University of Cambridge
Faculty of Education

DIFFICULTIES IN NUMBER
EXPERIENCED BY CHILDREN AGED 7 TO 11
IN PUBLIC CARE IN ENGLAND

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MAY 2014

This dissertation is submitted for the degree of Doctor of Philosophy.
PREFACE

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except where specifically indicated in the text.

The dissertation does not exceed the word limit of 80,000 words.

ACKNOWLEDGEMENTS

My thanks to Julia for getting me started, and especially to Tim for making sure that I finished!

My thanks also go to the five case study children, their families, and the staff in schools who were generous with their time and considered my questions carefully.
ABSTRACT

Researchers and governments in the UK and elsewhere have raised concern about the low average levels of educational attainment reached by children in public care. This study explores the causes and nature of looked-after children’s difficulties in mathematics, and suggests potential improvements for policy and practice in the future.

I undertook case studies, across a period of a year, of five looked-after children aged 7 to 11 with varied ‘care backgrounds’ who were identified as having difficulties in mathematics, and used clinical interviews to explore their understanding and skills in counting, place value, addition and subtraction. Interviews with the children, their class teachers, teaching assistants and other adults in school provided data about each child’s experience of mathematics in school, and I interviewed each child’s main foster carer to explore the mathematics the child did at home, and to examine the links between home and school.

My study identified several barriers to each child’s progress, including a lack of recognition of the effects of previous trauma, loss and neglect, on the child’s ability to engage in educational activity. School systems of organising mathematics teaching sometimes separated the child from classmates and teachers; poor assessment, poor teaching, and the child’s own avoidance techniques meant they were not able to engage successfully in mathematics lessons. There was little evidence of positive links between home and school to help the child make progress, but some unacknowledged good practice within the home environment that could be shared.

Similarly, some teachers were making a positive difference to the child in their care, but would have benefited from additional support and professional development. Productive approaches found during the study included using the clinical interview for detailed assessment; using oral and practical work in context to increase understanding of arithmetic; and a focus on metacognition using visually stimulated recall, to show the child that they could be successful.
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**LIST OF ABBREVIATIONS/ GLOSSARY OF TERMS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>C4EO</td>
<td>Centre for Excellence and Outcomes in Children and Young People’s Services</td>
</tr>
<tr>
<td>CRB</td>
<td>Criminal Records Bureau</td>
</tr>
<tr>
<td>CWDC</td>
<td>Children’s Workforce Development Council</td>
</tr>
<tr>
<td>DBIS</td>
<td>Department for Business, Innovation and Skills</td>
</tr>
<tr>
<td>DCSF</td>
<td>Department for Children, Schools and Families</td>
</tr>
<tr>
<td>DES</td>
<td>Department of Education and Science</td>
</tr>
<tr>
<td>DfE</td>
<td>Department for Education</td>
</tr>
<tr>
<td>DfEE</td>
<td>Department for Education and Employment</td>
</tr>
<tr>
<td>DfES</td>
<td>Department for Education and Skills</td>
</tr>
<tr>
<td>DoH</td>
<td>Department of Health</td>
</tr>
<tr>
<td>EPPE</td>
<td>Effective Pre-school and Primary Education Project</td>
</tr>
<tr>
<td>EPPI Centre</td>
<td>Evidence for Policy and Practice Information and Coordinating Centre</td>
</tr>
<tr>
<td>FSM</td>
<td>Free School Meals</td>
</tr>
<tr>
<td>GCSE</td>
<td>General Certificate of Secondary Education (examinations taken by children at age 16 in England, usually in at least five subjects)</td>
</tr>
<tr>
<td>IRO</td>
<td>Independent Reviewing Officer (appointed to oversee a looked-after child’s situation)</td>
</tr>
<tr>
<td>KS2</td>
<td>Key Stage 2 (ages 7 to 11)</td>
</tr>
<tr>
<td>KS4</td>
<td>Key Stage 4 (ages 14 to 16)</td>
</tr>
<tr>
<td>LA</td>
<td>Local Authority</td>
</tr>
<tr>
<td>LACES</td>
<td>Looked-After Children Education Support</td>
</tr>
<tr>
<td>Level 4</td>
<td>Expected level of the National Curriculum for child at end of KS2</td>
</tr>
<tr>
<td>LSA</td>
<td>Learning Support Assistant (see also TA)</td>
</tr>
<tr>
<td>NC</td>
<td>National Curriculum</td>
</tr>
<tr>
<td>OFSTED</td>
<td>Office for Standards in Education; later, Office for Standards in Education, Children’s Services and Skills</td>
</tr>
<tr>
<td>ONS</td>
<td>Office for National Statistics</td>
</tr>
<tr>
<td>PEP</td>
<td>Personal Education Plan</td>
</tr>
<tr>
<td>QCA</td>
<td>Qualifications and Curriculum Authority</td>
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</table>
RME  Realistic Mathematics Education (an approach to mathematics learning and teaching initiated in the Netherlands)
SATs  Standard Assessment Tasks/Tests (national assessments used in England at ages 7 and 11)
SEN  Special Educational Needs
SENCO  Special Educational Needs Co-ordinator
SR  Stimulated Recall
SSI  Social Services Inspectorate
TA  Teaching Assistant (see also LSA)
TIMSS  Trends in International Mathematics and Science Study
UPN  Unique Pupil Number
VSH  Virtual School Head
VSRD  Visually Stimulated Reflective Dialogue
Year 3  Academic year for child aged 7 to 8
Year 4  Academic year for child aged 8 to 9
Year 5  Academic year for child aged 9 to 10
Year 6  Academic year for child aged 10 to 11
Year 11  Academic year for child aged 15 to 16
ZPD  Zone of Proximal Development (Vygotsky, 1978)
1. INTRODUCTION

This study brings together several themes from my personal and professional experience: as a teacher of mathematics; a foster carer and adoptive parent; an education professional both in the field of family education, and of teachers’ continuing professional development; and a mathematics education researcher with a particular interest in children who find mathematics difficult.

My experience in the complex area of the educational experience of children in foster care has been consolidated over the last decade. In 2003 I initiated an action research project called the Letterbox Club, aiming to raise the attainment, in reading and number, of children aged 7 to 11 in public care. This was given major funding for 2007 and 2008, and the programme has now been established nationally as an intervention recommended by the DfE (Department for Education). It is described briefly below. The project provided further insight into many of the successes and difficulties faced by children in care and those working with them, but also raised questions that would benefit from more detailed research.

In this chapter I introduce some of the issues facing children in public care that may lead to poor educational performance, including in mathematics, and consider the evidence for concern about looked-after children’s attainment. I describe my previous work on the Letterbox Club, which has provided relevant contextual information for this study, although it does not form part of this thesis. Finally, I outline the focus of my research (which brings together consideration of the educational attainment of children in care, and children’s difficulties in mathematics) and its potential impact on policy and practice.

Children in Public Care

Children who have been placed in public care (sometimes referred to as ‘looked-after children’) are amongst the most vulnerable children in the education system in the United Kingdom. The challenges they face are often partly a result of their earlier experiences: Jackson and Sachdev’s review of research and practice in the education of children in care commented:
Over half of looked-after children are known to have been abused or severely neglected before they came into care. Once in care, a high proportion suffer further experiences of rejection and multiple changes of placement... It would be surprising if they did not show signs of disturbance and sometimes experience difficulties in conforming to school regimes and expectations. (Jackson and Sachdev, 2001, p.109)

Jackson and Sachdev concluded:

Our review of research over the past 20 years highlights consistent weaknesses in the care and education systems which have made school an unhappy experience for too many children looked after away from home. … there is a consistent picture of low attainment, denial of mainstream schooling, lack of concern and encouragement from social workers, and placements that offer inadequate support and encouragement. (Jackson and Sachdev, 2001, p.139)

Children who are in care have a diverse range of experiences and very varied needs. One thing they all have in common is that, compared with children not in care, there will have been many occasions when adults who work or live with them will have been asked to sum up their perceived needs, for example for case conference reports, court reports and personal education plans. This acute level of ‘labelling’, often shared with the child and sometimes including the child’s view, may be a source of limitation on the child’s (and carer’s and teacher’s) opinion of what they might achieve. Jackson and Sachdev (2001) noted that many young people in care felt their teachers expected less of them because of their situation.

Further issues for looked-after children are instability and transition. A change in care placement or class teacher, or coping with any new and unfamiliar situation, may cause the child distress and anxiety. Some schools and carers acknowledge this, but not all; the ‘timeliness’ and appropriateness of support for the child are important aspects to explore. This links with the concept of ‘resilience’, an area where there may be a ‘virtuous circle’: educational achievement can be a protective factor, making a child more resilient, and a resilient child will be able to make better use of their educational experiences, and better able to cope with change.
The last ten years have been a time of major change in provision for looked-after children in England. The bringing together of social care and education for children’s services, indicated, for example, by the requirement of the Children Act 2004 that local authorities should appoint a Director of Children’s Services (where they previously had had a Director of Education and a Director of Social Services), has opened up many opportunities for improvement. It has also shown more clearly that there are gaps in our knowledge and understanding of how the different elements of looked-after children’s lives fit together.

**Looked-after children and low attainment in mathematics**

Many studies have established that the educational standards achieved by children in foster care in the United Kingdom are lower than would be expected, and that education has not been given sufficient priority in the past. (DoH/SSI/Ofsted, 1997; Fletcher-Campbell and Archer, 2003). The education of looked-after children is now a priority for central government and local authorities in England, established as such by the government of 1997 to 2010, with considerable funding being provided during the six years after the publication of *A Better Education for Children in Care* (Social Exclusion Unit, 2003), and with continued support after a change of government in 2010.

Many previous in-school and out-of-school interventions with looked-after children have concentrated on reading; many local authorities have arrangements for support in behaviour and attendance; but in a survey conducted in 2008 of 50 local authorities in England, there were none providing support in mathematics, other than for GCSE revision at age 15 or 16 (Personal communication, February 2008).

During the last ten years, there have been several initiatives aiming to raise mathematical attainment for any children having difficulties in mainstream schooling in England: for example, the Numeracy Strategy’s ‘Wave 3 booster classes’ (DfES, 2005), and the more recent *Every Child Counts* programme (Torgerson et al., 2011). Whilst these may sometimes have included children in care, there is no research to show whether, or how, these interventions have benefited looked-after children.

Children in English schools sit national tests in Mathematics and English at the end of Key Stage 2 (the end of primary school), when the majority of children are aged 11.
The results of these tests are graded from Level 1 up to Level 5, and the government currently sets a national target for the percentage of children who reach Level 4 or above (DfES, 1999). The Key Stage 2 test results at age 11 for children in care in England are consistently lower than the national average for all children. For example, in Mathematics in 2010, only 44 per cent of looked-after children reached the national ‘target’ of Level 4 or above, compared with 79 per cent for all children (DfE, 2010a). Even when compared with the results for children from backgrounds of poverty, this is low: 64 per cent of children who were in receipt of free school meals (an accepted indicator for low family income), achieved Level 4 or above in the same year (ONS, 2011).

Many of the reasons for looked-after children having difficulties in mathematics may be the same as for children who are not in care, but for each child there are also likely to be additional problems specific to children in care, which will be discussed further in the literature review. This study will aim to provide a holistic view of the difficulties that children in care face when learning mathematics in the primary years.

**The Letterbox Club: an educational initiative with looked-after children**

The Letterbox Club is an educational intervention with looked-after children that aims to raise attainment in both reading and number, by sending children parcels through the post, once a month for six months, containing reading books and number activities. The data from a national pilot in 2007-2008 showed children making good progress (Griffiths, Comber and Dymoke, 2010).

Children who took part in the Letterbox Club pilot were assessed before and after the intervention, using the Neale reading test (Neale, 1999) and bespoke mathematics assessments that I had designed (discussed further in Chapter 3). For the purposes of the evaluation of the Letterbox Club, an indication was needed of whether children seemed to be making additional progress because of the project, but no detailed analysis was made of the specific strengths or difficulties the children displayed, because the funder did not require it. Similarly, whilst it was evident that many foster carers were engaging in educational activity with their foster children, no details of this were collected.
My role as Principal Investigator for the Letterbox Club gave me a broader picture of many of the issues facing looked-after children and the adults who live or work with them, as well as raising additional questions for research. It also helped me to build positive working relationships with key staff responsible for overseeing the education of looked-after children in many local authorities across England. Issues of access to looked-after children and their carers can be very complex, and this previous contact proved helpful for my doctoral study.

Focus of research

This study aims to explore the difficulties encountered by many looked-after children when learning mathematics, in order that consideration can be given to improving the outcomes for children in the future. Children’s difficulties often become particularly evident to their teachers at the age of 7, especially in England where they are assessed at the end of Year 2 against national standards. As the Williams Report concluded (DCSF, 2008), children who ‘fall behind’, or who need to work at a slower pace, need early intervention to support them. Once they move to secondary school (which usually happens at age 11), it becomes much more difficult to help the child make progress. The focus of this study is therefore on children aged 7 to 11.

Two contexts for children’s learning will be examined: their learning at school, and their learning at home. As Alexander says:

> What happens to children at home vitally affects what happens to them at school. The roles of parents and teachers overlap, and the division of responsibility for children’s socialisation and education is blurred. The relationship of parenting to educating is subtle and multi-faceted, and demands not only close collaboration between parents/carers and teachers but also mutual understanding and respect. (Alexander, 2010, p.488).

My intention is to examine the ways in which different elements of looked-after children’s experience of learning mathematics fit together. The diagram below (Figure 1.1) encompasses the major elements that I will consider, and the arrows show links between them, with the most tenuous link, I believe, often being that between learning at home and at school.
The model of ‘mathematical proficiency’ offered by Kilpatrick, Swafford and Findell (2001), which includes the idea of ‘productive disposition’, is useful here. They describe “productive disposition” as being “the habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.” (p.5).

My experience when working with children whose attainment is low has been that children’s motivation and self-belief as learners need attention if a child is to begin to make better progress (Ahmed, 1987; Houssart, 2004); however, it is also often the case that success in learning something new will improve a child’s self-belief for future learning. The arrows on figure 1.1 show similar reciprocal relationships between other elements, which will be explored in this study.

The child’s current view of learning at school will depend not just on the quality of the teaching they are receiving now, but also on their past experience: for example, they may be very wary of answering questions, or of saying that they do not understand something, because of previous failure in the classroom (Rowland, 2000). Similarly, their past experience of learning at home may mean they do not have a positive attitude towards educational activities, including homework. Even if their carer is keen to help, a child’s antagonism or anxiety may make the carer feel they
cannot persevere. Additionally, the carer’s own experience of the education system may have been disappointing, and they may feel their own knowledge and skills are not sufficient to support the child’s learning (Wheeler and Connor, 2009; Fieler, 2010).

The study will concentrate on number, as being an aspect of mathematics seen as important by teachers, children, parents and carers. Denvir and Brown’s landmark study (1986) examined the number concepts of children aged 7 to 9 who were considered to be ‘low attainers’ in mathematics. Their longitudinal study, although conducted over twenty years ago, has considerable relevance for this study. The key aspects of number that they considered were counting, addition, subtraction and place value, and these delineate the mathematics content for my research.

Denvir and Brown also discussed issues of hierarchy (the order in which children learn things, and whether they need to understand one thing before they move on to another) and this may be especially pertinent for children with gaps in their educational experience.

I begin from a constructivist perspective (von Glasersfeld, 1995), regarding learning as a process in which children (and adults) use their experience to construct knowledge, building upon their existing knowledge. From this perspective, as Hughes, Desforges and Mitchell (2000) outline, effective teaching involves assessing learners’ existing understanding and arranging experiences that will challenge them and enable them to construct “more advanced intellectual structures” (p.14).

**Potential impact on policy and practice**

Although the main participants in this study are children in public care, any conclusions are likely to be relevant for other children with disrupted or interrupted educational experiences in mathematics: for example, travellers, refugees and children with periods of absence from school through illness or exclusion. As with previous studies on improving mathematics teaching for low-attaining pupils (for example Ahmed, 1987), some of the findings may be useful across a wider spectrum of attainment than just for those who find mathematics difficult.
Educational achievement affects the life chances of any child or adult. Alexander’s summary of recommendations included ‘intervene quickly and effectively to help disadvantaged and vulnerable children’ (Alexander, 2010, p.510), and current and recent UK government policy shows considerable agreement with that view. It is intended that this study will contribute to a greater understanding of the causes and nature of looked-after children’s difficulties in mathematics, and hence to finding potential improvements for practice and policy in the future.
2. LITERATURE REVIEW

The study draws upon literature in three main fields. The first concerns children in care, and will provide background information about the circumstances of this group of children, and about research relating to educational achievement. Secondly, I will examine low attainment in mathematics and difficulties in learning mathematics. Since my main focus will be on number, I will consider children’s difficulties in the context of what is known about children’s learning in counting, place value, addition and subtraction. Thirdly, I will consider research into the respective contributions of school and family to children’s learning. I will conclude by outlining my research questions in the light of this review of the literature.

The educational attainment of looked-after children

The low level of educational attainment of many looked-after children is a major concern of central government in the United Kingdom, and many local authorities are exploring ways of providing educational support for these children in school and elsewhere.

At any one time, about 65,000 children are in care in England (about 0.5 per cent of all children under 18), of whom about 40 per cent are aged 10 or under. Most children are placed in families (Cairns and Stanway, 2004). During any year, some children will come into care (either with a care order, or under a voluntary agreement) and some leave the care system (for example, because they are adopted, return to their family or are deemed old enough to live independently). In the year ending 31st March 2011, 27,310 children began to be looked after, and 26,830 ceased to be in care (DfE, 2011a). For some children, being in care may be a short, single interlude; some will have several periods in care; for others, once in care they will not return to their birth family – but this may not be known for some time.

Many studies have established that the educational standards achieved by children who are in public care in the UK are low, and that education has not been given sufficient priority in the past (Jackson, 1987; Jackson, 1994; DoH/SSI/Ofsted, 1997; Fletcher-Campbell and Archer, 2003). The first legislation to include a specific duty for every local authority in England in its role as ‘corporate parent’, to promote the
educational achievement of looked-after children, was the Children Act 2004 (DfES, 2004).

Statistics about the educational performance of looked-after children can be difficult to obtain, but have improved in quantity and quality in England since 1999, as local authorities have been required to report annually to the Department for Education. National comparisons are made using figures that only count children who have been in care continuously for at least 12 months, which therefore discounts some of the most unsettled and poorly-performing children. The manner of reporting looked-after children’s attainment in national tests has been amended several times, but data for the last five years show little change in the overall position, with the ‘attainment gap’ (i.e. the difference between the percentage of all children, and the percentage of looked-after children, reaching a national target) remaining at about the same level. Table 2.1 shows the results for 2010 for the end of Key Stage 2 (age 11), which are typical for the five year period 2006 to 2010. I have included a column of results for children registered for free school meals (a proxy indicator of poverty), as these children are likely to be from similar socio-economic circumstances as looked-after children (Davies and Ward, 2012).

Table 2.1: Percentage of children in each category reaching Level 4 or above in Key Stage 2 National Curriculum assessments for English and Mathematics in England, 2010

<table>
<thead>
<tr>
<th>Subject</th>
<th>All children (a)</th>
<th>Children eligible for Free School Meals</th>
<th>Looked-after children (b)</th>
<th>Attainment gap (a-b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>80</td>
<td>64</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Mathematics</td>
<td>79</td>
<td>64</td>
<td>44</td>
<td>35</td>
</tr>
<tr>
<td>English and Mathematics</td>
<td>74</td>
<td>-</td>
<td>36</td>
<td>38</td>
</tr>
</tbody>
</table>

Compiled from DfE (2010a) and ONS (2011)

The ‘attainment gap’ is wider by the end of Key Stage 4 (age 16) when only 12 per cent of children who had been in care for a year or more got five or more GCSEs
(including English and mathematics) graded A* to C, compared with 53 per cent of all Year 11 pupils (DfE, 2010). Few looked-after children go on to university; figures are hard to estimate, but it is probably less than 2 per cent, compared to nearly 50 per cent of all children (DBIS, 2011).

There are considerable differences in outcomes for children in care from different local authorities. This has become more apparent since November 2011, when the DfE introduced annual performance tables for 15 ‘indicators’ in four groups, covering information about placements, adoption, educational attainment and leaving care. The indicators for attainment use a three-year rolling average; from 2008 to 2010, the percentage of children who achieved at least Level 4 at Key Stage 2 in both English and mathematics varied between authorities from 17 per cent to 60 per cent, with an average of 35 per cent, across 122 local authorities in England (DfE, 2011b). This unevenness in practice is noted by Brodie (2010) as being evident within local authorities as well as between them, as there is a ‘high level of variation within individual journeys through the care system’ (Brodie, 2010, p.2).

Ofsted (2011a), the Office for Standards in Education, Children’s Services and Skills, has also commented on the variation in outcomes for looked-after children from one local authority to another:

> It is not variations in the level of demand or the intensity of financial pressures that distinguish between those authorities that are performing well and those authorities that are performing poorly: overwhelmingly it is the quality of leadership, management and partnership working that makes the difference. (p.120).

**Reasons for underachievement**

Comparing the attainment of looked-after children with averages for the country as a whole does risk the implication that the care system is responsible for children’s failure, and it would be useful to be able to compare the outcomes for children taken into care with those for children who live in similar circumstances of social deprivation (Hannon, Wood and Bazalgette, 2010). A comparison between those in care and children eligible for free school meals still shows a deficit in attainment for those in care, as is shown in Table 2.1 above, but this can currently only be observed
at an aggregate national level of analysis. From 2010, the national data returns for looked-after children have been linked for individual children to a system of Unique Pupil Numbers (UPNs), which may provide the opportunity in future to examine these issues of the interplay with social deprivation more carefully.

Issues affecting looked-after children, in addition to socio-economic factors that contribute to low attainment for many children from similar backgrounds to those who come into care, were summarised in a report from the Social Exclusion Unit (a government department). They listed five key problems:

(i) too many young people’s lives are characterised by instability;

(ii) young people in care spend too much time out of school or other place of learning;

(iii) children do not have sufficient help with their education if they get behind;

(iv) carers are not expected or equipped, to provide sufficient support and encouragement at home for learning and development; and

(v) children in care need more help with their emotional, mental or physical health and well-being. (Social Exclusion Unit, 2003, pp.3-4).

These five reasons may be particularly relevant to difficulties in mathematics. For example, gaps in schooling are likely to be the experience of a child in care who moves families and often schools at the same time, or who is waiting for a school place, or who is excluded from school. Even if a child in care is attending school regularly, there may be periods of time when their attention to school work is poor, because of their family and personal situation. Particularly in more hierarchical areas of mathematics (and therefore particularly in number) these gaps could be the source of a succession of difficulties, exacerbated by insufficient remedial support.

Davies and Ward (2012) acknowledge concerns about the poor outcomes for children in care, in their review of 15 government-funded research projects from 1997 to 2011, but stress that research demonstrates that:

… taken as a whole, when compared with their home circumstances, care is often a positive alternative for children and young people who have been maltreated. However, a major problem is that, though it may offer a safer and
more nurturing environment, care can, as yet, rarely compensate for past disadvantages (pp.146-147, my emphasis).

