22	106	6	66	23=	19	100	5	50
	17-03-2008	111	14=	46	117	7	87	6=	15	94	4	34	48=	34	123	8	94
	03-03-2008	110	17=	43	113	7	80	16=	22	106	6	66	23=	27	112	7	78
	28-03-2008	98	46=	13	78	2	7	69=	21	104	6	60	31=	28	113	7	80
	03-03-2008	84	69	15	82	3	12	67=	7	79	2	8	70=	12	90	4	26

Example page from students FERT scores

GLOSSARY

BEI	The British Education Index supports the professional study of education by facilitating the identification and use of specific reading matter and event-related information.
CAT 3	The Cognitive Abilities Test (CAT) is the most widely used test of reasoning abilities (numerical, non-verbal and verbal reasoning) in the UK. Used to understand individual pupil potential and learning styles, CAT will help to inform your decision-making and target setting.
DAR	Diagnostic Assessment of Reading.
EBSCO	Information Service. This is the leading service provider of e-journal, e-book and e-journal package and print subscriptions, e-resource management tools.
ERIC	Exeter (University) Research and Institutional Content archive.
FERT	Cognitive Abilities Test 3 produced by NFER – Nelson.
GTP	Graduate teachers programme.
IEP	Individual education plan.
LSA	Learning support assistant.
NLS	National Literacy Strategy (2003).
OFSTED	Office for Standards in Education, Children’s Services and Skills.
P.E.	Physical education.
R.E.	Religious education
SAS	Standards age scores.
S.A.T.	Standard attainment test.
SEN	Special Educational Need.
SENCo	Special Education Needs Coordinator.
SpLD	Specific Learning difficulties.
SpSK	Specific spatial skills.

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