The need for compensatory support has long been recognised. For example, Heath, Colton and Aldgate (1994) observed that even in long-term foster placements, educational progress often seemed slow; they concluded that this was likely to be because of the effects of neglect and abuse before children came into care, and indicated a need for exceptional educational intervention. Similarly, Stein (2006) says, “any association between care and outcomes will be flawed unless it recognises the impact of … pre-care experiences” (p.6).

**Statements of Special Educational Needs**

One way in which children who have ‘learning difficulties’ could be given additional support has been through a ‘statement of special educational needs’, indicating that a formal process has been undertaken to provide them with additional support in school. A high proportion of children in care in England have a ‘statement’: 25 per cent, compared with less than 3 per cent of children in the overall school population (DfE 2010a and 2010b). This figure may be an underestimate of the number of children in care who would benefit from a ‘statement’: Jackson and McParlin (2006) point out that frequent changes of school and changes in the allocated educational psychologist (who is crucial to the process) can mean that children in care wait much longer to be assessed. This is not unique to the UK: Trout, Hagaman, Casey, Reid and Epstein (2008) similarly reported that in the USA, “multiple placements may interrupt the special education placement process, and consequently … services may not be provided.” (p.980).

Additional difficulties in the identification of children with special educational needs were raised by Croll (2002), who reported that there may be considerable levels of under-reporting of special educational needs in schools with high levels of social deprivation. In terms of reading levels, his survey showed that teachers were judging special educational needs with reference to achievement levels in their school:

In the schools serving areas of least deprivation, children described as having learning difficulties were, on average, less than one year behind their chronological age in their reading achievements. In contrast, in schools
serving areas of the greatest deprivation, children described as having learning
difficulties were, on average, two and a third years behind. (Croll, 2002, p.50)

For looked-after children, many of whom are placed in schools serving areas with
high levels of deprivation (DfE 2011b), this could be a further impediment to any
difficulties being recognised. Anders et al (2011), using the extensive database from
the EPPE (Effective Pre-school and Primary Education) project (Sylva, Melhuish,
Sammons, Siraj-Blatchford, and Taggart, 2010), examined the identification of
special educational needs (SEN) at age 10. They raise concern about teacher
assessment, but in relation to possible over-identification of special educational needs,
as well as under-identification. Their analysis indicates that:

teachers’ judgements of SEN are not only related to actual attainment levels of
children and suggest that some groups of children are disproportionately over-
represented. This has important equity implications since SEN identification
may affect children and parents’ perceptions or expectations of a child and
their future educational trajectories. (p.432).

Anders et al are cautious about the reasons for this over-representation, which occurs,
for example, for boys and for children young for their year; however, they suggest
that perhaps teachers may “generalize their overall impression of certain groups of
pupils” (p.431) and that “It may be that boys’ behaviour in class also affects teachers’
perceptions of whether they have SEN” (pp.431-432).

For the general population, the most prevalent reason for having a statement is
‘moderate learning difficulty’ (24 per cent in 2009), followed by ‘behaviour,
emotional and social difficulties’ (23 per cent). However, for children in care, the key
issue is more likely to be ‘behaviour, emotional and social difficulties’ (45 per cent),
followed by ‘moderate learning difficulty’ (20 per cent) (DfE 2010a and 2010b).
Brodie’s review of research into the education of looked-after children comments that
educational issues need to be considered alongside emotional and behavioural health,
and notes the importance of settled, safe accommodation (Brodie, 2010).

Trauma, loss and attachment disorders

The diagnosis of emotional and behavioural disorders amongst children in public care
is another area, alongside educational attainment, that has received increased attention
during the last decade. Meltzer, Corbin, Gatward, Goodman and Ford (2003) reported that 45 per cent of children aged 5 to 17 in their survey of looked-after children in England were assessed as having mental health problems – compared to 10 per cent of the general population. Similarly, in the United States, Pecora et al. (2010) found that 45.5 per cent of adult alumni from foster care (i.e. those who had been in care when younger) had a current mental health diagnosis, with the most common diagnosis being post-traumatic stress disorder (20 per cent of alumni, compared to 4 per cent of the general population). The impact of these poor levels of mental health on children’s capacity within school had not previously been appreciated – but the development of effective mental health services for looked-after children in England has become a greater priority in many local areas. (Callaghan, Young, Richards and Vostanis, 2003).

Poor behaviour in the classroom will affect a child’s ability to learn effectively, and may affect the teacher’s view of the child and perhaps their willingness to help the child make progress. For some looked-after children, normal disciplinary strategies are ineffective: O’Neill, Guenette and Kitchenham (2010) suggest that teachers need to know more about the effects of childhood trauma and attachment disorders, so that they can “identify what types of behaviours children can control and those they cannot.” (p.195).

Children’s responses to trauma and loss (including bereavement) commonly include anxiety, difficulty in concentrating, and a low sense of self-efficacy (i.e. a lack of belief that they could effect change or influence events) (Worden, 1996). The latter, in turn, may be expressed as aggressive and angry behaviour, or withdrawal and depression.

As well as their experience of loss, the child who comes into the public care system is likely to have experienced severe neglect and sometimes direct ill-treatment, sometimes over a considerable period of time before it comes to any professional’s notice, and sometimes continuing whilst efforts are made to improve a birth family’s functioning (Davies and Ward, 2012). The decision to take a child into care is never taken lightly; as Davies and Ward comment, “…parents are given numerous chances to demonstrate their capacity to look after a child; if these efforts prove unsuccessful they delay the progress of a case to the detriment of children’s welfare.” (p.146).
Attachment disorders are common amongst children taken into care after the age of three months (Golding, 2008), and may result in children having difficulty in forming positive relationships with peers, teachers and other adults. The most common pattern is of secure attachment, when a child grows up with caregivers (usually parents) who respond positively to a child’s needs, so that children know they are loved, and develop “raised levels of resilience based on high self esteem, self-efficacy and coping capacity” (Howe, 2006, p.128).

In contrast, Howe notes the difficulties encountered by children who experience avoidant, ambivalent or disorganised attachment in their birth families, adapting their behaviour to the pattern of parenting with which they are presented. Hence avoidant children cope by not becoming attached or close to anyone, because their carers have been anxious or rejecting when any emotional demands have been made on them; ambivalent children are demanding and anxious to be noticed, yet never reassured, because their carers have been poor at recognising their children’s needs and inconsistent in their responses. Children with disorganised attachment are those “…whose carers are the direct cause of their distress and fear. … Within such caregiving environments, children find it difficult to organise an attachment strategy to increase the carer’s availability.” (Howe, 2006, pp.128-129).

Howe noted that new carers are likely to need extensive support. Children who have not experienced a secure attachment with responsive parents, will have developed strategies to cope with their previous situation, which they continue to use when placed in a more normal and potentially helpful environment – often pushing the adults around them into responding in the manner the children had experienced previously. This may adversely affect their relationships and behaviour both in their foster home and at school, and hence their capacity to learn.

Whilst foster carers will have had some preparatory professional development to make them aware of potential difficulties, teachers and other adults in school may not have had this. In addition, being aware of the traumatic situations that children in care are coping with, may in itself be a source of stress for a teacher; there is usually no provision for ‘supervision’ (i.e. the chance for the teacher to talk through their reactions or actions with a more senior colleague), unlike the arrangements for social workers and many people working in the mental health services (Webb and Vulliamy, 2002).
Educational interventions for all children with low attainment

The literature examining educational interventions with looked-after children is relatively sparse. Looked-after children are, of course, part of the general school population, so they may be able to access those interventions offered to all children whose attainment is low. In England in the last ten years, this may have included ‘booster classes’, tuition in the school holidays, or other initiatives promoted through the National Numeracy Strategy or Primary Strategy (DfES, 2005 and 2006). For children of secondary age, additional support has often been concentrated on those who are close to achieving the national target at age 16 of five GCSEs at grades C and above (Gillborn and Youdell, 2000). Similarly, with a target of having as many children as possible reaching National Curriculum Level 4 by age 11, primary school initiatives were often restricted to children on the borderline between Levels 3 and 4, and not to those at lower levels. Gross (2007) discusses the impact of some of these interventions, notes the need for further research, but reports some evidence of children’s attitude to mathematics becoming more positive. However, Ruthven (2011) reports otherwise on the effects of the National Strategies, using data from the Trends in International Mathematics and Science Study (TIMSS). This analysis compared English pupils’ achievement and attitude to mathematics in 1999 and in 2007, and showed improvements in achievement, but “a very substantial fall in [positive] attitude between the two cohorts, markedly greater than the international trend” (Ruthven, 2011, p.429).

Adult support and the child’s productive disposition

The idea of a productive disposition towards learning mathematics was considered in Chapter One; Kilpatrick, Swafford and Findell (2001) conclude that a child’s belief in “diligence and one’s own efficacy” (p.5) is a necessary element of a child’s developing mathematical proficiency. However, for a child who finds mathematics difficult, there can be tension between adults’ efforts to support them, and the child’s opportunities to act independently.

One frequently-provided intervention for vulnerable children is the support of a teaching assistant (TA). A review of research conducted by Alborz, Pearson, Farrell and Howes (2009) provided a mixed view of the effectiveness of these staff: seven of
the 14 studies they reviewed reported that “over reliance on TA support, or too much support, hindered pupil interaction with peers and teachers, undermined opportunities for self-determination, or led to pupils feeling stigmatised” (p.15). Four studies reported a positive impact: this was most likely to be achieved when TAs were trained to deliver specific interventions to individuals and small groups, and where the TA promoted pupil self-determination and social interaction. However, Muijs and Reynolds’ (2003) study of using learning support assistants for mathematics, suggested that the most influential factor in any classroom was the effectiveness of the teacher, not the TA, in directing the child’s work.

Blatchford, Russell and Webster (2012), from their study of the impact of TAs, come to a similar conclusion. They point out that paraprofessionals employed in other fields, such as health, are more likely to take on routine tasks, leaving the most complex cases to more qualified staff. Supporting pupils in education requires a process of learning more about the pupil, and developing a suitable pedagogical approach – which is far from routine. They note that the use of TAs is especially problematic when they are given charge of low-attaining pupils – “when there is a separation of pupil from the teacher and the curriculum” (p.142).

Of course, the fact that some children ‘learn dependence’ in school, to the detriment of the child’s progress and understanding, can be true of ‘mainstream’ pupils as well as those with special educational needs, and may be fostered unwittingly not just by TAs but also by teachers (Hendy and Whitebread, 2000).

Dweck and Leggett (1988) described two major patterns of behaviour: the mastery-oriented and helpless patterns, and suggested that, just as people may have differing views of ‘intelligence’ as either a fixed or malleable quality, this may be mirrored in their beliefs about personality, as fixed or incremental. When given a problem to solve, those who saw themselves as helpless were likely to attribute failure to personal inadequacy, to express negative feelings towards any task, to say they were bored and wanted to stop, or to be anxious and keen to divert attention to other activity. Holt, in his influential book How children fail, described children who seem to decide that “if they can’t have total success, their next-best bet is to have total failure” (Holt, 1984, p.109).
Teachers can create difficulties in pupils’ affect and motivation, but they can also exert a positive influence over what a child wants to do, as well as how they could go about it (Hannula, 2006). Dehaene (2011) asserts that while neuroscience gives us new information about how people perform mathematically (and shows that connections within the brain grow with use), emotions still have a place when we examine cerebral function: “If we are to understand how mathematics can become the object of so much passion or hatred, we have to grant as much attention to the syntax of emotions as to the computations of reason” (p.218).

One element of creating a positive attitude towards learning is that the teacher encourages children to be interested in a task, asking questions and promoting discussion about the topic in hand. Sadly, there is some evidence that lower-attaining children are less likely to experience this than their higher-achieving peers. The second ORACLE study of practice in primary classrooms (Galton, Hargreaves, Comber, Wall and Pell, 1999) found that task-related interaction between high-achieving children and their teacher was around 77% in their study, whereas for low-achievers it was lower, at 62% - with non-task-related, routine interactions taking up the remaining 38%.

**Educational interventions for children in care**

Outside of school, many educational interventions specifically for children in care have concentrated on reading. For example, the ‘PRAISE’ project (Menmuir, 1994) and ‘Looking After Literacy’ (Wolfendale and Bryans, 2004) considered the benefits of children and young people owning their own books, and looked for ways of encouraging them to read with others. Wolfendale and Bryans’ evaluation suggested that the children who made the most progress on ‘Looking After Literacy’ were those who recognised the opportunities for self-improvement that the project offered – which links with the idea of ‘productive disposition’, discussed above.

From 2003, central government funding enabled local authorities to set up dedicated teams to support the education of looked-after children in their areas. In many cases they initially concentrated on children in Year 11, and sometimes in Year 10, leading to GCSE public examinations.
Admission to a “good school” was recognised as particularly important for looked-after children in the Government White Paper *Care Matters: Time for Change* (DfES 2007), which outlined statutory changes in school admission arrangements, to prioritise children in care even if a school was oversubscribed. The 2007 White Paper introduced four further strategies aiming to raise educational achievement, all of which were endorsed by the Department for Education in guidance issued after the 2010 change of government (DfE, 2011c):

- The recommendation that a “Virtual School Head” (VSH) should be appointed for each local authority: a senior member of staff who would oversee the education of every looked-after child from their area, liaising with the schools they attended. This followed a positive evaluation of the work of the VSH by Berridge, Henry, Jackson and Turney (2009).

- A statutory obligation to have a Designated Teacher for looked-after children in all maintained schools and academies. This teacher would oversee all looked-after children in their school.

- A recommendation that additional resources should be provided by the local authority to help children whose attainment had fallen behind.

- A recommendation that one-to-one tuition should be provided where needed in Key Stage 2 and Year 7 (i.e. for children aged 7 to 12). This followed a view that private tutoring was increasingly common amongst children living with their birth families, and should therefore be available to looked-after children – although research evidence is somewhat mixed about whether tutoring is effective (Ireson, 2004).

The funding for the recommendations made here was limited, as for any element of public service. Natriello, McDill and Pallas (1990) point out one likely result of this:

> Even those programs that are effective must often dilute the intensity of the social and educational services they provide, in order to serve as many children and families as possible. We believe that a primary explanation for why a great many well-intentioned and plausible educational programs for the disadvantaged have only small positive impacts is that they are not intensive enough (pp.191-192).
The relationship between government policy and classroom practice is far from simple, even when sufficient financial support is available, and was examined by Wang, Haertel and Walburg (1993), aiming to inform educational policies and practices in the United States. They concluded that “Distal variables, like state, district and school level policy and demographics, have little influence on school learning” (p.276), and that “…practitioners and teacher educators … must attend to proximal variables such as: (a) psychological variables, especially metacognition and cognition; (b) classroom instruction and management, and student and teacher social and academic interactions; and (c) the home environment” (p.278). They note that classroom instruction should include the provision of engaging and challenging work, with sufficient time on task.

The more recent experience in England of government policy establishing ‘high-stakes testing’, where aggregated test results for any school have been used both as part of the national inspection process and in ‘league tables’, contradicts the view that policy has little or no impact on school learning – but this impact may not always be what was intended. In this case, policy that aimed to raise the achievement of all children has resulted in significant changes in classroom practice, for example with increased time spent on ‘practising for the tests’ rather than learning for understanding, and with a focus on ‘borderline’ children, who are close to reaching national targets, rather than the lowest-attaining pupils (Mansell, 2007).

Instability and transitions

Instability is a feature of the lives of many looked-after children in the UK; for example, in the year to March 2010, 11% of looked-after children in England had lived in three or more placements during that year (DfE, 2011b). Changes of home, school and social worker are relatively common, and have been cited by children as having an adverse impact on their educational progress (Harker, Dobel-Ober, Lawrence, Berridge and Sinclair, 2003).

School mobility in itself may not be the cause of educational underachievement. Children whose parents are in the armed forces are more likely than their peers to change schools frequently, and at non-standard times, but on average they perform well, and “many of them become very adaptable and integrate readily into new
circumstances” (DfE, 2010c, p.5). Strand and Demie’s study (2006) showed that whilst pupil mobility was strongly associated with low attainment in the key stage tests taken at age 11 in England, there was not a causal relationship; other variables, including socio-economic disadvantage, were the likely cause of both low attainment and high mobility. They did, however, note the need to attend to emotional, social and academic issues when pupils move schools at non-standard times. Heinlein and Shinn (2000) found that early mobility (i.e. children moving school two or more times before Grade 3, ages 8 to 9 in the USA) did seem to be harmful, whereas later mobility, in grades 4 to 6, was not, once prior attainment was taken into account. They argue that this could be because “the early years of elementary school are a particularly critical period for attaining a foundation in basic skills, so that disruptions during this time have lasting effects” (p.356).

Normal, planned transitions may be a cause of difficulty for children in care, and are a focus for additional support for the mainstream school population (Anderson, Jacobs, Schramm and Splittgerber, 2000). The transition from one class teacher to another, common to most children in primary education, may be made more difficult by the length of the summer holiday: there is some evidence that children’s performance in reading, spelling and in computational aspects of mathematics can suffer over this period (Cooper, Nye, Charlton, Lindsay and Greenhouse, 1996; Galton, Gray and Ruddock, 2003). In addition, many looked-after children find any change difficult to cope with because of the distress and uncertainty that previous changes may have signified, and a change of teacher can cause great anxiety. In schools that are having difficulty in appointing permanent staff, this may be exacerbated when children have a succession of ‘supply’ (substitute) teachers, resulting in disorganised lessons (Siraj-Blatchford et al., 2011). The concept of ‘resilience’ – the capacity to cope with change, stress and to retain positive views about the future- is important here, and educational achievement itself can be a protective factor which helps build children’s resilience (Bostock, 2004; Gilligan, 2006).

The skills of professionals who work with children in care

Zeller and Koengeter (2012) describe the role of the social pedagogue, a professional who combines social work, therapeutic and educational skills to work with children in
care in Germany and Denmark, and agree that school success can increase a child’s well-being. They note that ‘biographical learning’ is important for school success: that is, children being given sustained support to discuss their earlier lives, to come to terms with their situation, and to establish good relationships with their peers and the adults around them. They stress the need to encourage the child to pursue education even if it is interrupted by ‘biographical crises’, and to extend formal and informal educational support beyond the age of 18, recognising that many children in care will need a longer period of time to complete their education.

Brodie (2010) expresses concern about the skills of ‘front-line professionals’ in the UK, and notes the “unevenness in the way in which children experience support for their education while being looked after” (p.34), with a consequent need for improved professional development. Hayden (2005) identifies similar problems in her exploration of the effectiveness of Personal Education Plans (PEPs) for children in care; for the social workers involved, “a key issue was the need to increase their confidence in dealing with the education system” (p.351).

The relatively new role of Independent Reviewing Officers (IROs) in each local authority includes an expectation that an IRO will review each child’s PEP every six months (DCSF, 2010), with the aim of improving the focus and effectiveness of the PEP as a tool to raise achievement. It is currently unclear as to the curriculum advice that is given in an ‘average’ PEP; research so far (as exemplified by Hayden (2005), above) has concentrated on inter-professional relationships and the contribution that the child may make to their PEP, rather than, for example, a PEP’s specific recommendations to improve a child’s progress in reading or mathematics.

The Letterbox Club (see Chapter One) seems to be a unique intervention in offering support in mathematics outside of school for looked-after children in Key Stage 2 (ages 7 to 11). A brief survey of the 50 local authorities taking part in the Letterbox Club in 2008 (undertaken in person at induction meetings, February and March 2008, where staff from each authority were present) elicited no other examples of mathematics support in or out of school for Key Stages 1, 2 or 3 (ages 5 to 14) for looked-after children. One local authority lead teacher told me: “We have more expertise available in the teaching of reading – our special needs team are all reading specialists. Maths is harder to tackle.” All the authorities were offering some support in reading where needed; many had arrangements for support in behaviour and
attendance; some looked at ICT (for example, by providing computers for home use). Mathematics had not been seen as a priority, or local authority staff had simply not been able to find ways of providing support.

**Low attainment in mathematics**

The complex mixture of explanations discussed in the literature of low attainment in mathematics includes gaps in schooling, problems caused by pupils being given work that is not well-matched to their current level of understanding, poor teaching, a lack of effective remedial support (including from home), and children’s fear, lack of motivation or disengagement from their work in mathematics. (Ahmed, 1987; Haylock, 1991; El-Naggar, 2002; Dowker, 2004; Houssart, 2004; Watson, 2005; Gross, 2007).

Allardice and Ginsburg (1983) concluded that some children whose attainment is low may actually be operating as effectively as they can, within their own cognitive capabilities, but that the majority of children with low attainment are likely to be held back by educational factors, including poor teaching, exemplified by:

- the failure to connect new material to what children already understand;
- teaching some children too quickly and others too slowly; and using textbooks that are confusing and mathematically inaccurate. Furthermore, it is well known that many elementary school teachers are themselves uncomfortable with mathematics and feel they can do a better job at teaching reading than arithmetic. (p.330)

The issue of what makes someone an effective teacher of mathematics was considered by Askew, Brown, Rhodes, Johnson and Wiliam (1997); they outlined three broad orientations of teachers (transmission, discovery and connectionist) of which ‘connectionist’ was the most effective in their study:

The primary belief here is that teaching mathematics is based on dialogue between teacher and pupils, so that teachers better understand the pupils’ thinking and the pupils can gain access to the teacher’s mathematical knowledge. This belief manifested itself in practice through extensive use of focussed discussion to help pupils explore efficient strategies and interpret the meaning of mathematical problems. (p.28)
This focus on the importance of the teacher exploring the child’s understanding alongside the child was considered further by Black and Wiliam (1998) in their seminal work on assessment for learning, promoting the use of formative assessment as a key element in raising achievement. They acknowledged that assessment may also be time-consuming and complex – with a consequent need for professional development to help teachers embed it in their practice.

The pressures of a perceived lack of time with a class-full of pupils, national tests and targets, and a lack of confidence or expertise amongst primary teachers, may lead to an increased likelihood of teachers favouring ‘transmission’ methods: for example, teaching algorithms (methods or rules for reaching an answer, especially in arithmetic) without being concerned about understanding. This is not a new phenomenon, and creates difficulties for children when they memorise algorithms wrongly. Tilton (1947) noted the frequency of ‘systematic errors’, where a child has learnt rules for carrying out standard methods, say, for subtraction, but has learnt them incorrectly:

If the youngsters who have such incorrect rules are to be helped, the teacher should know the child’s rule, because the child’s need is just as much to unlearn his incorrect rule as it is to learn the correct rule. To work in ignorance of his rule is to give him a feeling of confusion. (pp.84-85).

Tilton emphasised the need for the teaching of rules to be based on children’s understanding of the number system, built through concrete experience, and commented that even small amounts of individual exploration with their teacher of a child’s thinking about their methods could help resolve problems. This kind of exploration could also avoid the accumulating problems when a teacher attributes a child’s mistakes to carelessness or forgetfulness, rather than a fundamental misunderstanding of a process or concept (Ryan and Williams, 2007).

The National Numeracy Strategy (DfEE, 1999) provided the impetus for many primary teachers in England to consider ways of improving mathematics teaching, extending debate about which algorithms are the best ones to teach, how these can build upon children’s mental methods and non-standard pencil and paper methods, and how the increasing availability of calculators might change classroom practice (Anghileri, 2000; Ruthven, 1998; Thompson, 1997a). Brown and Millett (2003) used
data from the Leverhulme Numeracy Research Programme, which ran from 1997 to 2002, to examine children’s performance in number over this period, and concluded that whilst the Strategy had been successful in raising the achievement of most children (and especially for the ‘middle 50%’), standards were lower among the lowest 5%:

…low attaining pupils derive little benefit from the whole-class teaching episodes, and the topic of the lesson does not always correspond to their areas of greatest need…

The result is therefore that attainment has become further polarised. When we looked at the progress of each cohort on particular [test] items it became clear that it takes between five and seven years between the time when the highest attaining children can give a correct response and when almost all children can. (p.202)

It seems that the ‘seven year difference’ discussed in the Cockcroft Report persists: “By this we mean that, whereas an ‘average’ child can perform [a] task at age 11 but not at age 10, there are some 14 year olds who cannot do it and some 7 year olds who can” (DES, 1982, paragraph 342).

Kyriacou (2005) similarly concluded that the NNS had disadvantaged low attaining pupils, in the systematic review undertaken by the Evidence for Policy and Practice Information and Coordinating Centre (EPPI Centre), exploring the impact of daily mathematics lessons on children’s confidence and competence in early mathematics. He commented that the NNS framework seemed over-ambitious in the speed at which new topics were implemented, and that “the objectives-led approach may be negatively affecting the confidence of lower-attaining pupils” (p.178).

Setting and ability grouping

The increased use of whole class teaching advocated by the Numeracy Strategy (alongside recommendations from the DfES and Ofsted) encouraged many more primary schools to consider setting (i.e. organising teaching in classes grouped by attainment), particularly where there were two or more classes in a year group. This was previously common in secondary schools, but had not been as prevalent with younger children (Hallam, Ireson and Davies, 2004). Several studies have found that
setting and ability grouping can produce some advantage for pupils in the ‘top group’, but pupils in a ‘low-ability’ class or group tend to achieve less than those in mixed ability classes. They may have less effective teachers, a restricted and less interesting curriculum, and be demotivated (Davies, Hallam and Ireson, 2003; Kutnick, P., Sebba, J., Blatchford, P., Galton, M. and Thorp, J., 2005; Nunes, Bryant, Sylva and Barros, 2009). Boaler (2009) pointed out that setting is more common in England at a younger age than in many other countries where performance in mathematics is better. Dunne et al. (2007) commented on the high number of pupils placed in the wrong ‘ability’ groups: their survey and case study data indicated that pupils from lower socio-economic backgrounds had a higher probability of being placed in lower sets, irrespective of previous attainment, and teachers used ‘behaviour’ as a consideration when placing pupils in sets. Once placed in a low set, pupils were unlikely to ‘move up’.

The implications for low-attaining children’s social development and their relationships with peers are important areas of consideration, when mathematics and literacy are in setted groups, and take a high proportion of classroom time. As Howe (2010) comments, “The formal subgroups that children are assigned to for educational purposes bear upon the nature of their informal arrangements” (p.184). Looked-after children who have moved schools, and those who have moved placement and are travelling a long distance to school (and therefore cannot as easily make friends outside school), may particularly need support in building positive friendships, and it may be difficult to do this within small ‘bottom sets’.

*Individual difficulties in arithmetic*

Whether in setted groups or in whole-class situations, the opportunity to spend time one-to-one with a child who needs additional help in mathematics may seem very desirable, but be difficult to achieve. Dowker’s (2004) review of research into children with mathematical difficulties, carried out for the DfES, looked at studies published between 1926 and 2004, including that of Tilton (above), and concluded that small amounts of individual support, well-targeted and as early as possible, can be very effective for many children in reducing their difficulties in arithmetic. Dowker points out that arithmetical ability comprises many different aspects, and
difficulties in arithmetic may be very different in different children; for example, some may have difficulty in memorising number facts, others in applying what they know. Gervasoni and Sullivan (2007), working in Australia, also stress the importance of recognising the complexity of arithmetic difficulties; Houssart (2007) notes that arithmetical capacity may not be fixed and easily assessed, but can vary from day to day amongst children exhibiting difficulties.

Two individualized intervention programmes being used in England with children aged 6 and 7, Mathematics Recovery (Willey, Holliday and Martland, 2007) and Numeracy Recovery (Dowker, 2001), were compared by Dowker. Both programmes concentrated on number:

> The Mathematics Recovery programme places more emphasis on counting and number representation, and the Numeracy Recovery programme on estimation and derived fact strategy use. From a more theoretical point of view, the Mathematics Recovery programme places greater emphasis on broad developmental stages, while the Numeracy Recovery programme treats mathematical development, to a greater extent, as involving potentially independent, separately-developing skills and processes. (Dowker, 2004, p.35)

This issue of ‘broad developmental stages’ was examined by Denvir and Brown in their important longitudinal study (1986) working with children aged 7 to 9, which outlined a structure for examining achievement in number, using a diagnostic assessment instrument, and then using teaching activities to extend low-attaining children’s understanding of number concepts. The aspects they considered were counting, addition, subtraction and place value, using children’s responses to organise items into a broad hierarchy of skills.

Denvir and Brown used 47 items of assessment, which were listed in order of difficulty after using them with the children. To exemplify the range covered, the two found to be most difficult were

Mentally carries out two digit ‘take away’ with regrouping;
Uses multiplication facts to solve a ‘sharing’ word problem.

and the items children found easiest were

Compares collections and states whether equal;
Can say numbers in correct sequence to 20, can solve addition and take away by direct physical modelling;

Makes 1:1 correspondence. (p.30)

There was no direct hierarchy evident in the 47 individual items (where every child had the same ranking of facility for every item). However, Denvir and Brown were able to group the items into seven ‘levels’:

When each of the skills was ordered according to facility and each of the pupils ordered by overall raw score it was possible to group the skills into ‘levels’ defined by a particular range of facility so that every pupil who had succeeded in 2/3 of the skills at any level had succeeded in 2/3 of the skills at every preceding level. (pp.29-31)

Items that match some of Denvir and Brown’s list of skills were used in this study, and are described in Chapter 3.

Some of the methods used (albeit wrongly) by the children in Denvir and Brown’s study reflect the standard algorithms taught to children in most English primary schools in the 1980s, and may be less likely to be evident today, as alternative methods have been more prevalent, following the guidance of the National Numeracy Strategy (DfEE, 1999). Some children may use ‘compensatory strategies’: Gifford (2006) discussed the use of a calculator for children who have difficulty in using other standard methods for calculation, and endorses the value of contextualised problem-solving, based on a Realistic Mathematics Education approach (Fosnot and Dolk, 2001; van den Heuvel-Panhuizen, 2005).

The enquiry into primary mathematics teaching chaired by Williams (DCSF, 2008) gave additional impetus to consideration of early intervention for children in England who find mathematics difficult, especially during Year 2 (ages 6 and 7). The range of proposals that was examined for a national remedial programme included interventions using practical equipment (such as Numicon: Wing, 2001) and others with a strong structure for individual coaching. All put a focus on counting practice as a means of developing children’s ‘feel’ for the number system. The programme that was instituted, ‘Every Child Counts’, was evaluated by Torgerson et al. (2011), and found to be effective but very expensive, because it included 30 minute daily lessons one-to-one for 12 weeks for the lowest-achieving 5 per cent of children in Year 2,
working with a specialist ‘Numbers Count’ teacher. Many of the elements included in the programme were valuable:

- The programme emphasised that the ‘first teaching’ offered to a child (i.e. in their main mathematics lessons) must be of a good quality, as a remedial or ‘catch-up’ programme should not be compensating for current poor teaching.

- The programme included a comprehensive assessment of each child’s strengths and difficulties, and their individual tuition programme was tailored to their needs, with an emphasis on enjoyment, motivation and building confidence.

- Parents and carers were involved wherever possible, to give encouragement to their child, or to carry out additional practice or activities.

A high proportion (over 40%) of the children involved in ‘Numbers Count’ were eligible for free school meals and it is likely that the intervention served some looked-after children, but separate information about them is not available.

Gifford and Rockliffe’s (2012) review of a remedial mathematics programme, developed by a centre for children with dyslexia, identified a similar list of features to those in the ‘Numbers Count’ programme. These included detailed assessment, targeted teaching content, small group or one-to-one teaching, using a multi-sensory approach and positive teacher expectations.

Good practice in mathematics teaching is discussed in two reports from Ofsted, both noting the importance of swift intervention to support children having difficulties. This can happen through individual help, from the class teacher or from a specialist teacher (such as in Finland: Ofsted, 2010) and sometimes on the same day as a problem is noticed, before the next lesson (in an ‘exemplary’ school in England: Ofsted, 2011b). In the examples from both countries, this additional support was not limited just to children whose attainment was low.

Munn and Reason (2007) conclude that arithmetical difficulties are best understood by setting them in the context of all children’s learning about number. In the review that follows, I will concentrate on aspects of research that have particular relevance for this study, considering the teaching and learning of counting, place value, addition and subtraction.
Key aspects of learning about number

The importance of counting in providing experience that develops an understanding of the number system and which strengthens children’s work in arithmetic has been acknowledged in the last fifteen years, with particular reference to the work of Anghileri (2000), Fuson (1988), Gelman and Gallistel (1978), Ginsburg (1989), Resnick (1987), Steffe, von Glasersfeld, Richards and Cobb (1983), and Thompson (2003). This has led to significant changes in the primary curriculum in England.

From the 1960s to the 1990s, counting was undervalued; Thompson’s seminal book (1997b) before the National Numeracy Strategy was implemented, reminds us that at that time, the approach to beginning arithmetic that had prevailed since the 1960s was based on ‘pre-number’ work including sorting into sets, matching and ordering. The influence of the Nuffield Mathematics Project (1967), whilst extremely positive in many ways, had promoted a view of teaching perhaps based much more on a mathematician’s view of the logical structure of the mathematics (and strongly influenced by Piaget), rather than by examining the more complicated picture uncovered by looking at how children construct their own routes to understanding. It had also been assumed that children would be able to transfer skills practised in a different context to those needed for counting – for example, that practising matching sets of objects would help develop the ‘one-to-one principle’ described by Gelman and Gallistel (see below), or that putting objects in order of size would help with reciting the number names in order. As Thompson said, “There would appear to be no evidence to support this assumption.” (p.156).

Counting as a complex activity

Learning to count is a complex process. Gelman and Gallistel’s (1978) examination of children’s counting outlined five principles for successful counting which children must come to appreciate: three “how-to-count” principles and then two “what-to-count” principles:

- The one-to-one principle: knowing that we count one number word for each object (or action) being counted, and that each number word is unique;
The stable-order principle: that we use a consistent list of number words to count with. Children may not initially use the standard sequence of number words, but can demonstrate this principle using their own idiosyncratic (but stable) list;

The cardinal principle: knowing that the answer to the question ‘How many things are there here?’ is the final number in the count (ie the answer is not the whole string of numbers);

The abstraction principle: that you can count any collection of items or actions, and they do not have to have anything in common;

The order-irrelevance principle: that a count can start with any object, and count them in any order, and the result will still be the same.

Steffe, von Glasersfeld, Richards and Cobb (1983) described counting as ‘a complex [activity] consisting of three component activities’ (p.24). These are firstly the ability to produce the standard number word sequence (one, two, three,… for the child’s own language); secondly, the ability to define the things they wish to count (the countables); and thirdly to co-ordinate those two to match the counting words with the countables.

Steffe et al distinguished five types of counting ‘from the point of view of the child. The distinctions rely on what it is the child seems to generate and be aware of while counting.’ (p.116) These counting types become increasingly sophisticated, and affect the ways in which children use counting to solve addition and subtraction problems:

- Counters of perceptual unit items are children who need actual items available to them – objects, sounds, physical actions to count. They may use substitute perceptual items – for example, if they were asked “If I had 2 marbles, and then I was given 3 more, how many would I have?” they might use fingers to stand for marbles.

- Counters of figural unit items are able to imagine items to count, for example visualising buttons that are covered over by a cloth, in order to find the total number of the hidden ones plus others that are in sight.
• Counters of motor unit items are able to substitute a motor act (for example, wagging a finger, pointing or putting up fingers) for perceptual or figural unit items.

• Counters of verbal unit items use the number words themselves as countable items – for example, to find out how many more you need to make 10, if you have 7 already, the child counts on ‘8, 9, 10’ and knows that the answer is 3.

• Counters of abstract unit items do not need to relate the counting they are doing to perceptual or figural items. Children who are counters of abstract unit items are able to see the results of counting as a number, without relating it to a collection of objects or actions.

Whilst these counting types are listed as successively more difficult, Steffe et al. acknowledged that, for example, children who are counters of verbal unit items may use earlier counting types if the context of the problem allows. They also discussed the difficulty of deciphering how a child has completed a problem, using clues from the child’s verbalisation and gesture during the process, and their way of presenting an answer, to agree on the most likely level of operation that the researchers have seen.

Steffe et al. stressed the importance of building children’s facility in counting, including being able to count backwards and to begin counting at any point: “… these additional abilities increase flexibility in the use of the numbered word sequence and this is matched by an increased ease of production. The backwards practice also opens up importantly different problem-solving strategies.” (p.24).

Different terms are used for similar ideas by different authors. Buys, when writing about emergent numeracy in the pre-school years in Holland, distinguished between the counting sequence and resultative counting (Buys, 2001). The counting sequence (i.e. the number names, in order) may be practised as if it were a special rhyme or verse to be learned, without counting any objects or actions. This relates to Gelman and Gallistel’s stable-order principle, outlined above, to Threlfall’s oral counting (Threlfall, 2008), and to Schaeffer, Eggleston and Scott’s (1974) recitation. Resultative counting is defined by Buys as counting a quantity to determine the total number; to do this successfully, the child will need to know that we count one thing at a time, not counting anything twice or missing anything out. This incorporates
Gelman and Gallistel’s one-to-one principle and the cardinal principle; Threlfall (2008) used the terms enumeration and counting for cardinality; Fuson (1988) and Schaeffer, Eggleston and Scott (1974) used the term enumeration when the child attaches number names to items they are counting. Buys’ (2001) term seems particularly clear: resultative counting is counting where you get a result – and I wonder if this simple separation of counting into the counting sequence, and counting where you get a result, may be especially helpful for discussions with parents and carers – or with children themselves.

The importance of understanding cardinality was discussed by Maclellan (2008), in relation to beginning arithmetic: if a child does not yet understand counting as a method of determining quantity, they will not be able to understand the tasks of addition and subtraction.

Fuson (1988) gave an account of how children’s concepts of number change over time and with experience, and provided many examples of careful interviewing and observation, each based around a task for children to do, that uncovered detailed evidence of their ways of working. She discussed the internalisation of counting that occurs in many children around the age of five or six, as their use of pointing at objects and saying the numbers out loud diminishes.

Pointing may move from touching to pointing near objects to pointing from a distance to using eye fixation. Saying number words moves from saying audible words to making readable lip movements to making abbreviated and unreadable lip movements to silent mental processing of number words. This first internalisation of counting may result in less accurate counting, although internalised counting does evidently become as accurate as external counting in many situations. (p.193; my emphasis).

For a child experiencing difficulties, I think there may be times where their teacher or teaching assistant assumes they are ‘going backwards’ (or not concentrating), instead of recognising that the child is beginning to make a step forward into a more sophisticated method of working, resulting in a temporary loss of accuracy that will lead to longer-term gains.
Fuson emphasized that teaching will be most effective if it is based on the ‘normal developmental sequence of understandings’ (p.416), and stressed the influence of a child’s previous experience on where they might be in that sequence:

For example, some children might live in an environment containing many different number symbols that would be labelled for the child. An older sibling might teach a given child addition at a young age. One preschool might have the children doing a lot of counting and saying the number-word sequence, while another might do practically nothing in these areas. (p.405).

The importance placed in some classrooms on beginning pencil and paper arithmetic as early as possible, and abandoning equipment or drawing, seems to be another common place where things go wrong for children. Fuson warned against any premature move to working solely with abstract unit items (see Steffe et al.’s types, above):

… young children who can represent cardinal situations only with perceptual unit items will need to be provided with entities for cardinal addition and subtraction. They simply cannot represent or understand cardinal addition or subtraction without such representations. (p.416).

The importance of using your fingers when you are counting was discussed by Pimm (1995), commenting that finger use is both visual and tactile. Fingers can be used as objects to count to ten, and the child can see complements of ten with fingers up and down; they can explore, for example, different ways of making seven on their fingers. Pimm noted that fingers can also be “placeholders for whatever numbers I choose. (For example, I might label each finger ‘-ty’ and count in tens). They are serving as dynamic physical symbols for the process of numeration itself, as I move around the number-name sequence” (p.16).

The number sequence in English follows a stronger pattern after 20, and children can construct the sequence up to 99 relatively easily, once they know the decade numbers from twenty to ninety. However, Munn acknowledged the difficulties that children may have in counting with numbers above 100, and noted an explanation given by one child, aged 6, when asked why he thought the sequence should be 107, 108, 109,
“It seems as though it should be 10 but it can’t be 10 because we’re ever so high now, past a hundred, and 10 is right back at the beginning. It must be 200 next” (Munn, 2008, p.27).

The transition from counting entirely in ones, to being able to count in tens and ones, or hundreds, tens and ones, is not a straightforward one. Steffe (2004) pointed out one problem – that children may be very familiar with the sequence ‘ten, twenty, thirty…’ but actually have no conception of how big these numbers are. The child may not, for example, realize that counting objects in ones to 30 should give you the same answer as you get when you group them in tens. He describes a practical situation where children were asked to compare amounts of money, and says: “I refer to their apparent counting-by-ten activity as pseudo counting by 10. I have observed a similar phenomenon in the case of counting by two” (p. 246). My own observations in schools concur with this view: sometimes children who are given, say, 32 objects grouped as 3 tens and 2 single items, will count ‘10, 20, 30, 40, 50’, as their acoustic knowledge of the pattern of counting in tens is very strong, but it is not linked to sufficient experience of counting in tens and then ones, so they do not see that that they have slightly more than 30.

*Place value*

Difficulties over children’s understanding of ‘place value’ have long been recognized, and Thompson (2003) gave a broader view of place value as comprising both ‘column value’ (e.g. 64 is 6 tens and 4 ones) and ‘quantity value’ (e.g. 64 is 60 and 4). He suggested that using quantity value gives children more success in numerical problems, is more sensible for mental arithmetic, and gives children a better appreciation of the number system.

Fuson, Smith and Lo Cicero (1997) undertook a year-long teaching experiment to examine and develop ten-structured thinking by children in the First Grade (ages 6 and 7) in urban classrooms in the United States. They outlined a developmental sequence for children working with numbers 10 to 99, linking each *quantity* with the *spoken number word* and the *way it is written in numerals* (these three elements being described as a triad). They emphasized the child’s need for much greater support in learning about two-digit numbers than is necessary for single digit numbers.
The sequence they provided began with a ‘Unitary’ conception, where children count
the number in ones: “1,2,3,…32”. Later, children begin to see the split between tens
and ones: “1,2,3,..30; 31, 32”, and then as “10, 20, 30, 31, 32”. Eventually, the child
will integrate these earlier conceptions, so they can see 32 as thirty-two, 30 and 2, or 3
tens and 2 ones.

Fuson et al. explained that the design-decisions they made for their successful
teaching experiment were based on previous studies both of children inventing
calculation methods, and of children learning traditional algorithms with
understanding. Four aspects were particularly relevant for my study:

- The researchers did not assume that children must have an understanding of
  place value before beginning on the addition of two-digit numbers, but rather
  that “addition and subtraction work as important settings for children’s
  continued construction of place-value conceptions” (p.745);

- Teachers looked for ways of improving the ‘attentional capabilities’ of
  children, since: “At least a third of the … class seemed unable … to
  concentrate in a sufficiently sustained manner to make important
  connections” (p.763);

- Individual assessment and teaching was seen as very important (partly
  because of attentional difficulties), and it was stressed that this did not
  usually take much time for each child;

- The use of a mixture of tens and ones equipment (including counting frames
  for pennies in rows of ten, and $1 and $10 bills) and drawn representations,
  using sticks for tens and dots for ones, was encouraged. Counting practice
  using equipment and drawing included examples where children were
  presented with tens and more than ten ones, not just examples with tens and
  up to nine ones.

Using number equipment and diagrams

Hiebert and Carpenter (1992) discussed the merits of using counters, base ten
equipment and money to help children understand place value and calculation
methods, and noted that teachers may underestimate possible difficulties inherent in
these materials: “There is no guarantee… that students see the same relationships in
the materials that we do” (p.72). Just as in pencil and paper arithmetic, children can
be taught to use apparatus in an algorithmic manner, which does not benefit their
understanding of arithmetic; in some instances, it may be that a child can only use
apparatus successfully if they have already grasped the concept that it purports to
teach (Mason and Johnson-Wilder, 2004). Similar problems may arise when using
tools such as the hundred square or the number line (including the ‘empty number
line’); these images may be introduced in ways that confuse, or require remembered
‘rules’ – or alternatively they may be offered with explanation, time to explore, and
with children being given control over the ways in which they use them (Murphy,
2011; Plunkett, 1979; van den Heuvel-Panhuizen, 2008). Different tools may support
different mental arithmetic strategies: for example, strategies involving splitting
numbers into tens and ones can be shown with base ten materials, while the number
line is better for strategies where one number is kept whole, and the other is used to
‘jump’ along sequentially (Ellemor-Collins and Wright, 2007).

One useful role for equipment and images may be in supporting a child in
understanding a problem, solving it, and explaining what they have done. The
assumption is often that any explanation will need to be in words, but non-verbal
transactions are also possible. For example, Ryan and Williams (2007) describe a
situation where one child needs to “pay” another child 47; he has given her 4 ten-
strips, and now offers another:

Barry holds out the ten-strip without having to formally verbalize an offer: ‘I
offer you this, will you accept it … what will you give me back?’ Vy even
hesitates, and we think we know why without her having to say, and we
interpret this as ‘but it is too much … there is a problem …’. As such the
manipulative has afforded an action, a gesture – the hesitant offering of the
ten-strip – to begin a whole collective ‘conversation’ (p.61).

The children’s understanding of the situation, and their thinking about how to solve
the problem, does not need to be put into words at this stage:

Manipulatives and other representations (diagrams, graphs, tables, and so on)
serve to help learners engage mathematically as such before they are fully able
to formulate their new ideas in formal language. Indeed by the time the new
learning is formulated in proper, formal language, most of the hard work of problem solving has usually already been done. (p.62).

**Addition and subtraction**

Anghileri (2000) and Thompson (2008) summarised previous research and their own conclusions about the relationships between counting and whole number addition and subtraction. Both authors cited Carpenter and Moser (1984), whose work included a longitudinal study of 88 children’s addition and subtraction concepts as they developed over three school years. They examined the changes in the dominant strategies used by children over time. For addition, children shifted from predominantly using “count-all” when they started school (e.g. to add 2+3, collect 2 objects and then 3 more, and count them all to find the total: direct modelling of the problem), to “counting-on from first” (e.g. for 2+3, count ‘2; 3,4,5’), then to “counting-on from larger” (realising that 2+3 gives the same answer as 3+2, so count ‘3; 4,5’), and lastly to using number facts (knowing that 2+3 is 5, because they have done this sum often enough to know it ‘by heart’). However, Carpenter and Moser also noted that “children are not entirely consistent in their choice of strategies. When children have several strategies available, they often use them interchangeably rather than exclusively using the most efficient one.” (p.189). This applied to both addition and subtraction.

For subtraction, children similarly moved from using direct modelling strategies, to counting strategies, and then to using number facts. Their direct modelling and counting strategies were likely to reflect the kind of word problem in which the subtraction was embedded. For example, a separate subtraction problem such as ‘Tim had 11 candies. He gave 7 candies to Martha. How many candies did Tim have left?’ (p.180) could be solved by collecting 11 items, removing 7, and counting the remaining items; whereas a join missing addend problem such as ‘Kathy has 9 pencils. How many more pencils does she have to put with them so she has 15 pencils altogether?’ would be more likely to encourage the child to take 9 items, to add more until there were 15, and to count how many they had added.

Carpenter and Moser (1984) pointed out that there was a smaller proportion of children who knew their number facts than their mathematics programme expected.
The programme anticipated that the majority of children would know number facts to 10 by the end of First Grade (age 7), but only 11% of the children in the study achieved this. However, children made good use of derived facts (for example, a child might not know what 4+5 is, but does know that 4+4 is 8, so calculates that 4+5 must be 9): “Although derived facts often seem to require a great deal of insight about numbers, they were not used by just a handful of bright students. Over 80% of the children used derived facts at some time in the study” (p.196).

Dowker (2004) advocated the learning of number facts, as otherwise the time children spent on calculation would “divert time and attention from other aspects of arithmetical problem-solving, resulting in lower efficiency.” (p.7). Learning new number facts can be done in many ways: for example, Karpicke and Roediger (2008) (albeit in the context of learning new vocabulary) suggested that repeated testing can be more effective than repeated studying; Topping, Campbell, Douglas and Smith (2003) advocated the use of games. Langer (1997) commented that a particular benefit of games is the variation they provide, helping children to pay attention. It is evident that if children can derive new number facts from their existing repertoire of known facts, then some of the derived facts will become known facts (Askew, Bibby and Brown, 2001). The emphasis on building recall through derived facts seems useful: Resnick (1983) and Thompson (2008) stressed the importance of thinking of numbers as compositions of other numbers, and using derived facts when working with numbers to 20 could lead more naturally to a consideration of a range of mental calculation strategies with larger numbers, in both addition and subtraction.

Children’s lack of confidence with subtraction compared to addition has long been established (McIntosh, 1978). This could be for many reasons, including that it is often (in England) taught separately and after addition, with perhaps a swifter move to abstract presentation, and less practical experience in context. Kamii and Lewis (2003) suggested that subtraction is intrinsically more difficult, that children cannot be successful with a particular single-digit subtraction until they know the corresponding single-digit addition fact, and hence addition needs to be taught first. However, they base this conclusion on a positive correlation between the number of subtraction questions a group of children successfully completed in a test, and higher levels of success in addition items – disregarding the possibility that lack of learning of subtraction facts might be a more direct problem. By contrast, Fosnot and Dolk
(2001) emphasised the reciprocal connections between the two operations, which can best be explained and developed through sensible contexts. They also noted that subtraction includes both removal and difference (comparable to Carpenter and Moser’s separate and compare problems), yet teachers sometimes cause children difficulties by implying that subtraction only means “take away”.

Carpenter and Moser (1984) outlined some of the varied strategies that children use for subtraction, both taught and untaught. With low-attaining pupils, teachers may feel that teaching just one strategy for subtraction is best; however, Peltenburg and van den Heuvel-Panhuizen (2011) investigated the preferred strategies of pupils aged 8 to 12 who were considered to be low-attainers in mathematics, and found that their repertoire included an indirect addition strategy (‘counting on’) rather than direct subtraction (taking away), even though they had not been taught indirect addition. The problems they were set were all in context, and the pupils matched their strategy to this, and to the size of the numbers involved. The researchers’ conclusion was that advice to teach just one method of subtraction to low-attaining pupils was misguided.

Verschaffel, Torbeyns, De Smedt, Luwel and Van Dooren (2007) discussed the issue of children developing and using their own strategies to solve problems in arithmetic, and considered whether the ability to devise a personal strategy is an indication of a child’s strength in mathematics. They noted the need for further empirical research with children whose attainment in mathematics is low, to investigate “an instructional approach wherein children are cultivated in developing their own preferences based on task, subject, and context characteristics” (p.24).

**Successful learning and teaching in mathematics**

One aspect of pedagogy that may be neglected by teachers in England is that of generating examples. Badly-chosen examples can be unnecessarily confusing; those that are well-chosen can demonstrate a pattern, or provide a gradually more challenging sequence of questions. Rowland (2008) commented on the need for the teacher to choose examples carefully when introducing a procedure or concept, and contrasted this with “the legitimate random choice of examples to enhance conviction about the truth of some principle or the efficacy of some established procedure” (p.158). Variation theory (Marton et al, 2004) draws attention to the need to consider
both the content and the learner when planning classroom activity, and to try to improve the overlap between the learning intention of the teacher, their enaction of that intention, and the impact on the pupil (what the pupil learned - their *lived object of learning*.) By varying examples, the order in which examples are provided, and the contexts, the teacher can provide learning situations that are more or less effective for the pupils concerned. Runesson (2005) asserted that “what is learned reflects the pattern of variation that was present in the learning situation” (p.72) and also commented that “A learner is more likely to experience what something is if it is contrasted with what it is not” (p.84). However, Mason (2011) cautions that variation in itself does not guarantee that the pupil will learn what is intended; there will sometimes need to be explicit interaction between teacher and pupil, to uncover a pattern.

Askew (2012) provides examples of teaching sequences that examine connections and patterns through variation, and points to the work of Fosnot (for example, Fosnot and Dork, 2001) as embracing similar principles. Askew also notes that sometimes the teacher must change their learning intention and its enaction, to match children’s responses. He gives the example of classroom work where his intention was to look at calculations such as 122-92, and he gives the children 120-90 to calculate at first, hoping they will see that 122-92 will give the same answer. “I’ve done lessons where it has taken everyone so long to do 120-90 that we have worked on finding differences between multiples of ten instead” (Askew, 2012, p.70).

Zazkis and Liljedahl (2009) explored ways of using variation within a story to establish a mathematical pattern: one well-known example of such a story is *The doorbell rang* (Hutchins, 1986) where successive additional visitors arrive, and this changes the amount of food each person can have. The context of a story can make the situation more accessible to the child: the combination of ‘human sense’ (Donaldson, 1978) and variation may be particularly powerful. Whether in a context or in a more abstract situation, Watson and Mason (2005) confirmed the importance of choosing examples carefully, and of involving learners in constructing their own examples and questions; they noted that learners will often challenge themselves to tackle more difficult situations than their teacher proposed.

The central issue of the relationships between different kinds of knowledge, and how they can best be developed in children, is discussed by many authors. Alexander,
Schallert and Hare (1991) outlined three major elements: procedural, conceptual and metacognitive knowledge. In primary mathematics, procedural knowledge, for example, could include knowing an algorithm in arithmetic, and where to apply it; conceptual knowledge gives an underlying understanding of a problem, which may be enough for the child to find a solution for themselves (and may help them see why an algorithm works); metacognitive knowledge includes the individual’s knowledge of themselves as learners and thinkers. These ideas of procedural and conceptual knowledge link with Skemp’s (1976) instrumental and relational understanding.

Ainley and Pratt (2006) argued that the utility of a mathematical idea is also important, and can be a successful starting point for teaching, rather than the traditional sequence of learning about procedures and relationships before finding out where they could be used.

Dehaene (2011) concurs that basing a child’s mathematical learning in human experience and needs is reasonable: “Ideally, each pupil should mentally, in condensed form, retrace the history of mathematics and its motivations” (p.224). This does not mean using an entirely ‘discovery based’ curriculum: Beishuizen and Anghileri (1998) discussed the implications of learning through context, as practised in Dutch primary schools using Realistic Mathematics Education (RME) (Treffers, 1991), and explained that pupils’ own understanding of, and solutions for, a context-based problem are then used to discuss and explore increasingly efficient, higher-level strategies: “This didactic process of guided development from informal to higher-level formal strategies is called ‘progressive mathematisation’ … It is accomplished not only through cognitive but also through metacognitive activation” (p.525).

Metacognition is embedded in two aspects of the metaphor for being a successful learner of mathematics outlined by Kilpatrick, Swafford and Findell (2001), with five strands of mathematical proficiency combining as a rope: strategic competence and adaptive reasoning. These two, together with conceptual understanding, productive disposition and procedural fluency, provide one possible structure to examine learning and teaching.

The idea of productive disposition, of children feeling confident, interested and optimistic about their work in mathematics, has obvious relevance when working with children who are convinced that they cannot ‘do’ mathematics, and who perhaps expend more energy in finding ways of refusing to engage than in trying to
understand the work they are presented with. It is one of the areas in which support and encouragement from home may be particularly important.

**Learning at school and at home**

There is general agreement that parents and families play a major part in children’s educational experience, and that educational settings should work in partnership with them (Desforges with Abouchaar, 2003; Muschamp, Wikeley, Ridge and Balarin, 2007). There is less agreement about how this partnership between schools and families should happen, and for looked-after children it is a more complicated picture than for children living with their birth families. Until 2007, there was no explicit expectation that foster carers would support children’s educational activity, even for homework set by school. A shortage of foster carers in most areas of the country may have made some social services departments nervous about adding an additional requirement to the expectations they already had, and there was sometimes the view that children needed to be ‘settled’ before it was worth worrying about educational attainment. Sadly, of course, some children are never settled.

Delays in taking action were reported to me by foster carers in interviews before establishing the Letterbox Club. One foster carer said:

“I do short term fostering, so I’ve often got a child just for a few weeks – so I never worry about how they’re getting on with their reading or maths because they’ll get that sorted out in their next placement. Mind you, sometimes you think you’ve got someone for a week, and they’re still with you a year later.”

(Griffiths, 2005)

The Training, Support and Development Standards for Foster Care established by the Children’s Workforce Development Council, published in 2007, make explicit the need for carers to support educational achievement. Standard 4 is about ‘supporting play, activities and learning’, and Standard 5, ‘understand the development of children and young people’, includes a section on ‘supporting educational potential’ (CWDC, 2007). The Standards are a further development resulting from the Children Act 2004.
The report ‘Care Matters’ (DfES 2006), encouraged local authorities to provide training for foster carers in helping children with educational activities. Nationally, one major source of advice and training is Fostering Network (a charity) and in 2008 they began to publish on-line materials to support carers – but these mainly concern literacy, because there was no information about the needs of looked-after children or carers in mathematics available to the writing team, and they had less experience in this area of work (from personal interview with senior staff, October 2008).

The Ofsted (2011a) annual report on children’s services in England notes that “effective services… ensure that carers work in close partnership with schools so that carers are equipped to provide appropriate support and encouragement to the children in their care to help them achieve better at school” (p.134), but Brodie (2010) noted, “The extent to which current models of training for carers integrate care and education appears variable and is less developed than in continental Europe” (p.30). She commented that carers also need to receive appropriate and comprehensive information relating to their foster child’s education, and this is not always provided.

Much of the research examining educational activity at home (for all families, not just foster families) has been with young children. Tizard and Hughes (2002, from first edition in 1984) have previously shown that both middle-class and working-class families can provide educational experiences at home of a rich and varied nature, the importance of which may be underestimated by professional educators and by parents themselves. The EPPE (Effective Pre-School and Primary Education) Project agreed, and stated:

> Although parents’ social class and levels of education were related to child outcomes the quality of home environment was more important. The home learning environment is only moderately associated with social class. What parents do is more important than who they are. (Sylva et al., 2005).

The positive effect on educational achievement of emotionally supportive relationships with friends, parents, other adults and other family members was noted by Siraj-Blatchford (2010); using data from the extended EPPE project (see above), she argued that children who ‘succeed against the odds’ are supported by a strong
sense of self-efficacy, and ‘masterful’ learning dispositions (Dweck and Leggett, 1988; Dweck, 2000).

The differences between learning mathematics in school and in everyday settings were considered by Walkerdine (1988). In her re-analysis of Tizard and Hughes’ recordings of young children at home and at nursery, she commented on the similarities between children’s mathematical play in the two settings, but also observed that at home, the child and adult (mother) play together and the adult extends the child’s knowledge because of their participation, whereas at nursery the adult more often watches while children play. She suggested that the educational value of the home activity is different, because:

… [at home] the mothers do join children’s activities as participants and indeed, conversely, the children join adult activities as participants… The children in nursery school do not join in adult activities because there are none to join in. (pp.113-114).

This mix of purposefulness and joint activity, with children more often directing their own learning, and adults responding to them rather than deciding what they should do, was noted as more common at home than in classroom settings by Anghileri (2006). As other authors have reported, the support offered to a child at home may involve a wide community of adults and other children, all with an interest in the child doing well (Gregory, Long and Volk, 2004).

Homework

This relatively optimistic picture of learning at home (which may not have been available previously to a child who comes into care) becomes less clear as children get older. Parents may still be keen to help: Williams, Williams and Ullman (2002) surveyed 2000 parents of children aged 5 to 16 for the DfES and 72% said they would like to be more involved in their children’s education. However, the nature of that possible involvement was not made clear.

Many parents expect to encourage their children to complete homework. It has not always been a common feature of the life of a primary school pupil in England, but was always more prominent after the age of 11. The expectation that homework in literacy and numeracy would be set has been accepted by increasing numbers of
primary schools (beginning with gentle endorsement from the DfEE via the Numeracy Strategy, (DfEE 1999), but the effectiveness of homework is still contested. The nature of homework set by school is usually very different to the educational activities carried out more spontaneously within families.

A Canadian team (Canadian Council on Learning, 2009) conducted a systematic international review of research from 2003 to 2007, complementing an earlier review to 2003, examining the impact of homework (“any task assigned by schoolteachers intended for students to carry out during non-school hours”, p.5) on academic achievement for Kindergarten to Grade 13. More of the studies reviewed were about mathematics than any other curriculum subject. The most relevant conclusion was that time spent on homework, and the regularity or frequency of it, had less effect than the quality of the homework set: “Homework that increases active student engagement with the homework task likely boosts achievement. A meta-cognitive component where the students must think about their own learning may be an important part of this engagement” (p.48).

This is not a surprising conclusion: Hallam (2004) similarly reported mixed evidence about the effectiveness of homework, and the need for it to be carefully planned. Merttens (1999) emphasized the importance of homework tasks being discussed or otherwise acknowledged at school after they were completed, but also warned of the inequity of requiring homework from children whose parents were unlikely to be able to help them.

Homework can be a source of stress and tension between parents and children. Solomon, Warin and Lewis (2002) provided examples where, for example, a mother and her teenaged daughter felt they were ‘battling against a common enemy’ of dull or difficult homework, or where “homework is a site of considerable conflict based on parental anxieties and teenagers’ reluctance to be helped.” (p. 619). Foster carers may feel this reflects their experience with the children they care for (of any age), especially if they have not yet been able to build a good relationship with the child, or the child is a reluctant learner at school.
Parents and foster carers supporting mathematics at home

In mathematics, a common issue raised by parents and teachers is that of the different ways in which parents may tackle a calculation compared to the school. The arguments here run in parallel with those about whether children should be encouraged to develop and use a variety of methods in school, discussed above. Some schools try to discourage parents from helping with arithmetic unless they use the school’s suggested methods, but other schools welcome differences in methods, which are discussed and valued. Baker, Street and Tomlin (2003) suggested that when a child engages in contrasting numeracy practices in school and at home, this can be helpful. They describe the experience of Aaysha, using different methods at home and school: “…it could be that the differences and distance between the practices she manages and the switching she does between them provide her with the metacognitive skills and understandings that raise her attainment in school numeracy.” (p.13).

Some parents are anxious about helping their children at home, because they feel their own skills in numeracy are lacking, or because their own experience of school as a child was poor. Some parents may be prompted into re-engaging with education themselves (Brew, 2003). However, those foster carers who live in areas of multiple social and economic deprivation may particularly lack confidence in approaching a school for help or advice, or may feel the neighbourhood school has little to offer. Fieler (2010) suggests that there may be an educational equivalent to the ‘inverse care law’: a description of medical service delivery that says that those who most need good medical care (families in poverty) are least likely to get it.

Fieler (2010), Croll (2004) and Lareau (2003) each discuss the construct of social capital (alongside economic capital and cultural capital), citing the work of Bourdieu (1986), as a means of understanding the capacity of diverse families to support their children in successful educational engagement.

The central idea underlying social capital is that social relationships and the personal networks which they create are a resource which can be used to generate outcomes which are valued. … For Bourdieu, social capital is just one part of a series of forms of capital which are implicated in the way that the education system serves to reproduce patterns of social and economic advantage and disadvantage (Croll, 2004, p.398).
A family’s social capital can reside within and outside the extended family – through membership of social, sporting, political or religious organisations, or through more casual acquaintance, for example, with other parents who are waiting for their children after school. Social capital provides families with benefits: for example, “For parents who might be unsure about how the education system works, being able to contact a relative or friend who is a teacher or education professional may provide valuable information” (Fieler, 2010, pp.15-16). Potentially, the concept of the ‘corporate parent’ (i.e. the local authority as an additional substitute parent for each looked-after child) should increase foster families’ social capital in a powerful and effective manner, but currently this does not usually seem to be the case.

Support for parents (including foster carers) in providing educational activity needs to be both accessible and acceptable (Brodie, 2010), and, as Ghate and Hazel (2002) said, parents should not be made to feel “over-anxious, inexperienced or ignorant” (p.252). This is not always easy to achieve: Brooker (2010) commented on the balance of power that needs to be negotiated in the complex relationship between the professional in an educational setting and a parent or carer, made more complicated where social class or cultural differences are evident. Alongside this, a foster carer is also engaging with a social worker, and sometimes with birth family members, who may have differing views on what is best for a child.

Projects where those who work in schools seek to learn from home seem to be relatively rare. The Home School Knowledge Exchange Project (Winter, Salway, Yee and Hughes, 2004) used shoe boxes of small items sent back and forth between home and school to help each setting find out more about the other, although they commented that activities which involved communicating from school to home were easier to organize than those which went from home to school.

Mayall (2007) raised the difficult issue of how teachers’ expectations and pre-conceived views of children may affect children’s achievement in school, saying there had been little research on “the extent to which school staff recognize, respect and respond to what children bring from home” (p.2). The work of Cremin, Mottram, Collins, Powell and Drury (2011) provides a rare example of teachers being encouraged to examine their own ‘deficit’ models of children’s backgrounds in the context of literacy, resulting in more positive perceptions about children and their
families, but the intensive nature of the project would make it difficult to replicate. Young people who have been in care have commented that they feel teachers expect them to be low-achievers, and may have little understanding of why they came into care or what their lives are like outside school (Jackson and Sachdev, 2001). Foster carers may similarly feel their role is not appreciated or understood by teachers.

At present, very little is known about how foster carers support the children in their care in terms of educational activity. It is likely that, as for all parents, they want children to do well. Carter-Wall and Whitfield (2012) note that parental involvement does improve educational outcomes, but interventions aiming to raise the aspirations of parents and children have not been shown to affect achievement. As Wheeler and Connor comment about parents in disadvantaged situations, “It is not interest in education that parents lack, but knowledge, information and resources.” (2009, p.18).

**Research questions**

This review of the literature shows that there are areas in work with looked-after children where further research is indicated. As has been discussed, it will often be evident by the age of 7 if a child has difficulties in mathematics, and additional support may be particularly helpful before children go to secondary school, which is usually at age 11. There is common agreement amongst primary teachers, parents and carers, and children themselves that number is predominant in its importance within mathematics, and the relatively hierarchical nature of work in number (compared, for example, to shape and space), may make it particularly difficult for children whose education is interrupted. Lastly, the issue of low educational attainment amongst children in care is a national concern.

My research therefore addresses two major questions:

- What are the difficulties faced by looked-after children in England aged 7 to 11 whose attainment in mathematics is low, specifically in number?
- What strategies are likely to improve looked-after children’s understanding and progress in number between ages 7 and 11?
3. RESEARCH DESIGN AND METHODS

My research questions focus on a complex area of work with vulnerable children and the adults who live or work with them:

- What are the difficulties faced by looked-after children in England aged 7 to 11 whose attainment in mathematics is low, specifically in number?
- What strategies are likely to improve looked-after children’s understanding and progress in number between ages 7 and 11?

In this chapter, I will discuss possible ways in which I could answer these questions, and outline the reasons for my final choice of design frame. I will then discuss the methods employed, noting particular issues regarding research with children and the procedures and practicalities of the research, including ethical concerns.

Choosing a research framework

As discussed in Chapter One, and explored further in Chapter Two, any examination of looked-after children’s attainment and understanding in number must necessarily be set in the context of their lived experience, and the support they gain from the adults and children around them. This would include considering affective and personal issues related to learning such as motivation, attachment, transition and resilience, and institutional issues including school organization and the mathematics curriculum as experienced by each child.

Looked-after children form only about 0.5% of the school population in England (DfE, 2011a), and there may be only one or two looked-after children in any one school; this makes it difficult to collect data of any kind across a large number of children. Quantitative data has been collected by central government during the last 15 years on a narrow range of indicators, including the percentage of looked-after children reaching the expected National Curriculum target levels for English and Mathematics at age 11. This confirms that low attainment in mathematics is more common amongst looked-after children than in the general population, but it does not answer the question of what their difficulties in mathematics may be. The literature review (Chapter Two) has given an indication of the varied nature of looked-after
children’s previous and current experiences, and this complexity signals the need for an approach to research that is detailed, acknowledging that it would not be feasible to examine every possibility, but providing a clear picture of useful examples of children’s educational situations.

Qualitative research has many features that suit my field of study, including a focus on examining people’s experience in everyday situations, and an interest in different perspectives. Denzin and Lincoln (2011) provide a picture of the breadth of data that qualitative research may consider, using a wide range of interpretive practices, since each practice “makes the world visible in a different way” (p.4). I anticipated, though, that I might wish to use some quantitative methods alongside a predominantly qualitative approach. Robson (2011) suggests that it may be helpful to consider research designs as flexible or fixed, rather than ‘qualitative’ and ‘quantitative’, allowing for the design to develop during data collection.

I did not anticipate that there would be a single clear answer to my first research question (about children’s difficulties) that would cover the circumstances of every child and their mathematical achievements. I expected that it would be important to study and to try to interpret children’s and adults’ perceptions, motives, plans, actions and the outcomes of these, both in school and at home. My second question (about improving understanding and progress) was also likely to lead to varied responses for different children; the processes and situations that I should study would include those from my first question, but would also need to include opportunities for children to work in ways that might be new to them in mathematics, to consider whether and how they might learn more successfully. I was interested to think further about what constitutes ‘understanding’: when would I feel a child understood what they were doing within a mathematical task? Ryan and Williams (2007) noted that “The teacher can see or hear behaviour, but has to infer what the learner knows” (p.155); they additionally suggested that ‘understanding’ may be demonstrated when a child (or adult) can explain the mathematics to someone else. I therefore wanted to provide opportunities for this to happen, within my research.

In my research with the adults around each looked-after child, I was aware that each adult would construct their view or understanding based on their own previous experience, influenced by the context in which they lived or worked. I would need to
be careful not to reach conclusions based solely on my own view, but to acknowledge alternative explanations and, also, to consider the timing and circumstances of the response. For example, suppose a foster carer said that they were not interested in education; this might be true, or it might be a response made at a time when their concern with the child’s health was a priority, rather than a ‘true’ statement of the foster carer’s view overall. As a further alternative, it might indicate that the foster carer was anxious about their own capacity to help a child with educational activity. Each possible explanation would need further exploration. It can be difficult to uncover the most plausible version of reality, and many of my conclusions might be quite tentative as a result.

I considered two possible styles of educational research (Cohen, Manion and Morrison, 2007) to answer my research questions: action research and case study. Thomas (2009) calls these design frames: “the framework for your research – connecting purposes with questions with the ways in which data can be collected” (p.99). I also briefly considered a third design frame outlined by Thomas, evaluation, used to assess how effective an intervention has been. Within this frame, I would have examined the individual learning plans that are compiled for looked-after children in local authorities in England, and which are meant to lead to corresponding action. However, it was quickly evident through discussion with staff from several local authorities (personal communication, 2010) that these plans seldom provided any detail about the child’s mathematical attainment or activity, and therefore would not be a useful focus.

**Action research**

I considered an action research design (Carr and Kemmis, 1986), with repeated cycles of “look, think, act” (Stringer, 2007) as more appropriate than an evaluation of current ways of working, particularly as it would allow scope for the exploration of my second research question, about helpful strategies to use with looked-after children. As Robson (2011) says, action research “adds the promotion of change to the traditional research purposes of description, understanding and explanation” (p. 188). Action research aims to change a situation, solve a problem or improve practice; it is research done by practitioners (sometimes with support from others), in a process of systematic inquiry that will explore the initial situation, predicate a possible change
and carry that out, then evaluate the effectiveness of that action and reflect upon it. A further cycle of inquiry provides an opportunity to try further changes, carry out further evaluation and analysis, and to reiterate the whole cycle as often as is needed or is possible (McNiff, 1988; Kemmis, 1993). Action research has been a powerful tool for practitioners to develop and improve their practice, and has been used extensively (in many forms) in educational settings. However, action research seemed premature in a situation where so little is known about the mathematical experience of looked-after children whose attainment is low, and I wanted to concentrate on uncovering and clarifying the many influences on any looked-after child’s performance in the mathematics classroom. I did not yet have a clear picture of all the surrounding circumstances. If I had identified immediate areas where change might be desirable, there would be considerable doubt as to whether I would have the power or influence to alter them, as it would require co-operation from others who might not see the need for change. I also wanted to maintain a broader view of potentially helpful strategies, including examining existing practice to identify effective ways of working. It seemed likely that action research would be more useful for further research after the current study is completed.

**Case study**

Case study was my chosen research frame as it provided the best opportunity, within the resources available to me, to answer my research questions.

Case study aims to gain a detailed, in-depth understanding of one case or a small set of cases – where a case could, for example, be just one individual person, or a whole organisation. Yin (2009) suggested that case study is a good choice when the research aims to find out how or why a situation has arisen, and where it is not possible or appropriate to change the situation whilst studying it (as would be the case in action research or a teaching experiment).

Stake (2003) summarised the nature of case study thus:

…case studies need accurate description and subjective, yet disciplined, interpretation; a respect and curiosity for culturally different perceptions of
phenomena; and empathic representation of local settings – all blending (perhaps clumped) within a constructivist epistemology. (p.149).

Stake (2003) talked about three types of case study: an *intrinsic* case study, undertaken to examine a case that is of interest in itself; an *instrumental* case study, examined to provide insight into an issue; or a number of cases may be studied jointly to investigate a population or general condition, forming a *collective* case study. Alternatively, Yin (2009) and Robson (2011) simply refer to *single-case studies* and *multiple-case studies*. A multiple-case study, where each case was a looked-after child whose attainment in mathematics was low, seemed likely to provide the data I needed. A multiple-case design requires more extensive resources than a single case study on the same topic, but it follows the principle of replication that is used in experiments, where any conclusions can be checked (or disproven) by repeating the experiment. Within a multiple-case study, replication (looking at more than one case using the same methods) and comparison between the cases can provide evidence that is more persuasive than that from a single case.

Stake (1995) discussed the way in which cases should be chosen for study, saying that it is not essential to have a group that are representative of the larger population (in my case, of looked-after children in the age range 7 to 11): “Balance and variety are important; opportunity to learn is of primary importance.” (p.6). He also noted the way a case study will evolve as new issues arise, and confirmed that a researcher cannot study everything – choices about what is it is feasible to study are necessary.

Yin defined a case study as “…an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2009, p.18).

The phenomenon of children in care and their low educational achievement is certainly one that requires in-depth inquiry. The complexity of their situation (with its interplay of past and present circumstances, and of home, school and other influences) is such that it can be difficult to establish which elements of each child’s context are affecting their educational progress, and which elements are a result of low achievement (and hence are part of the phenomenon). Cause and effect can be difficult to disentangle – for example, poor behaviour and lack of application to
learning could result in low attainment, or alternatively frustration at not understanding the work provided could lead to poor behaviour.

Yin (2009) noted that case study inquiry benefits from the prior development of theoretical propositions to guide data collection and analysis. A case study could provide a multi-dimensional, rich picture of each child and their low attainment in mathematics, using ‘thick description’ (Geertz, 1973) which aims not just to describe, but also to interpret a piece of behaviour or a situation, using the context and the researcher’s own knowledge of the world. My theoretical propositions about influences on the child’s mathematical learning are summarized in Chapter One (in Figure 1.1), so I would need data from the children themselves, and from two groups of adults (at home and at school), but each of these would need different methods of data collection. I needed to design a data collection protocol, aiming to conduct the study of each case in a similar manner.

Yin (2009) listed six common sources of evidence used in case studies (documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts) and discussed the importance of using more than one source, to triangulate (i.e. to see from different angles) the evidence the researcher collects. This triangulation through using multiple sources and methods of data collection can confirm or corroborate a conclusion or explanation, or it might provide a different or more nuanced view.

Cohen, Manion and Morrison described case study as “a step to action” (2007, p.256): my second research question reflects this, aiming to identify useful strategies to improve the situation of children in similar circumstances to those I studied. The first step, though, was to build on my previous experience of working with children who find mathematics difficult, and with children in care, through systematic study.

Flyvbjerg (2011) comments: “…true expertise is based on intimate experience with thousands of individual cases and on the ability to discriminate between situations, with all their nuances of difference, without distilling them into formulas or standard cases” (p.312). Case studies of a small number of children would provide an opportunity to learn more whilst acknowledging that their problems may be very complex, and simple generalization may not be possible. Each case would be analysed individually, and I would also draw conclusions from across the cases.
Planning the case study

When planning this multiple-case study, I needed to consider the number of children to include and how to choose them, the length of time over which to track them, the data that it would be realistic and desirable to aim to collect, and issues of permissions and access. I considered that those who would have information relating to the children’s mathematical achievement would be the children themselves, their teachers, their foster carers and the local authority. It was important to include a range of sources of data in my case study, to provide as complete and truthful a picture as possible of each child’s situation. However, as Trout, Hagaman, Casey, Reid and Epstein (2008) noted, in their review of the literature on the academic status of children in out-of-home care in the USA, there are particular difficulties that may apply when researching with children in care:

> Because many of these children are wards of the state, change placements frequently, and are not in contact with their parents or legal caregiver, issues such as consent, timings for assessments, and special considerations for state wards may limit what can and cannot be studied with this population (p.991).

Access and permissions were a key issue for my study. When working with children in care, permissions are complex; considerations of access needed to include deciding with the participants where, when and for how long each encounter should be, and careful discussion of confidentiality; and I needed to keep a balance between the frequency, number and length of visits, and the imposition this placed on participants, however willing. For vulnerable children, a clear exit from the sequence of visits was important – so that a child knew from the beginning what the likely programme of visits would be, and when they would end.

Greene and Hogan (2005) commented that the process of research with children is highly inferential, as the enquirer needs to make assumptions about a child’s actions or words, and from the child’s own reports on their subjective world. They pointed out that no one, adult or child, is likely to be completely objective:

> People can report on their motivations and emotions only to the extent that they are aware of them... the impulse to present oneself in a way that is socially acceptable to others (social desirability) can influence answers to
direct questions and is likely to remain a significant factor even in extended qualitative encounters with a researcher. People can also deliberately set out to lie and deceive. Children are not exempt from any of these processes. (pp.6-7).

In my previous research with looked-after children, I was aware that the children, foster carers and other adults involved have frequently been involved in completing questionnaires and reports, taking part in case conferences and being interviewed – these activities, however informal, have been a more common feature of their lives than for most people. At times they may have decided to ‘gloss over’ difficulties, or alternatively to exaggerate them, in order to influence the resulting outcome: perhaps to maintain a placement, to gain additional help for a child, or to be eligible for respite care. It was therefore important to be as clear as possible with the adults and children concerned, about the aims of my research, and about my lack of influence in any decision making about individual cases, to encourage ‘truthful’ reporting.

The data collection methods that are appropriate to use with children are necessarily bounded by the child’s age and their ability to manage the medium offered. For example, a questionnaire may be too difficult to read, or require too much concentration to complete – both important considerations when working with children whose attainment in school is low. Interviews require more research time, but provide a better opportunity to gain detailed information, with the added advantage of being able to ask questions that follow unexpected lines of interest.

I considered whether observation in the child’s usual mathematics lessons would be useful or feasible, but decided that, since my major interest was in children who had difficulties in mathematics, their teaching situation would often be in very small groups or one-to-one, and my presence could be a distraction or could change the normal teaching situation. Some teachers or classroom assistants might feel uncomfortable with an additional adult watching them teach, even if I explained I was concentrating on what the child did. Since I wanted to uncover what children understood, and their processes of learning, it would be more helpful to work with each child individually. I decided that the clinical interview (Ginsburg, 1997) offered a structure for enquiry that is much richer, and could form the central feature for each case. Alongside this method, I would examine each child’s work in the classroom in two ways: by interviewing their class teacher or the adult who usually worked with
them, and by talking to the child whilst looking at the work in their exercise book. If it seemed there was still a need to find out more about normal classroom practice, I could consider adding observations in the classroom at a later stage.

*The Clinical Interview*

Ginsburg (1997), in his influential text, introduced the broad nature of the clinical interview in mathematics as one where the child engages in mathematical activity, and the adult discusses, encourages, questions and guides the child, all the time observing and analyzing the child’s activity. Ginsburg commented that whilst traditional standardized methods (of testing and interviewing) can play a useful part in research, they are not suitable for studying complex thinking or dynamic change, and they do not allow for the exploration of cognitive processes. In addition, traditional methods may not effectively motivate all children to ‘do their best’; this may be especially true of children who are not from a majority group. (Ginsburg gave the example of lower-class African-American children, but looked-after children could certainly be another example.) Rowland (1999) noted the importance of the clinical interviewer having sound pedagogical content knowledge of the area being examined with the child, citing Doig and Hunting (1995), and exemplified this in his account of an interview on fractions with Susie, aged 10, where an interviewer who was less knowledgeable on this topic would not have elicited as interesting a response. In my study, I concentrated on counting and early arithmetic, where my pedagogical knowledge is very secure, as this has been my major interest in research and teaching.

Ginsburg stressed that the flexibility of the clinical interview method allows the researcher to obtain data that would not be obtained by other means, as he or she has “the freedom to alter tasks to promote the child’s understanding and probe his or her reactions; …the interviewer attempts to uncover the thought and concepts underlying the child’s verbalizations” (1997, p.39). The interviewer also displays “an attitude of respect towards the child. The interviewer conveys the impression, in word and deed, that he or she is deeply interested in the child’s thinking and acknowledges that it is the product of a genuine attempt to make sense of the world.” (p.39). This is likely to result in the child enjoying the interview, as well as being willing to discuss things they feel uncertain of or do not understand.
Ginsburg traced the origins of the clinical interview technique from the influence of Freud, through its original development by Piaget, and to the additional focus of Vygotsky (discussed below). He quotes Piaget’s own explanation for his interest in developing a new way of working:

…I noticed that though [the standardized] tests certainly had their diagnostic merits, based on the numbers of successes and failures, it was much more interesting to try to find the reasons for the failures. Thus I engaged my subjects in conversations patterned after psychiatric questioning, with the aim of discovering something about the reasoning process underlying their right, but especially their wrong, answers. (Piaget, 1952, cited by Ginsburg, 1997, p.30).

As well as examining a child’s independent problem solving, Vygotsky was interested in exploring the child’s potential for development when aided: the ‘zone of proximal development’ (ZPD), defined as the “distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p.86). This seems particularly pertinent for a child whose attainment is currently lower than that of the majority of their peers; the implication is that a child with a ZPD that encompasses a wide distance, may have a greater potential for learning than one where the ZPD is small. The child’s propensity to learn is something that the clinical interview can explore.

Ginsburg argued that researchers who hold a constructivist position (with its emphasis on each individual building knowledge rather than receiving it without alteration from external sources) will especially value the clinical interview, as it enables the researcher to begin to uncover personal constructions. Part of doing this involves making sure that the researcher does not impose their own views on the child. “I have to discover what is important to the child, regardless of whether I value it, and how the child constructs a way of dealing with it.” (p.60). This personalizing of the interview process acknowledges that even when two people are asked a question in exactly the same way, they will each interpret the question based on their own experience and interest in the question: the objective equivalence of the asking of the question is superceded by the interpretation of the question by each individual.
During an interview, the researcher may also see a child’s thinking change and evolve. Indeed, the nature of a clinical interview, well executed, is such that it may contribute to a child’s thinking, and their ability to ‘think about thinking’: it is potentially a metacognitive intervention. Ginsburg concludes:

> Even the most experienced interviewer never conducts a completely successful interview. … You always think of something that you could have said. You almost never learn as much as you would like about the child. But even if your interview is imperfect, as it must be, you are likely to learn something about the child’s mind, and the child might too. (p.158).

The fact that, almost inevitably, the child would learn something as I conducted any clinical interview was an important part of my research. I did not want only to discover what the child could or could not do, but also to consider how they learnt something new. This would contribute to my second research question – examining what interventions might improve their understanding and progress in number. My intervention would be relatively small, and would arise after uncovering something the child was unsure about. Similarly, I acknowledge that my interviews with teachers, foster carers and other adults would be likely to have an effect on their thoughts and actions – the very act of listening to someone carefully is an intervention (Dockett and Perry, 2007).

Clinical interviews would give me considerable information about the child’s attainment in mathematics and their ‘productive disposition’ (Kilpatrick, Swafford and Findell, 2001). Interviews with foster carers would concentrate on mathematics at home; learning at school would be investigated through interviews with school staff, and by examining paper-based mathematical work (‘bookwork’). Data from the local authority, interviews with local authority staff, and discussions with the child would contribute to home and school aspects. The clinical interviews would be complemented by assessments of arithmetic and any available assessments or reports provided by the school. As will be described further below, although I had not originally planned to do this, I was also able to undertake ‘recall’ interviews on some occasions, where a child watched the video of one of their clinical interviews and discussed their work as they watched.
Figure 3.1 summarises which elements of each child’s mathematical learning (shown in Figure 1.1 earlier) were informed by these sources of information. Each element is discussed further in the following section.

Figure 3.1: Major sources of data about the elements of each child’s mathematical learning.
Research methods and data collection

A case study of one child, whilst valuable, would not provide sufficient representation of the different experiences and circumstances of children in care, but the study also needed to be manageable, and to enable me to collect sufficient data to answer my research questions. I therefore wished to complete my study with profiles of three or four children, so I decided to begin with five, since there was a high risk that at least one of the children would leave the study before I had completed it – perhaps because the child, foster carer or teacher did not want to continue, or because the child moved placement or school. In fact, I was able to maintain contact with all five. I wanted to track the children for the equivalent of one academic year (comprising three school terms), and, since the issue of transition might prove to be important, decided that this should cover two academic years, initiating my visits in the final term of one school year, and continuing across the first and second terms of the following school year (i.e. covering the period May 2010 to April 2011). This would have the further advantage of giving me the chance to gain the viewpoints of additional teachers or other adults about the child, as in most schools the children would have a change of teacher over the summer.

Selecting the local authority and the five case study children

In order to make issues of access to children, families and schools more straightforward, the case studies were undertaken with children in care from just one local authority (LA). A local authority covers a geographical area defined for local government purposes, and the LA’s duties include safeguarding children’s interests, and providing placements for children who have been taken into public care.

I wanted to identify children who were thought to be in the lowest 25% of the attainment range for their age and who were attending mainstream schools, but excluding pupils with statements of special needs for severe learning difficulties. Classroom teachers in England currently express their view of a child’s attainment in mathematics in terms of ‘levels’ in the National Curriculum, and the levels are also used for official pupil records. The National Curriculum for England (DfEE/QCA, 1999) outlined level descriptions from Level 1 (the easiest) to Level 8 (the most challenging); the national targets at the time of this study were that the majority of
children should be at Level 2 by the end of Year 2 (aged 7) and at Level 4 by the end of Year 6 (aged 11). (The National Curriculum ‘level descriptors’ for Levels 1 to 4 for number are provided in Appendix A).

I therefore expressed ‘low attainment’ as meaning children who were working at Level 1 when they began Year 3, or Levels 1, 2 or low Level 3 in Year 5, with attainment that was seen to be at least a year behind their peers compared with national expectations. From my previous research on the Letterbox Club, the data for looked-after children in England in 2007 indicated that about 15% of children in the age range 7 to 11 (Key Stage 2) were working at least a year below expectations, so I would need a local authority that had a Key Stage 2 cohort of at least 40 looked-after children to provide my set of five pupils who had difficulties in mathematics.

Since it might often be necessary to rearrange interviews because of the nature of the children’s situations, it was important to choose a local authority to which it was easy to travel, so I listed LAs within 50 miles of my residence which had a cohort of 45 or more looked-after children in Key Stage 2 each year, using data from the DCSF website. Ideally, I wanted to use a local authority that was seen as representative in its practice when supporting the education of children in care – neither outstanding for excellent nor very poor practice – but this was difficult to judge at the time (2010) apart from my personal knowledge. Of the three LAs I decided to approach in turn, the first one agreed to take part. My personal judgement about the local authority as one with ‘representative performance’ was not confirmed until after my field work was completed: in the DfE performance tables for children in care and adoption (DfE, 2011b), reporting on the three years to 2010, the authority was in the middle third of the national tables for children’s academic performance at the end of Key Stage 2.

The chosen local authority’s service for looked-after children was in the process of reorganisation, and it took nearly two months to establish which member of staff was the most appropriate to give me permission to undertake my study, having checked my references and CRB (Criminal Records Bureau) clearance. I was then able to liaise with one member of staff who oversaw all the primary school placements for looked-after children in the local authority; for the purpose of this study, she is called Vanessa Jones.
Vanessa had attainment records from the end of Key Stage 1 (when the children were seven years old) for the majority of children in the care of the LA, and more recent teacher assessments from pupil reviews (which look at issues to do with school and care placements). She had met all the children in the cohort and was reasonably familiar with their care histories. Children’s initial period in care is likely to be a stressful time, so we agreed to exclude from the study any children who had been in care for less than three months.

Since my focus was on Key Stage 2 (ages 7 to 11; Years 3, 4, 5 and 6), and the case studies would be carried out starting in one school year and continuing into another, I wanted to include children who were in Year 3, Year 4 and Year 5 in April 2010, who would then move into Year 4, Year 5 and Year 6 in September 2010. Vanessa drew up a list of those children who fitted my indicators for low attainment in mathematics, and for a minimum length of time in care. In addition, she excluded any children with severe physical difficulties from the list. This left a cohort of nine children from which to choose five, with four reserves, in case any child, foster carer or teacher I approached at the initial stage did not want to be part of the study. During the short period when I was deciding which five children to approach, one girl was reassessed in mathematics, and was now deemed to be at an attainment level in line with the average for her school; and a decision was made that one boy was likely to be moved placement to another geographical area within a month. I therefore needed to choose five children, leaving two reserves.

I wanted a variety of circumstances relevant to children in care amongst the children in my case study, and aimed to provide the “balance and variety” outlined by Stake (1995, p.6) and discussed earlier in this chapter. The LA’s complete cohort of looked-after children for Years 3, 4 and 5 was 44 pupils, of whom half were boys and half were girls. (Nationally, there are slightly more boys than girls in care). In terms of ethnic origin, 79% were white, 2% Asian, and 18% of mixed/black heritage. 48% of children in the whole cohort had been in care for less than 2 years; the (mean) average time in care at age 10 was about 4 years 3 months, but the range at age 10 was from one month to nearly 10 years. If possible, I wanted the case studies to cover a mixture of types of placements: in short term care, in long term foster care, placed with relatives (‘kinship care’), and placed for adoption. The number of placements a child had had might be relevant. Whilst the majority of placements were with foster carers
living in the local authority area, a substantial number were with foster carers who lived in other local authorities – another variable which might be relevant.

I chose three boys and two girls; two from Year 3, one Year 4 and two Year 5; they are listed below in Table 3.1, with the information that was available to help make the choice. All names are pseudonyms.

Table 3.1: Information from LA as at April 2010, used to choose five children for case study

<table>
<thead>
<tr>
<th>Child</th>
<th>Year Group</th>
<th>Gender</th>
<th>Ethnic origin</th>
<th>Number of years in care</th>
<th>Placement information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye</td>
<td>Year 3</td>
<td>Girl</td>
<td>White British</td>
<td>2</td>
<td>Placed with one younger sister with foster carers outside the LA area with a view to adoption.</td>
</tr>
<tr>
<td>Ronan</td>
<td>Year 3</td>
<td>Boy</td>
<td>White British</td>
<td>1</td>
<td>Placed with 4 siblings with long-term foster carers outside the LA area.</td>
</tr>
<tr>
<td>Kyle</td>
<td>Year 4</td>
<td>Boy</td>
<td>Mixed Heritage</td>
<td>3</td>
<td>Placed with kinship carers in the LA area after previous long-term placement ceased. Severe emotional and behavioural difficulties.</td>
</tr>
<tr>
<td>Dylan</td>
<td>Year 5</td>
<td>Boy</td>
<td>Mixed Heritage</td>
<td>5</td>
<td>Placed with single foster carer in LA area; had had many previous carers.</td>
</tr>
<tr>
<td>Millie</td>
<td>Year 5</td>
<td>Girl</td>
<td>White British</td>
<td>10</td>
<td>Placed with long-term foster carers in the LA area, and had been there since she was a baby.</td>
</tr>
</tbody>
</table>

The reserves were:

Reserve 1: Year 5 boy; white British; in kinship care since 2007 in LA area;

Reserve 2: Year 5 girl; white British; several carers since 2008, in LA area.

As mentioned earlier, I began with five participants as there was a risk of one or more of the case studies being cut short. I kept in mind the possibility of initiating additional cases if any of the initial target children were unable to continue, but this did not prove necessary. In one case (Kyle), I continued to follow the child for one further school term, for reasons explained in chapter 4.
**Agreement with the local authority about contact with case study participants**

The LA has direct responsibility for children in care, for foster carers, and for social work staff. Schools are relatively autonomous, but the LA was, of course, concerned to maintain good relationships with head teachers in the schools that the case study children attended. I therefore discussed several practical and ethical issues with the local authority officer, Vanessa Jones, before I contacted any of the potential participants. Ethical issues are discussed further at the end of this chapter. We agreed the following:

- Although the main participants in the study would be children, foster carers and class teachers, it was important to make sure their social workers, head teachers, designated teachers (i.e. the teacher in each school with responsibility for looked-after children) and, where there was contact, the child’s birth parents, were told about the study. Vanessa agreed to contact the foster carers and children to check they were interested in taking part, and to provide information for everyone else, including confirming that I had permission from the LA to undertake the study. She would get permission from the foster carers to give me their names, telephone numbers and addresses so that I could arrange to see them. Vanessa asked my permission to tell the foster carers that I used to be a foster carer myself, as she felt this would be reassuring.

- Initially, participant children would only be asked to agree to meet me once. I would discuss the project with each child on that visit, so that they could be asked whether they were happy to take part for the year, after they had met me and I had explained (or demonstrated) what it would involve. This would mean their consent to participate would be better informed.

- I prepared a letter for each child about the research, and would give them the letter after an oral explanation. I would explain that there were a lot of children living in foster families who find mathematics (or numeracy) hard, and that I was trying to find out more about this, to help children get better at mathematics, and to help their teachers and carers know how to help them. The child’s letter is included as Appendix B: similar letters were prepared for the adults involved.
- Confidentiality was a key issue. I would keep details of the child’s identity, school and home addresses confidential, including by the use of pseudonyms when reporting my findings. If I used a transcriber for any interviews, they would also be clear of the need for confidentiality when undertaking this work.
- I would take account of the child’s view of how to organise the visits to their school or foster home so that they would not feel embarrassed or uncomfortable.
- I would be sensitive about the length of time my interviews would take, and also the timing of them – making sure I did not inconvenience family or school arrangements.
- Since some children in care have the expectation that any adult who interviews them has influence on decisions about where they live and with whom, I would emphasise that my interviews were about their work in number.
- I would give the child the opportunity to learn something new in each session, following their own interests wherever possible.
- If anything the child said or did caused me concern, I would contact the appropriate person (usually Vanessa or the Head teacher) to pass this on.
- At the end of the project, I would spend time with the child discussing the work they had done over the time I had been visiting, say goodbye and thank them for helping with the study.
- I would report on my main findings to the LA once my study was complete.

*Baseline assessment: Letterbox Club assessment items*

As part of each case study, I wanted to collect basic information about each child’s understanding and fluency with number in a systematic manner, both to inform the possible mathematical content of the clinical interviews, and to provide information about each child’s progress across the year in the areas of mathematics that I was studying (i.e. counting, place value and early addition and subtraction). There are fewer tests available for the assessment of mathematics than for reading (Mackenzie, 2007); many of those available are pencil and paper tests, which are not suitable for
children whose reading levels are low; and I needed items that would assess the target areas of mathematics in which I was interested. For similar reasons, I had already devised mathematics assessment items for the Letterbox Club (described in Chapter 1). These were drawn up using the content listed for number at Level 2 and Level 3 in the National Curriculum for mathematics in England (given in Appendix A), and boundaries were set for a marking scheme that indicated whether children had attained Level 1 or below; Level 2; Level 3; or Level 4 or above. A small sample of thirty Year 6 children had been tested using these assessments in the same period that they took their national assessment tests (SATs), and the assessments using the Letterbox items matched the children’s national results (Griffiths, 2009).

I used the Letterbox instruments for this study, administered at the beginning of the year of study with each child to gather baseline data, and then repeated in the last meeting of the year to examine their progress.

Further notes about the development of the Letterbox Club assessments and the complete scripts for the National Curriculum (NC) Level 2 and Level 3 assessments are included in Appendix C. There are 20 assessment items at each Level; my focus for this study is on counting, addition and subtraction, so I was interested in responses to all 20 items on the Level 2 assessment paper, and 8 items on Level 3. Table 3.2 lists the focus of each question, and is structured to show the links between Level 2 and Level 3 items.
Table 3.2: Focus of each item in Letterbox Club assessments.

*A child who completes the Level 2 assessment items confidently will then try Level 3.*

<table>
<thead>
<tr>
<th>NC Level 2 (20 items)</th>
<th>NC Level 3 (8 items)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counting in ones with up to 10 objects</td>
<td>Counting in ones with up to 50 objects</td>
</tr>
<tr>
<td>Counting in ones with up to 30 objects</td>
<td></td>
</tr>
<tr>
<td>Counting in tens and ones within 20</td>
<td>Counting in tens and more than ten ones within 100</td>
</tr>
<tr>
<td>Counting in tens and ones within 100</td>
<td></td>
</tr>
<tr>
<td>Counting in twos within 20</td>
<td>Counting in fives within 100</td>
</tr>
<tr>
<td>Counting in fives within 40</td>
<td>Counting in tens and ones within 200</td>
</tr>
<tr>
<td>Addition within 10</td>
<td></td>
</tr>
<tr>
<td>Subtraction within 10</td>
<td></td>
</tr>
<tr>
<td>Subtraction within 12</td>
<td></td>
</tr>
<tr>
<td>Addition within 20</td>
<td></td>
</tr>
<tr>
<td>Mental recall of addition and subtraction facts within 10 <em>(ten questions)</em></td>
<td></td>
</tr>
<tr>
<td>Addition with multiples of five within 100</td>
<td></td>
</tr>
<tr>
<td>Subtraction of a multiple of ten from a 2-digit number within 100</td>
<td></td>
</tr>
<tr>
<td>Addition of two 2-digit numbers within 100</td>
<td></td>
</tr>
<tr>
<td>Subtraction of a multiple of five from 100</td>
<td></td>
</tr>
</tbody>
</table>

*Organising the clinical interviews*

At least three clinical interviews (Ginsburg, 1997) were carried out with each child, starting with one in the Summer Term 2010, one in the Autumn, and one planned for the Spring Term 2011. Each interview began with a task based on the child’s understanding of number, indicated for the first interview by the initial assessment, and in subsequent interviews by the previous interview. In this section, I shall consider practical aspects of planning the interviews, including the content, venue, timing and recording of the interview.

The aim was to investigate the child’s answers or solutions to problems, but also the ways in which they interpreted a situation and the methods they used to solve a
problem. Before the first interview, I explained to each child that I was trying to find out more about how children learn mathematics, and I was especially interested in finding out about things they found hard to do, or they did not understand, because this would help teachers do a better job. To help me, I would sometimes ask them to explain how they did something.

The initial task for each interview was planned in advance, but most activity was contingent on the child’s responses on the day. In order to be able to explore the child’s thinking as each interview proceeded, I assembled a zipped bag of equipment that would support activity and discussion in the areas of counting and calculating. The equipment is listed in Table 3.3. Items were packed in a mixture of small bags and boxes that would be attractive to children; everything was kept in the zipped bag until I thought it might be useful, when I could provide children with a choice of materials for a particular purpose (whilst trying to ensure that the choice was not overwhelming or distracting). For example, if we were going to count in twos, I could offer real 2p coins, plastic £2 coins, using centicubes fixed in twos, or using pairs of single items. The child could also choose to use drawing or writing to help them. The variety of equipment was planned to engage the child’s interest, and to give them control over the methods they wished to use. It might help a child concentrate for longer, by providing an alternative medium to use when an initial focus was no longer successfully engaging them. The range of equipment was also chosen to enable me, where appropriate, to help the child make progress in one of the areas explored during the interview.
<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stationery for recording</strong></td>
<td>Pencils and pens; rubber; pencil sharpener.</td>
</tr>
<tr>
<td></td>
<td>Felt pens; silver pen.</td>
</tr>
<tr>
<td></td>
<td>Ruler.</td>
</tr>
<tr>
<td></td>
<td>Paper and card.</td>
</tr>
<tr>
<td></td>
<td>Sticky notes.</td>
</tr>
<tr>
<td></td>
<td>Blu-tack.</td>
</tr>
<tr>
<td><strong>Counting</strong></td>
<td>Boxes of plastic goldfish, 1960 pennies, florists’ beads, polished pebbles, and counters.</td>
</tr>
<tr>
<td></td>
<td>Bags of real 1p, 2p, 5p and 10p coins.</td>
</tr>
<tr>
<td></td>
<td>Bags of plastic 50p, £1 and £2 coins.</td>
</tr>
<tr>
<td></td>
<td>Wallet with token £5, £10, £20 and £50 notes.</td>
</tr>
<tr>
<td></td>
<td>Bag of centicubes (plastic connecting cubes)</td>
</tr>
<tr>
<td></td>
<td>Bead strings: 20 beads in 5s; 100 beads in 10s.</td>
</tr>
<tr>
<td></td>
<td>Bag of Dienes’ 100s, 10s and 1s equipment.</td>
</tr>
<tr>
<td><strong>Generating examples and representing numbers</strong></td>
<td>Dice (1-6, 0-5, 0-9); spinner.</td>
</tr>
<tr>
<td></td>
<td>Pack of playing cards.</td>
</tr>
<tr>
<td></td>
<td>Digit cards (showing 0 to 9).</td>
</tr>
<tr>
<td></td>
<td>0-20 cards and 0-100 cards.</td>
</tr>
<tr>
<td></td>
<td>Place value cards (showing 1 to 9, 10 to 90 and 100 to 900; sometimes called ‘arrow cards’).</td>
</tr>
<tr>
<td></td>
<td>Number lines marked 0 to 20 and 0 to 100.</td>
</tr>
<tr>
<td></td>
<td>I metre tape measure marked in centimetres.</td>
</tr>
<tr>
<td></td>
<td>100 square (i.e. an array of numbers 1 to 100 in rows of ten).</td>
</tr>
<tr>
<td><strong>Other equipment</strong></td>
<td>Calculators (two different models).</td>
</tr>
<tr>
<td></td>
<td>Game/s taken for child for a specific interview.</td>
</tr>
</tbody>
</table>

During the course of each interview, I made notes of the problems or calculations I asked the child to complete, in order to keep a running record which would assist in
making decisions about what to do next. At the end of each interview, I asked the child whether there was anything they would like to borrow, to practise something we had explored.

I had permission to carry out the interviews either at the child’s home or in school. An interview at home would have had to be in the late afternoon after a day at school, when the child would be tired and the interview would encroach on usual family routines; there might additionally be difficulties in finding a quiet space to work. I decided to carry out the interviews in school, but it was important not to disrupt the child’s work by taking the child out of lessons at a time that was inconvenient or unwelcome to either the child or their teacher. Each school was offered a complete choice of times in the day when I was available; some teachers preferred me to see the child at the same time as their usual mathematics lesson, for up to the same length of time as the lesson; others did not want the child to miss their usual lesson, and preferred an afternoon time when their timetable was more flexible. On several occasions, interviews needed to be re-arranged because the child was absent, or the teacher had forgotten an activity such as swimming. Some schools had sufficient teaching space so that the interview could be in a quiet room with no distractions. In others, there would be time spent searching for somewhere to work, or the interview would be interrupted or had to be moved part-way through. In every case, school staff were as helpful and co-operative as circumstances allowed.

Records of each interview were made in several ways. The intention of recording was to capture the child’s speech, gesture and activity, using video recording, contemporaneous field notes, any paper-based work completed by the child during the interview, and additional notes made immediately before or after the interview. An audio recording was made as an additional source (in case of difficulties with the video recording) and to provide a sound file for initial transcription. Notes of the child’s activity and gesture, taken from the video material, were added to the transcription of the audio material on a later occasion; this provided an opportunity to check the original transcription and correct it if needed.

The need for simplicity in setting up the recording was paramount; the equipment had to be quick and easy to set up in a limited space, without access to electricity. The technical options available have become wider in the last few years, and two options
were considered: using a small digital camera such as a *flipvideo*, or using software such as *Photobooth* on a laptop. Small digital video cameras are commonly used in schools, and their small size can mean that children forget they are there. The operator does not have to stay behind the camera all the time, but it is only possible to check what is being filmed by looking from behind the camera. It can be used to record work in close-up with one child, or across a larger group. *Photobooth* has not commonly been used in schools, but many children are familiar with this or similar software, as it is provided on many laptop computers to record short pieces of film to send to your friends via social networking sites. It is set up by opening the laptop and clicking on the *Photobooth* icon; the camera position is adjusted by changing the angle of the laptop screen or turning the laptop slightly, and an interviewer who is sitting next to the child, can see what is being recorded without having to move. The child and adult can see themselves on the laptop screen (as though in a mirror) whilst the video is recording, and it is most suitable for close filming, not for wider areas.

The value of video material in research, allowing the researcher to watch and consider an episode again, was discussed by Stigler, Gallimore and Hiebert (2000), but they noted the potential problem of the *camera effect*, where awareness of the camera changes the behaviour of the person being filmed. (They also commented that they did not feel this was a major problem, and that there might similarly, for example, be a *questionnaire effect* if that was the means of collecting data). This might indicate that a less obtrusive method of filming would be best – such that the child ‘forgot’ the camera was there. However, that in itself raises ethical issues (Robson, 2011) and the open nature of *Photobooth* seemed especially appropriate when recording looked-after children’s work, so this was the method chosen. The overt nature of the filming seemed reassuring: for example, in his first interview Kyle commented “I can see what you’re watching when I’m doing stuff.” In the first interviews with each of the five case study children, four commented favourably, in unsolicited remarks, on being able to see what they were doing on the laptop screen; the fifth, Millie, seemed disinterested during her first and second interviews, but before her third interview, when I unpacked counting equipment before my computer, she said anxiously, “You haven’t forgotten your laptop have you, for filming me?”

Cheeseman (2009) has commented that one-to-one conversations with children about their work can encourage them to think seriously about their learning; in pilot
interviews with non-case study children that I carried out before beginning my fieldwork, to check the technical aspects of recording, the two children interviewed said that being videoed made them feel I was very interested in what they were doing. Williams (2011), when writing about videoing young children’s mathematical role play, conjectures that filming gives credence to the researcher’s request to ‘explain what you are doing’, and that it perhaps aids concentration.

Whilst it is possible to anonymise video material by, for example, pixellating the child’s face and ‘bleeping’ their name, this is technically time-consuming and can reduce data quality (Robson, 2011). In an attempt to anonymise the video recordings so that I could discuss them with colleagues, I had initially angled the laptop so that the child’s face was not visible on the screen, just their hands and torso. However, in every case apart from Millie’s in their first interview, the children either changed the laptop angle so that they could see themselves, or they physically ‘ducked down’ so that their face was lower and hence appeared on the screen. Millie said she ‘didn’t mind’ her face being filmed. This confirmation that they were happy to be filmed was helpful; and when watching the video material at a later point, it was useful to be able to see the child’s facial expressions. None of the children were under restrictions imposed by the courts about concealing their identities, and I confirmed with the local authority, the foster carers and the children themselves that I would only show the film to other teachers and people who were interested in children’s mathematics. Any sections that were unrelated to mathematics were deleted from the video record.

The accessibility of the controls for Photobooth did have one disadvantage: after one interview, the child concerned (Ronan) tried to replay the video but accidentally deleted it instead. The audio recording and field notes were used to transcribe that interview.

Studying the transcripts and video from each interview enabled me to improve my skills of questioning, commenting and choosing suitable lines of activity for future interviews (Rowland, 1995). In addition, I used four opportunities to present sections of video to groups of peers for discussion, all of which suggested additional issues to consider for future interviews, and for my analysis. These were presentations at BSRLM (British Society for Research into Learning Mathematics), March 2011; a University of Leicester research group, April 2011; the Cambridge Mathematics
Colloquium, May 2011; and SEMT (International Symposium in Elementary Mathematics Teaching, Prague), August 2013.

*Stimulated Recall interviews*

Lyle (2003) described stimulated recall (SR) as “an introspection procedure in which (normally) videotaped passages of behaviour are replayed to individuals to stimulate recall of their concurrent cognitive activity” (p.861). He noted that SR has been used extensively in teaching, counselling, nursing and medical research, language teaching and sports coaching (i.e. largely with adults). Contrasting the method with ‘think aloud’ techniques, where the subject is asked to comment on their cognitive processes whilst engaged in the target activity, he points out that this is difficult to do in many real-life problem-solving situations. Lyle suggests that to increase the validity of SR, ‘best practice’ would include making the retrospection as immediate as possible, and allowing the subject to make a relatively unstructured response.

My original intention was to use ‘think aloud’, questioning and observation during the clinical interviews as my methods of investigating children’s understanding. I had not planned to use visually stimulated recall, but the possibility arose after the first interview with Kyle. At the end of each clinical interview I gave children the chance to ask questions or choose a short activity of their own. When asked what he wanted to do, Kyle said he wanted to watch his own video, and to my surprise and delight then spontaneously gave a commentary. On this first occasion, I made field notes of his comments and where they were made in the sequence of the clinical interview.

Whilst Millie, my first interviewee, had ‘talked out loud’ in her clinical interview, and was able to discuss and explain the decisions she had made, in contrast, Kyle had made very little comment on his work during the original interview. As described by Lyle (2003), he had been absorbed in solving a problem, and could not simultaneously explain what he was doing. Watching the interview gave him the opportunity to both explain how he worked things out, and to identify what he had learnt. Kyle was also able to explain his gestures: as Tanner, Jones and Lewis (2011) noted in their study of pupils aged 5 to 7 videoing each other working, children are often able to interpret physical signs of thinking and concentration.
The additional information gained from this serendipitous recall interview was very illuminating, so I used the technique further. The software used, Photobooth, makes it easy to replay film straight away on the laptop screen (an additional advantage over using a flipvideo camera). However, SR interviews were not carried out every time, and were approached differently by each child. Whitebread et al. (2009), in their discussion of metacognition and self-regulated learning in young children, pointed to the difficulty that ‘think alouds’ may pose for those whose verbal understanding and fluency are less developed. This also proved problematic for some children engaged in SR interviews, and will be examined further in Chapter 5. For the planned stimulated recall interviews, children’s comments were audio recorded, and the transcription was added to the original version of the clinical interview.

*Additional assessments of child’s attainment*

Formal assessments of the child’s attainment, compiled in the year of study by the school or other external agencies, were sought. These were only available for the three oldest children: a detailed SEN (special educational needs) report for Kyle, and the national results at the end of Key Stage 2 for Dylan and Millie. In addition, I sought a copy of a Personal Education Plan (PEP) for each child; these are compiled about every six months for children in care, and I asked for a copy of the PEP written closest to July 2011 for each child, to see whether there were any targets set for mathematics, or any additional support offered for the child. However, there was no mention of mathematics on the three reports provided.

*Discussions with the child about their work in school and at home*

During the visit to each child when a clinical interview was held, an additional short interview was sometimes planned, to explore issues including the child’s recent work in the classroom (using their exercise book or mathematics folder as a focus) and their views on what helped them learn. This discussion was audio-recorded, but not video recorded. Since the interviews spanned two school years, the intention was also to explore issues relating to transition. For most children, the second interview was after
they had had a change of teacher and/or classroom support, and there could be
discussion about any differences they had experienced in their mathematics teaching.

The interview schedule is shown in Table 3.4 below, and was used as a basis for
discussion as appropriate to each child. I wanted to provide the opportunity for the
children to express their views about the factors influencing their learning, although I
anticipated that some children might find this difficult (McIntyre, Pedder and
Rudduck, 2005).

Table 3.4: Schedule for interview with child

<table>
<thead>
<tr>
<th>AREA OF INTEREST</th>
<th>POSSIBLE FOCUS OF QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s mathematics in school</td>
<td>What are you working on at the moment? Who do you work with (children and adults)? Do you always work with the same people? Do you enjoy mathematics lessons? How are you getting on? What do you think helps you to learn better? What makes it difficult to learn?</td>
</tr>
<tr>
<td>Links with home</td>
<td>Do you have homework? How does that go? Who helps you at home?</td>
</tr>
<tr>
<td>Mathematics at home</td>
<td>Do you do anything (apart from school-set homework) at home that you think might help you with mathematics?</td>
</tr>
<tr>
<td>Transition</td>
<td>Summer term: Who will teach you next school year? Autumn term: How are you settling in? What is different about mathematics this year?</td>
</tr>
</tbody>
</table>

Child’s mathematics exercise books for 2009-2010

My original intention was to ask permission to photocopy extracts from each child’s
written classwork, whenever I had discussed those pages with the child or teacher. One school then offered to give me the child’s complete set of exercise books for that school year, as the books would otherwise be thrown away; when approached, the four other children’s schools also made their written work available.
The exercise books and photocopies of work that were provided by each school covered varying periods of time. Skye had only been in the school since the spring term, so her books covered February to July 2010; Ronan, Kyle and Dylan’s work was provided for the complete school year September 2009 - July 2010; Millie’s school had a policy of sending completed exercise books home, and passing on any incomplete books to the next year’s teacher, and I was given a photocopy of her work from June to September 2010, thus covering the end of one school year and the beginning of the next.

*Interviews with the child’s teachers and other relevant adults*

A semi-structured interview was held in the Summer Term 2010 with the teacher or other adult who worked with the child for mathematics. (In some schools, if children are in setted classes for mathematics, i.e. placed in a group based on a child’s ‘ability’ or attainment, their usual class teacher may not be their mathematics teacher; in addition, some children may be in a small group that is taught by a Teaching Assistant who is not a qualified teacher.) These interviews aimed to triangulate the child’s account, and to collect additional information from the adults who worked most closely with them, covering topics including the child’s progress and behaviour in mathematics. The interview schedule shown in Table 3.5 provided starting points for discussion. The interviews were repeated in the Autumn Term with the child’s teacher or other adult for the school year 2010-2011.
Table 3.5: Schedule for interviews with the child’s teachers and other adults

<table>
<thead>
<tr>
<th>AREA OF INTEREST</th>
<th>POSSIBLE FOCUS OF QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation of mathematics teaching</td>
<td>Setted classes or not? Attainment groupings?</td>
</tr>
<tr>
<td></td>
<td>How are groups chosen?</td>
</tr>
<tr>
<td></td>
<td>Adults and children that this child works with.</td>
</tr>
<tr>
<td></td>
<td>Who decides what work the child will do?</td>
</tr>
<tr>
<td>Child’s mathematics in school</td>
<td>How is she/he doing in mathematics?</td>
</tr>
<tr>
<td></td>
<td>What are you working on at the moment?</td>
</tr>
<tr>
<td></td>
<td>How far can she/he count, reliably?</td>
</tr>
<tr>
<td></td>
<td>Any additional support/interventions?</td>
</tr>
<tr>
<td></td>
<td>Any sources of advice/resources for you?</td>
</tr>
<tr>
<td>Links with home</td>
<td>Does child have homework? How does that go?</td>
</tr>
<tr>
<td></td>
<td>Arrangements for reports and sharing information.</td>
</tr>
<tr>
<td></td>
<td>View of help from home.</td>
</tr>
<tr>
<td>Transition</td>
<td>Summer term: Who will teach child next school year?</td>
</tr>
<tr>
<td></td>
<td>Autumn term: How is child settling in?</td>
</tr>
<tr>
<td>Effects of being in care</td>
<td>Any aspects of being in care that you think have had an impact on child’s mathematics?</td>
</tr>
</tbody>
</table>

Each school in England has a teacher who is responsible for overseeing the progress and provision for children with special educational needs; this role, of Special Educational Needs Co-ordinator (SENCO) is sometimes combined with that of the role of Designated Teacher for Looked-after Children. In some schools, the head teacher, SENCO, or Designated Teacher offered to be interviewed briefly. In view of the busy schedule of these members of staff, these interviews were necessarily short, but added useful information to each case study.

All interviews were audio-recorded wherever possible, and supplemented by field notes. In most instances, the adults’ interviews were on a separate day from that of the
child’s interview and required an additional visit to the school, at lunchtime or after the end of the school day.

*Interview with the child’s foster carer*

A semi-structured interview with the main foster carer for each child was scheduled for July, August or September 2010. In two cases, these were straightforward to organise; one was delayed until November because of illness, but two interviews were more problematic to arrange, and illustrate the difficulties referred to by Trout et al. (2008) in collecting data in this field.

Kyle’s kinship foster carer’s contact details from the social work records included two mobile phone numbers and a landline phone number, but all were found to be out-of-date. The school provided a more recent mobile phone number, but this had been discontinued. A further call to the social worker was unsuccessful in finding a current phone number. Two personal visits to the family home failed to find anyone at home. Eventually, the school let me know of a time that the foster carer was likely to be coming in to school, and I met the carer there, to arrange a time to interview her.

Dylan’s carer was easy to contact by phone, and we made an arrangement to meet early in the Autumn term; however, she had forgotten the arrangement when I called at her house, so the interview was rearranged. On that occasion, she expressed her anxiety about an interview, as she said Dylan had said on the previous day that he did not want her to talk to me. We arranged to meet at another time in the following week, after school, so that Dylan could be there and we could discuss the research more generally, and she and Dylan could then decide whether they wished to take part. A few days after that meeting, I telephoned again; Dylan had changed his mind, and wanted the carer to talk to me; the interview was arranged, then later rearranged once more, finally taking place in November.

The interview schedule shown in Table 3.5 provided the structure for discussion with each foster carer, tailored to each child’s circumstances. Interviews were held in the foster carer’s home. In some cases the child was present during the interview for part of the time, and contributed their views. At the beginning of the interview, before discussing the focus on the child’s mathematics, I confirmed the length of time that
the child had lived with the carer, and any other relevant background details. The aim of the interview was to explore the carer’s perception of the child’s attainment, progress and confidence in mathematics. In addition, if the foster carer consented, I discussed the carer’s own feelings about the mathematics they did at school, and their feelings about helping the child.

Table 3.6: Schedule for interview with the child’s foster carer

<table>
<thead>
<tr>
<th>AREA OF INTEREST</th>
<th>POSSIBLE FOCUS OF QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s mathematics in school</td>
<td>How do you think child gets on in mathematics at school? What does school tell you?</td>
</tr>
<tr>
<td></td>
<td>What does child tell you?</td>
</tr>
<tr>
<td>Links with home</td>
<td>Does child have homework? How does that go?</td>
</tr>
<tr>
<td></td>
<td>Who helps the child at home?</td>
</tr>
<tr>
<td></td>
<td>Arrangements for reports and sharing information.</td>
</tr>
<tr>
<td>Mathematics at home</td>
<td>Do you do anything (apart from school-set homework) at home that you think might help child with mathematics?</td>
</tr>
<tr>
<td>Transition</td>
<td>Child’s response to changes over the summer holiday.</td>
</tr>
<tr>
<td>Foster carer’s own experience</td>
<td>How did you get on in mathematics when you were at school?</td>
</tr>
<tr>
<td>of mathematics at school</td>
<td></td>
</tr>
</tbody>
</table>

The interviews were audio-recorded for four carers, and three then provided additional information afterwards, as they showed me out of the house. This was added to field notes. Dylan’s carer did not want to be recorded (because she said she didn’t like the way her voice sounded) so field notes were used for her interview.

Data from the Local Authority and interviews with LA staff

Information held centrally by the local authority team for raising the educational achievement of looked-after children was accessed at three points in the study.
Initial background information for each child was collected through Vanessa Jones (the link member of the LA staff for this study) in April 2010, at the point where the case study sample children were chosen, and has been described previously.

In March 2011, before the third clinical interview had taken place with each child, I met with Vanessa again at her office, where she had the children’s paper-based case files and access to the LA database. For reasons of confidentiality, I could not have direct access to the files, but Vanessa was able to provide the following information, anonymised where needed:

- The month and year when the child first came into care;
- The child’s care history: the month and year of any changes in carer or return to family home;
- Their school history: the month and year of any changes in school; the names of the schools attended (which would allow me to find Ofsted reports for those schools);
- Confirmation of whether the child had a Statement of Special Educational Needs, and the prime reason for this;
- Any other significant information about life events, contact with birth family, or immediate plans for the child, where relevant to the study. In most cases, this was information to confirm issues that had been raised by school staff, foster carers or the children themselves in earlier interviews.

Vanessa left her post in the summer of 2011 after a further reorganisation in the LA. During the autumn term 2011, it was difficult to establish who should be my contact, to collect further data. A meeting in December 2011 with the elected councillor with responsibility for children’s services resulted in a meeting with the newly-appointed part-time Virtual School Head (VSH) for looked-after children for the LA in January 2012. The VSH agreed to provide copies of the PEP (Personal Education Plan) for each child for their review meeting closest to July 2011, so that any aspects of these local authority plans relating to mathematics education could be examined.

*Reports from OFSTED on individual schools*

Ofsted (Office for Standards in Education, Children’s Services and Skills) is the government agency that inspects schools in England and provides reports on the
standards achieved in teaching and learning within each school. These reports are freely available on the Ofsted website: www.ofsted.gov.uk. In order to provide guidance on the effectiveness (as judged by Ofsted) of each school that my case study children had attended, I examined the reports for the period the child attended. These reports are not listed separately in my list of references, as this would identify the schools concerned.

**Data management**

The data collected for all five children are summarised in Table 3.7 (and provided in a larger format in Appendix D). A simple system of numbering, prefixed by the initial of the child’s pseudonym, has been used to list each element of the data in chronological order – for example, Skye’s data is listed as items S1, S2, S3 and so on. These codes are used to identify the source of evidence in the chapters that follow, with a brief description – for example, “S3 clinical interview”.

**Data storage**

Lists of the data collected for each child individually are also included in Appendix D, giving details of the type of material collected (for example, audio, video or paper-based evidence). Paper-based records have been kept in separate files for each child; text, audio and video digital files were stored (with password protection) on a personal laptop and additionally on a separate hard drive.
Table 3.7: Summary of case study data collected

<table>
<thead>
<tr>
<th>Child &amp; DOB</th>
<th>Initial Interview</th>
<th>1st interview with child</th>
<th>Recall interview</th>
<th>Interview with Teacher</th>
<th>2nd interview with child</th>
<th>Recall interview</th>
<th>Interview with LAC team member</th>
<th>Final Letterbox tests (if RG)</th>
<th>3rd interview with child</th>
<th>Recall interview</th>
<th>Other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye</td>
<td>28/04/10 (SENCO)</td>
<td>S1</td>
<td>YES</td>
<td>12/05/00</td>
<td>S4</td>
<td>S6</td>
<td>S7</td>
<td>S8</td>
<td>20/12/10 (Teacher)</td>
<td>S9</td>
<td>YES</td>
</tr>
<tr>
<td>Roman</td>
<td>02/02</td>
<td>R1</td>
<td>2/01/10</td>
<td>2/05/10</td>
<td>R3</td>
<td>R4</td>
<td>R5</td>
<td>R6</td>
<td>3/02/11 (TA)</td>
<td>R7</td>
<td>R8</td>
</tr>
<tr>
<td>Kyle</td>
<td>12/00</td>
<td>K1</td>
<td>YES</td>
<td>7/01/10</td>
<td>K4</td>
<td>K5</td>
<td>K6</td>
<td>K7</td>
<td>10/01/10 (Teacher)</td>
<td>K8</td>
<td>K9</td>
</tr>
<tr>
<td>Dylan</td>
<td>03/00</td>
<td>D1</td>
<td>7/01/10</td>
<td>14/03/00</td>
<td>D2</td>
<td>D3</td>
<td>D4 + D5</td>
<td>D6</td>
<td>22/11/10 (Teacher)</td>
<td>D7</td>
<td>D8</td>
</tr>
<tr>
<td>Millie</td>
<td>04/00</td>
<td>M1</td>
<td>YES</td>
<td>28/03/00</td>
<td>M2</td>
<td>M3</td>
<td>M4</td>
<td>M5</td>
<td>27/03/00</td>
<td>M6</td>
<td>M7</td>
</tr>
</tbody>
</table>

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Transcription

Transcription of each interview was carried out initially by one of two paid assistants (both briefed in regard to confidentiality), using the audio files, and following an agreed format (see Table 3.8). The two people concerned were chosen because they were familiar with the local accent and had both worked with children extensively; this meant they were able to provide relatively complete transcriptions. I then reviewed each draft transcript while listening to the audio record or watching the video material, to correct where needed and to add information about relevant actions. The audio and video materials provide more information about each interview than a transcript alone (Preissle, 2011), but the combination of audio, video and paper-based media to study has been very useful.

Table 3.8: Conventions used for transcription

<table>
<thead>
<tr>
<th>Item</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name, place, date, in capital letters</td>
</tr>
<tr>
<td>Each conversational ‘turn’</td>
<td>Numbered on left-hand side</td>
</tr>
<tr>
<td>Speaker</td>
<td>Identify by first name only</td>
</tr>
<tr>
<td>Actions</td>
<td>In italics below speech</td>
</tr>
<tr>
<td>Timing</td>
<td>List time into interview at one minute intervals, to facilitate searching on audio or video records</td>
</tr>
<tr>
<td>Recall interview commentary</td>
<td>Add to initial transcript using second colour. If needed in black text, then tabbed to right-hand side of page and marked ‘child’s commentary’</td>
</tr>
</tbody>
</table>
Data analysis

Stake (1995) expressed the purpose of analysis in a case study very straightforwardly: the aim is to understand the case. This could be achieved both through direct interpretation (finding the meaning in one element), and through ‘categorical aggregation’ (by categorizing elements from the data, to make it possible to see patterns). For each child in my multiple-case study, I wanted to consider how and why something happened; to consider each child’s case individually, but also to look across each case for common experiences and themes.

Yin (2009) noted that the analysis of a case study will be shaped by the theoretical propositions that led to the case study; also, that analysis does not just come after data collection, but is in process throughout the study. My original questions, along with my theoretical propositions that the child’s attainment would be affected by school-based, family-based and child-based factors (shown in diagram 1.1), together provided a structure for my analysis and reporting. The data collected has therefore been organised and analysed using two broad domains – that relating to the circumstances around each child in school and at home (considered in Chapter 4), and that relating to my direct mathematical work with each child (reported in Chapter 5).

My first step in the process of analysis was to familiarise myself with the raw data (for example, from repeated study of my field notes, transcripts and recordings), often making notes of my ideas (memoing).

Care and school timelines

An initial concern when considering each child’s current position was to present a clear picture of their life history until the point where I met them, looking at changes in their family situation and school placements. When social workers provide this information for foster carers or schools, it is usually in continuous prose or in note form, but this can feel difficult to interpret. I devised a diagrammatic format to show the principle changes in each child’s life as two parallel bars on a timeline. The initial versions of these timelines were piloted with colleagues and with a small group of teachers, and refined following their comments. The diagrams are described in further detail in Chapter 4.
Analyzing interview data

The majority of data available relate to the interviews with children, teachers, foster carers and other adults; the transcriptions, audio and video material together were analysed using constant comparison (Miles and Huberman, 1994; Boeije, 2002; Thomas, 2009), where themes or categories are identified during repeated examination of the data, to assist in drawing empirically based conclusions from the study.

Appendix E includes examples to illustrate this process of analysis. The initial step is to identify temporary constructs, beginning to identify ‘codes’ or phrases to label an element of the data, to begin to make the data more manageable: an example of how I did this is included as Appendix E.1, showing the annotations I made on the first half of the interview with a foster carer. Many of the phrases I used were ones that I expected to see, based on my previous experience and my initial theories (such as ‘carer knows child’s attainment in mathematics is low’). Some were ideas that the data exposed, but that I had not predicted (such as ‘carer can give detailed observation of child’s difficulty’), thus leading to theory that was ‘grounded’ in the data (Robson, 2011).

I underwent a process of comparing elements of the data in different ways, to begin to clump codes together in a thematic way, all the time looking for what was similar and what was different between the different cases. Appendix E.2 provides an example of an interim comparison between the two boys who were coincidentally at the same school, within the themes addressed later in Chapter 4. Sometimes I concentrated on examining one child’s experience across several themes: Appendix E.3 shows a summary of one child’s mathematical experience, using the themes of ‘progress and motivation’ and ‘productive approaches’, which are considered in Chapter 5. I used the structure of this summary several times, both revising earlier versions that I did for this child, and providing a similar template to compare with each of the other four children, each time additional data were collected.

As Yin (2009) outlined, case study research is an iterative process, where themes may be developed and examined further as the study progresses; similarly, explanation-building proceeds iteratively as any initial propositions about the causes of low attainment in mathematics were tested against the evidence from each case in turn.
The search for patterns (Stake, 1995) has been matched with the recognition that the experience of each child has some unique features, too.

**Letterbox Assessments and other measures of attainment**

The Letterbox assessment items taken at the beginning and end of the period of field work were compared, both for any change in the child’s level of attainment, and to examine which individual items showed improvement. Wherever possible, I also compared my own observations and assessments of the child’s mathematical understanding, with assessments made by adults other than myself.

**Analysis of child’s written work in their exercise books**

Ofsted (2012), in their report on issues in teaching mathematics in England, noted that the scrutiny of pupils’ books was a common strategy for school leaders to use when monitoring the quality of teaching. These paper records of the child’s work were examined to contribute to a picture of the curriculum offered to the child, the time spent on each topic, the child’s methods, pace of working and contribution to the work, and the methods used by the teacher or other adult when marking the work or offering written advice. I do not assume that these paper records reflected all of the mathematics undertaken by the child, but they did provide an indication of the child’s experience in the classroom. One tool used was to list the topics presented to a child each day across a four-week period (excluding school holidays), as evidenced in their written work, to see how frequently the topic changed from one day to the next. Some material was also used as the basis for discussion with the child who had written it, and provides illustration of wider conclusions in the following chapters.

**Ethical issues**

The key issues for my study were those of permissions, making the purpose of the research clear, informed consent, confidentiality, and minimising the impact on the workload of participants; I also sought to make participation in the study as enjoyable and purposeful as possible (BERA, 2004). Some of the practical ways these aims were achieved have already been discussed earlier in this chapter.
I had written permission from the Lead Member of Staff with responsibility for looked-after children for the local authority to carry out my study; I read the child protection policy for the LA involved, and I provided a copy of my full current CRB (Criminal Records Bureau) disclosure document, a curriculum vitae and names of referees. Each school in the study also scrutinised my CRB document, and was provided with a copy.

Ethical issues are central to research with children. The British Educational Research Association guidelines (2004) include a section about research with children, which begins by stating the United Nations Convention on the Rights of the Child: ‘that in all actions concerning children, the best interests of the child must be the primary consideration’. (p 6). The guidelines anticipate the possibility that it may in some cases be necessary to keep the purpose of research covert, but in my research it was very important that the children taking part knew why they were doing so and gave informed consent, both to improve the reliability of the data, and to avoid the child assuming that there was a ‘hidden agenda’ in my meetings with them – for example, because they may have thought that any adult they met with individually might have some influence on where they lived or where they went to school.

Many authors (for example, Hall, 2005; Kellett and Ding, 2004; Thomas, 2009) discuss two differences between research with adults and with children, and which need ethical consideration. Firstly, children’s possible lower levels of competence may affect their ability to contribute through a particular research method (for example, young children’s reading levels or linguistic understandings may be less developed). Secondly, there is an unequal balance of power between an adult researcher and a child (who may feel they cannot disagree with the adult, nor say things which they think the adult might find unacceptable.) These two differences may also be evident between adult participants in the research process, of course. I have not used any methods that relied on the ability to read, for adults or children: mathematics assessments were completed through one-to-one interviews; I used interviews rather than questionnaires; all issues to do with explaining the purpose of the research and giving informed consent were discussed with participants, before they were given a letter summarizing the study and a consent form to sign. Wherever possible, I arranged interviews at times and locations that were chosen by the participants: Kellett and Ding (2004) note the importance of considering context and
In providing a more equal balance of power in this way. Additionally, as Mayall (2000) notes, I aimed to listen carefully to children, to “credit them with knowledge” (p.120) in a manner that aimed to confirm that their views would be taken seriously.

Confidentiality was discussed with the Local Authority member of staff with whom I liaised initially, as well as with all participants in the study, including children. I made it clear to the five children (and their corresponding adults) that all written references to them would be anonymized; any film or audio material I collected would predominantly be used by me, and small extracts might be used to show to teachers or other people who wanted to know more about how children learnt mathematics. I checked that none of the children was under a court order restricting access by specific adults; if they had been, I would not have shown their film to anyone else.

None of the material included information that could be used to identify the children’s foster carers, foster homes or families.

I considered the issue of imposing on people’s time carefully, although in many cases both adults and children were keen to continue beyond the time I had thought was the most I could ask. In return, I agreed that I would share any concerns or information I had that was likely to improve the child’s situation, and for one child (Kyle) I corresponded with the head teacher about my concern that he might need a specialist assessment for specific learning difficulties. I was asked by some foster carers and teachers for ideas as to how they could help their children, and I aimed to give at least one suggestion, or to confirm that something they were doing already was likely to help. Where appropriate, I referred people to other sources of advice or support.

One aspect of the research that I had not anticipated was the role of my own emotions during fieldwork. Alderson and Morrow (2004) discussed ways in which researchers may respond to children’s or adults’ distress or anger. Whilst my own experiences as a foster carer and adoptive parent have made me knowledgeable about issues of attachment, loss and trauma, I had not initially realized the impact that talking to the children might sometimes have on me personally, in raising old worries and triggering sadness. I have dealt with this by using familiar techniques to relieve stress; I have also been aware that sometimes I have needed to revisit data (particularly from interviews) after time has passed, to review it with a less emotional response. In
presenting my findings in the next few chapters, I endeavour to provide a balanced view of the five children and their situations.
4. THE CHILDREN, THEIR FAMILIES AND THEIR SCHOOLS

This chapter aims to do three things:

- to outline the five children’s backgrounds and their family circumstances;
- to explore the experience that their schools were able to offer them, including how their mathematics teaching was organised;
- to examine their experiences of mathematics at home and the links between home and school.

Chapter 5 will consider details of the children’s strengths and difficulties in number, and their views of mathematics learning and teaching.

In this chapter, after general introductory information, each child will be considered individually in order of their age, beginning with the youngest. In a final section, I will then discuss themes that emerge from this part of the study.

A list of the children and the adults concerned is shown in Table 4.1.
**Table 4.1: List of children, foster carers, schools and teachers/teaching assistants**

<table>
<thead>
<tr>
<th>Child and year group</th>
<th>Foster carers</th>
<th>School/s</th>
<th>Head teacher</th>
<th>Teacher/s and TAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye Y3 to Y4</td>
<td>Kate and Amy</td>
<td>Armthorpe</td>
<td>Ms Adam then Ms Andrews</td>
<td>Janet Allen then Kelly Asher</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ronan Y3 to Y4</td>
<td>Debbie and John</td>
<td>Brookhouse then Cranfield</td>
<td>Ms Brown then Mr Cooper</td>
<td>Claire Berry then Alanna Coates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyle Y4 to Y5 to Y6</td>
<td>Brenda and Leroy</td>
<td>Brookhouse then Duncroft</td>
<td>Ms Brown then Mr Davis</td>
<td>Peggy Boden Blanch then Brian Black then Emma Denton</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dylan Y5 to Y6</td>
<td>Chantelle</td>
<td>Elmswell</td>
<td>Mr Elliott</td>
<td>Jill East then Lucy Earl</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millie Y5 to Y6</td>
<td>Sue and Philip</td>
<td>Flexford</td>
<td>Ms Fisher then Ms Fox</td>
<td>Jessica Fellows</td>
</tr>
</tbody>
</table>

*N.B:* All names are pseudonyms. Children and carers are known by first names only; Initial letter of school name is used as initial letter of head teachers’, teachers’ and TAs’ surnames.

**Outlining children’s backgrounds and family circumstances**

Each case study child’s circumstances were different. Four of the five children were removed from their birth parents (at ages 3, 5, 6 and 7) because of neglect or abuse, and one child was taken into care soon after she was born because of a family breakdown. All five children had arrangements for continued contact with some members of their birth families, but these varied in their frequency and reliability. The children’s care placements also varied in their level of permanency, the previous experience of the foster carer/s, and the composition of the family.

Whilst the five children had all been taken into care by the same local authority, their foster carers did not all live in that geographical area, and their school placements were not all within the same local authority.
In England, central information about each child in care is held in a ‘case file’ by staff at local authority (LA) level, and can then be shared with foster carers and school staff (which may include the head teacher, designated teacher for looked-after children, class teachers and teaching assistants). The level of detail provided to each adult can depend on the way in which staff interpret ‘confidentiality’, with some staff (wrongly) assuming that confidentiality means as little information as possible should be shared (Davies and Ward, 2012). However, a basic, anonymised knowledge of the child’s care and school history may help an adult to appreciate some of the child’s potential difficulties. The central records held by the LA cannot be anonymised, so cannot be shared directly; foster carers and school staff will generally be given a report by the child’s social worker, which may not include full details of the child’s previous care or school placements, but will commonly provide a list of dates, exemplified in Table 4.2 (with anonymised dates) for Skye, the youngest child in my study.

**Table 4.2: Care and school history for Skye.**

<table>
<thead>
<tr>
<th>Date of birth 7/7/02</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4.09 to date: placed in long-term care with younger sister</td>
</tr>
<tr>
<td>12.9.05 – 12.2.10 Greenview Primary School</td>
</tr>
<tr>
<td>15.2.10 to date: Armthorpe Primary School.</td>
</tr>
</tbody>
</table>

(Source: S11, interview with LA staff member Vanessa Jones, and school records)

Because such lists can be difficult to interpret, I devised a diagrammatic representation of the information, to give a summary of each child’s circumstances as a timeline. My aim was to show changes in the child’s care or school placements in a manner that also represented the proportion of their life that had been spent in any one place.

Each diagram shows the child’s care placements on the upper line, matched against the child’s school placements on the lower line, with the child’s age (in years and months) along the base. For example, Figure 4.1 is the timeline for an ‘average’ child aged 11, who has not been in public care, and who started school at age 4:
I have used colour on the timelines to provide additional information:

- On the care part of the timeline, green indicates a placement that was intended to be permanent; pink indicates a temporary placement.
- On the school part of the timeline, green indicates a school that was recorded as ‘good’ or ‘outstanding’ by Ofsted (the official body for inspecting schools in England) in school inspections covering that period; orange is used for a school in the lower two categories, which were called ‘satisfactory’ and ‘inadequate’ at the time of this study.

Figure 4.2 provides a fictional example for a child taken into care at age 4. The first placement was temporary, and the child was moved to a permanent placement at age 6. The child started school at age 5, in a school in a lower Ofsted category, but moved school at age 7 to a school in a high Ofsted category. The child was aged 10 years 6 months at the point where the diagram was compiled.

In 2011, 53% of schools in England were in the two higher Ofsted categories, whilst 39% of schools were deemed ‘satisfactory’ and 7% were ‘inadequate’. This does not necessarily indicate that the child’s experience in a lower category school would be poor; however, it is likely to indicate a school that is under greater pressure.
the last seven years, government policy has been that children in care should be given priority for places in ‘good’ schools (DfES, 2007).

The experience that school offers the child, and links with home

For a child who has come into care, building a good relationship with their carers and teachers is important, and this takes time and commitment on the part of the adults concerned. Issues of attachment, trauma, loss and the effects on the child’s ability to form positive relationships were discussed in Chapter 2. Cairns and Stanway (2004) described the need to ‘learn the child’: that the adults around the child in care need to begin to understand and manage this individual child’s behaviour – acknowledging that it is not possible to provide a simple recipe for success. For each child, I have tried to examine the opportunities that the school provided for them to form good relationships with key adults and with other children, in order to promote subsequent positive effects on their educational attainment.

In terms of the child’s mathematical development, I have considered that each child needs an adult who is able to judge what is an appropriate level and type of remedial help for the child, and there then need to be good arrangements for this support to be provided. Help from school and home should complement each other, and communication between school and home might be important in making this partnership effective.

Sources of data

Table 3.7 in the previous chapter and Appendix D provide a summary of the data collected for each child. This chapter draws upon interviews with the adults in school and at home, discussions with each child, public information about the schools (from Ofsted and the schools’ own websites), and scrutiny of the children’s exercise books.

A care and school timeline is provided for each child in the reports that follow, using the LA data from Vanessa Jones (interview in March 2010 giving data for each child, listed as S11, R8, K10, D11 and M9), and checked against school data where there was any discrepancy.

I have quoted from transcripts of interviews using two conventions to show conversational turns:
• For exchanges between two people (usually myself and the interviewee), turn numbers are provided on the left-hand side of the text.

• For quotes where my contributions merely aim to encourage the interviewee, such as saying “Mm, yes…” my comments are omitted. Instead, the interviewee’s comments are given without interruption; the symbol // is used to indicate the end of each turn, and turn numbers are shown in brackets afterwards.

The children’s reports follow a common sequence: background information; the experience offered in the year group they were in at school when this study began; the foster carer’s views; and lastly, the experience offered in their later year group/s.
SKYE

Skye was aged 7 and in Year 3 at the beginning of the study. She was from a family of more than ten children who came into care together from a ‘chaotic’ household. Skye and her next-younger sister Marie (aged 6) were placed with long-term foster carers Kate and Amy, who had not had children before.

Contact between all of Skye’s siblings and her birth parents was to be arranged four times a year, at a large play centre during school holidays. In between, contact would be with smaller groups of the children and the birth parents.

Figure 4.3: Care and school timeline for Skye as at 9.03.11

As is often the case when children move families, Skye and her sister did not change school immediately in April 2009, but were taken by taxi each day to their previous school, Greenview. In discussions with social workers, including in my experience as a foster carer, I have been given several reasons for this practice. Continuity of schooling for an interim period may be recommended to reduce the number of changes that a child has to experience simultaneously, allowing them to keep contact on a temporary basis with peers and teachers who know them. Additionally, even when a care placement is intended to be permanent, there is a risk that it will break down, and the social worker may decide to keep the school placement the same for a while, in case the child needs to move again. However, a lengthy period of ‘overlap’ has disadvantages, and Kate, Skye’s foster carer, was clear that she and her partner had wanted Skye and Marie to change schools much sooner (interview with carer, S7). Kate had not had much contact with Greenview because of the distance. The girls’ taxi journeys were long (30 minutes) and boring, sometimes unreliable in their timing, and made it impossible for them to join in after-school activities or to play.
with friends. They arrived home tired, often having argued with each other during the journey. The girls had not been able to make friends in their new neighbourhood, to play with at weekends, because they were not at the local school; Kate had also hoped to start getting to know other parents with children there, and this had not been possible. Her major concern, though, was that Greenview’s performance was deemed to be ‘inadequate’ by Ofsted, and she felt Skye and Marie would not make much progress until they were moved to their new school. Skye and Marie had finally been moved to Armthorpe at the February 2010 half-term, after about ten months of being taxied. The foster carers would have been happier if they had moved school six months earlier, to start the new school year at the same time as their classmates.

The experience that school offered Skye

Some contrasts between the two schools that Skye attended can be seen in the summary information from the Ofsted website (accessed December 2011).

- Greenview Primary, for ages 3 to 11, had 240 pupils on roll; 61% on Free School Meals (FSM). Last three Ofsted reports to April 2009 (when Skye came into care): all ‘Inadequate’.

- Armthorpe Primary, for ages 4 to 10, had 180 pupils on roll; 14% on FSM. Last three Ofsted reports to April 2009: all “Good”.

The percentage of children on Free School Meals gives an indication of the catchment area that the school serves, showing levels of poverty amongst local families.

Skye’s new headteacher, Ms Adam, said that Armthorpe Primary had had very few children in care over the years she had been there, but that she had previously been deputy at a school similar to Greenview, so she had extensive experience of working with looked-after children (interview with head, S2). Ms Adam had met with the Head and SENCO (Special Educational Needs Co-ordinator) from Greenview to discuss Skye and Marie, before they changed school, but the discussion had mainly been about Marie. Ms Adam described Skye as “a very interesting little girl”.
Skye in Year 3 at Armthorpe with her teacher, Janet Allen

Ms Adam said that Janet Allen was her most experienced teacher and was also the SENCO for the school. Janet was affectionate with Skye, holding her close while we were introduced, and patting Skye’s shoulder encouragingly when we set off for our first interview.

I interviewed Janet Allen in July 2010; Skye had been with her since February. Janet described her classroom organisation for numeracy as being mixed ability, with children in groups based on attainment. One child in the class of 27 pupils had a statement of SEN, and there was a teaching assistant (TA) who worked with that child and Skye together. Another TA worked with a small group of low-attaining pupils, and Janet concentrated on the average achieving group and the high achieving group. Janet planned work for all the children in her Year 3 class, across a wide range of attainment. In addition to daily numeracy lessons, she set aside time first thing in the morning, where she or one of the two TAs worked with the lowest-attaining children on something connected to the numeracy lesson for that day.

The information provided to Armthorpe by Greenview Primary was given in terms of National Curriculum levels for Skye – that she was at level 2C for mathematics, and at a lower level, 2B, for reading. Consequently, the work that Janet had set for the TA to do with Skye when she arrived at Armthorpe was on topics pertaining to level 2 and early level 3, but she had begun to feel uneasy about the assessment. “I did have a few alarm bells ringing and I thought, no, I can’t really say she’s a 2C… but she’d been through huge change, and I felt that that would impact on her learning” (S5, turn 68). Janet had then used the Letterbox Club assessment (S1) with Skye at the end of April and had adjusted her work to level 1 as a result. Skye’s exercise book (S6) illustrated this change. From February to April, Skye completed very little work, and it was often marked ‘with LSA support’, indicating that the TA had helped Skye reach the right answers. The TA had not commented to Janet that she felt the work was too difficult for Skye, because she also felt this was a ‘settling in’ period. From the beginning of May, after Janet assessed Skye and decided to concentrate on addition and subtraction within 20, the quantity of work increased and there was a higher proportion of independent work.
Janet was keen to discuss my clinical interview with Skye in detail, and I outlined Skye’s response when I gave her two 2p coins and 3 pennies, and asked her how much this was. Skye had counted the three pennies, but then started again with the 2p coins:

21 Rose She went ‘two, four’, and then there was a big, deep breath, ‘five, six, seven’.

22 Janet That was really good then. Fantastic.

23 Rose That was excellent. Really, really big step forward there.

24 Janet We’ve done a lot of work on twos and 1ps ever since we did the Letterbox test because what it revealed to me, because when she did it with me, she went, regardless of the amounts of the coins, she just counted in single units. So one, two, three, four, five is what she would have said for that one.

25 Rose Yes.

26 Janet Every coin, even though we talked about them, she always counted as one. And she quite frequently got half way through and then needed to go back to the beginning as well. So that became her target then. I think we worked on fives, twos and ones.

(S5, interview with teacher).

Janet’s comments on Skye’s work were all couched in very positive terms. She said that Skye was the youngest in the class, but although she was not able to manage problem-solving, she was very good with shape, enjoyed drawing, loved singing, and was keen to learn. Janet said that if she had had Skye next school year, she would have been singing times tables, and finding ways of presenting number patterns visually; Skye was good at dance and loved football, and this breadth of interests meant there were many contexts in which numeracy could be introduced. Janet said Skye asked questions frequently: “She was constantly asking, when we were on the carpet, ‘What does that mean? What does that mean?’ and I think it’s genuine, // I don’t think it’s an attention seeking thing…” (turns 102 and 104).

Janet noted that repetition was necessary for Skye:
What she can do one day, she’ll need repeating the next day, and the next day, and the next day… And she wants constant feedback on how she’s doing. She obviously wants that, to know that she’s doing well. She’s really, really keen to please, isn’t she!” (turn 138).

Skye’s pleasure in coming to school had been evident when Janet was ‘on duty’ one dinnertime, supervising children queuing to go into the hall. A child from another class, queuing near Skye, muttered “Oh, I hate school”. Janet said:

Skye turned round and said, ‘Do you? I love school, I do. I really love it.’ And I thought, yeah, that sums Skye up, actually. She’s grabbing every opportunity she’s got, for everything. (turn 192).

Janet said that Skye was very open about her family situation:

She talks about going to contact, she talks about playing football with her dad. She’s talked to me about her brothers and sisters. // She quite often refers to one that’s in the war [i.e. serving in the army], and gets a bit stressed about that sometimes. (turns 226 and 228).

I asked about homework and contact with Skye’s foster carers. Janet said that both carers had been to parents’ evenings, to talk about Skye and her sister. Homework was provided in a separate book called a ‘learning log’, and taken home in their book bag, but this had not got underway yet: “Maybe I should have been a bit more on the ball, but they’ve got a lot of things to try and get into place” (turn 208). One problem was that the girls could not take their book bags home on days when they were collected from school to go on contact visits with their birth family, and this often included Friday nights, so they sometimes did not have their homework over the weekend, “which is when a lot of parents or carers have got the time to sit with their children and do something” (turn 216). Janet hoped that Skye’s new teacher would be able to establish a better routine at the beginning of the next school year.

Janet Allen and Ms Adam (the head) both retired that summer, so Arnhthorpe Primary School had a new head teacher, Ms Andrews, for the beginning of the school year in September 2010, and Skye and her class had a new teacher, Kelly Asher.
Skye and mathematics at home: the views of her foster carer, Kate

My interview with Skye’s foster carer, Kate, was in November 2010, about two and a half months after Skye had moved into Year 4. Kate was very welcoming and keen to talk. She did not feel that Skye had been anxious over the summer holiday about changing teachers. Kate and Amy had been to a parents’ evening, and knew that Skye was not doing well in mathematics at school, but Kate said she was not clear whether Skye was getting any extra help, additional to her normal lessons. Kate commented “both these girls have got some degree of learning difficulties, especially the younger one [Marie]” (S7, interview with foster carer, turn 62). Kate and Amy had talked to the school about whether Marie needed a formal assessment because of her evident special needs. “But the [new] teacher (Kelly Asher) did say that Skye, she’s realized that she needs things explained over and over and over again, and she does.” (turn 66).

Kate said that Skye brought her ‘learning log’ home on Tuesdays with homework, but it did not always include mathematics. When it did, she often felt the mathematics task was inappropriate for Skye:

Last week [it was] octagons. You had to draw a line within the octagon, to point out the isosceles triangle, which personally I think is way beyond Skye. I do (laughs). And I was struggling to explain it to her because it is obviously a long time since I have been to school. // I should imagine that was the general homework for the whole of the class and to me that’s not ideal. (turns 52 and 54).

I asked whether Kate did anything at home that she felt helped Skye with mathematics, and she showed me that she had bought workbooks, labelled by the age range for which they are suggested, for both the girls.

“Obviously Skye is not up to the age, her own age, but she does enjoy the books. // [We do] adding, subtraction. Obviously there’s a lot of pictures. Quite simple books. // She really does enjoy them. Obviously you have to explain sometimes… // And when she gets the hang of it, she’s quite good.” (turns 80, 85 and 87).
Kate said she had also been working on money with the girls, and that Skye did now recognize the different coins. “It’s like a lot of things with the girls. Just takes time. They are both having pocket money and I let them go and find something, what they can, by themselves.” (turn 97).

When I asked Kate whether she was confident in mathematics at school, she laughed: “It’s not a subject I enjoyed. … I have never been poor at maths but actually as I got older maybe I took a bit more interest in it.” (turn 102). She was confident that she could help Skye, and commented that education had changed since she was at school, but “all I can do really is go back to the way that I was taught. // Like I’ll let her count on her fingers, and it does work.” (turns 106 and 110).

Skye in Year 4 at Armthorpe with her teacher, Kelly Asher

My interview with Skye’s new class teacher, Kelly Asher, was in December 2010; her focus was predominantly on Skye’s behaviour in class, describing her as noisy, demanding, and difficult to manage. (S9, interview with teacher, turn 2).

The children were kept as a mixed ability class for mathematics, with pupils placed in one of three attainment groups. Kelly said that they had just started a new intervention with low attaining pupils (including Skye), to support their oral and mental arithmetic in the first part of each lesson:

I brief the teaching assistant on what we are going to do in that lesson then, as soon as [the children] come in [in the morning], she will grab them to a table outside the classroom and teach them what we are going to do in that lesson. So, it’s just repeating it. And usually it doesn’t click that time, but by the time that they come in for the normal mental starter, when I am doing whole class, I am teaching it again. (turn 24).

Part-way through the term, the LA’s looked-after children team had provided funding for an additional TA to work with Skye for mathematics on two days a week:

… being able to take Skye away from the class where there’s a lot of noise and distraction has been really, really helpful. Because when she hasn’t got that support she’s got a butterfly mind and she’s all over the place. (turn 2).
Kelly told me that the additional TA was the mother of one of the other girls in her class. My immediate (unvoiced) thought was that this could be difficult from the point of view of both girls – for Skye, because someone else’s mother was working with her, and for the daughter, who might feel uncomfortable about the arrangement, so I asked Kelly about the mother’s role as a TA:

7 Rose How does that work?
8 Kelly It’s alright. She’s really lovely, and we get on great. And her daughter is very different to Skye, so, you know…

When the one-to-one TA was not there, Skye mainly worked as one of the separate group of five low-attaining pupils in another room, while Kelly took the rest of the class. Kelly was not sure about Skye’s current level of attainment: “I’d have to look. I can’t remember all the children’s levels.” (turn 10). There did not seem to be any occasions when Skye worked individually with her class teacher, in mathematics or in other curriculum areas. Kelly acknowledged this:

Well the trouble is, because she is in that lower ability group I teach the whole class on the carpet and then she is either with the one-to-one TA or she’s out with a group with another TA. So I would get, like, a bit of a feedback on the group as the whole and sometimes it’s “Skye has worked really hard today, she’s done great” and sometimes it’s “she’s been distracted and giggly”. Giggling is quite a big one, I don’t know if you have noticed that with working with her but especially compared with some of the other girls she is very immature. (turn 14).

Kelly seemed very detached from Skye and did not mention any mitigating circumstances in the way that Janet had done. She said she had had little information about Skye, and did not know about the previous school. When I asked about homework, she said that it was usually differentiated for numeracy, but Skye’s work was ‘minimal’; the homework was usually checked by the TA. Kelly did not think that Skye’s two foster carers did much with the children, in literacy or numeracy, because they did not write anything in the ‘learning log’. She asked me to turn off the audio recorder before commenting that she did not think the foster carers were as interested in Skye as they were in her younger sister. I felt uncomfortable about the way she referred to Skye’s two foster mothers – and wondered if their relationship was what made her feel uncomfortable with them. It also seemed possible that Skye’s
and her foster mothers’ social class was an issue, in view of Kelly’s earlier comment about the TA’s daughter being “very different to Skye” (turn 8).

Ms Andrews, the new head teacher, was keen to talk to me before I left the school that morning (S10, interview with head), and asked how I thought Skye was doing in Year 4. In view of my promise that I would pass on any information that could benefit the child, I said I realized that Kelly was finding it more difficult to form a good relationship with Skye than her teacher last year, who was a very experienced member of staff, and I wondered if Ms Andrews had time to talk to Skye herself, as Skye did seem to be a child who responded well to adult attention.

When I visited the school in June 2011, Skye made a comment that raised the issue of her two foster mothers again. I asked what she had done in numeracy the day before and she said “Nothing, I’m not doing anything for her.” She said she was feeling very cross with her teacher, because everyone had had to do a painting for a card for father’s day, and she wanted to do one for her two mums instead, but had been told she must do one for a dad or granddad. I cannot be sure why (or even whether) the teacher had said this; perhaps she had intended Skye to make a card for her birth father, to pass on at a contact visit. However, it was clear that Skye was upset and angry.

My last contact with Armthorpe School, later that day, was very positive. Skye’s final assessment had shown improvement in her counting and arithmetic, and as her class teacher was not available, Skye and I went to the Head’s office to show Ms Andrews. Ms Andrews was not available either, but the school secretary came out, praised Skye, and arranged a time for Skye to come back later in the lunch hour, to tell Ms Andrews how well she had done. Skye did not stop grinning with pleasure for the whole encounter.

**Key issues from Skye’s case**

Predominantly, this case illustrates the value of a class teacher who is interested, sympathetic and keen to build a positive relationship with a looked-after child –and how the same school may have staff whose commitment to such a vulnerable child may differ. Skye’s experience during her time with Janet Allen had been very
positive; she had responded well to such a confident and caring teacher. Janet Allen knew a great deal about Skye’s life and about her attainment in mathematics, because she had spent considerable amounts of time with her. This had helped Skye to feel settled in this school, and may have contributed to her not feeling anxious about going back to school after the summer holiday. Her new teacher, sadly, was not as interested in finding positive ways of engaging with Skye.

The foster carer clearly saw the child’s educational experience as very important, and was trying to help at home. Links with school were not as strong as might have been helpful, with either teacher. In Janet Allen’s case, this seemed to be from a wish not to overwhelm the new foster parents; from Kelly Asher’s view, it seemed to be from a judgement that the foster carers were not interested.

The case of Skye raises several issues that will be discussed further in the last section of this chapter, including that of the timing of a change in school, the time spent with a teacher, the teacher’s commitment to the child, and the links between school and home.
RONAN

Ronan was aged 8 and in Year 3 at the beginning of the study. He had been taken into care with his four siblings because of neglect. Their birth mother had learning difficulties; she still had contact visits with the children. The five children were placed with experienced foster carers who had adult children; this was initially a temporary placement, but the foster carers had applied to adopt all five children, and were waiting for a court hearing.

Figure 4.4: Care and school timeline for Ronan as at 9.03.11

One of the five siblings was too young to be at school; the other four, including Ronan, were initially at Brookhouse Primary, close to their birth mother’s former home, and they continued to attend the same school after being taken into care in June 2009, travelling by taxi each day for a journey of about 25 minutes each way. Debbie and John (the foster parents) had been keen for the children to change to their local school, Cranfield, as soon as possible, as they knew that school well. This was finally achieved in August 2010. (R5, interview with foster carer).

The experience that school offered Ronan

The two schools that Ronan attended were very different. Here is the summary information from the Ofsted website (accessed December 2011).

- Brookhouse Primary, for ages 3 to 11, had 440 pupils on roll; 38% on Free School Meals (FSM). Last three Ofsted reports to March 2011: all ‘Satisfactory’.
Cranfield Primary, for ages 4 to 10, had 430 pupils on roll; 13% on FSM. Last three Ofsted reports to March 2011: “Good”, “Outstanding” and “Outstanding”.

Debbie had visited Brookhouse frequently when the children had come to live with them, and she had also been in contact by phone with their SENCO on several occasions, to talk about all four children, as well as attending parents’ evenings.

**Ronan in Year 3 at Brookhouse with his teacher, Claire Berry**

I interviewed Claire Berry in July 2010, when she had had Ronan for almost a complete year. Claire had been teaching for three years, and said she enjoyed being at Brookhouse. She taught her class of 30 children as a mixed ability class for mathematics with five groups based on attainment. Ronan was in the ‘bottom group’. There was one boy in the class who was autistic, and he had full-time one-to-one support from a TA; Ronan and one other boy sat with them. This was also the arrangement for literacy lessons each day, and for a 35 minute reading lesson three times a week in another room with the SENCO. Claire said the boys did argue with each other:

> [Ronan] falls out a lot with children. // I mean, the autistic boy not so much, // he’s just not bothered… // But Ronan and the other boy in particular // and it’s petty things, nothing much.

(R3, interview with teacher, turns 256, 262, 266, 268 and 270)

Consequently, Claire tried to provide Ronan with other company for the rest of the day, but she felt he did not have any particular friends. There were sometimes problems with getting him to concentrate: “…and some of the other children will say, ‘Ronan’s not doing anything!’” (turn 339). At other times, Ronan copied other children’s work: “I do give him the opportunities, to say ‘I can’t do this, I need help’ // that he normally takes up” but Ronan still copied frequently and without trying to hide the fact: “He’s not sly about it at all!” (turns 76, 78 and 80).

Claire talked knowledgeably about Ronan’s work in mathematics, giving details about particular things he could do. His work did not follow the same plans as the rest of the
class, because that was too difficult for him. His targets were to be able to add two
digit numbers, and to use a number line; Claire was also concentrating on
helping him to avoid writing numbers in reverse. She set the work for Ronan to do
each lesson and marked his exercise book. His books were full of encouraging
remarks both from the TA and in Claire’s handwriting (R4). Claire had given him a
plain paper exercise book, rather than one with squares, because she encouraged him
to draw to help him solve the arithmetic questions she had set, and she also provided
counters and cubes for counting.

Claire had set homework for Ronan in the previous school term, but it had not been
done, so she no longer set any. She said she was surprised, as she felt the foster carer
was very conscientious, but she had not contacted Debbie because she thought the
school’s SENCO was in touch with her, and she did not want to complicate things.

Claire commented on Ronan’s good manners: “He’s quite a sweet little boy actually //
but I’m afraid learning’s not his priority.” (turns 234 and 240). Ronan’s behaviour
was not a problem, except that sometimes he would not engage in classroom activity.

Ronan was sometimes withdrawn from lessons individually for reading with the
SENCO or with someone from the LA’s looked-after children team. There was also a
member of the speech and language therapy team who worked with him occasionally,
but Claire was not sure why.

Ronan had told Claire that he was going to a new school. I commented that many
children in care found it difficult to cope with change, so it did need to be managed
carefully. Claire expressed interest in behaviour that looked-after children might have
in common, and asked whether any of the other children I was studying had been very
possessive about their belongings. “When he first came into this class he did make me
chuckle. // He had a lovely backpack bag, you know, with everything in it, PE kit, the
whole lot…” (turns 492 and 494). Claire had shown Ronan where everyone else kept
their bags, but he had insisted that he would not leave it there. “He hadn’t been in care
very long at this point, it was only September” (turn 498); Claire agreed with him that
he could keep his things under her chair, and they had that arrangement for a couple
of months, until he became more relaxed and moved his bag to the pegs with the other
children’s bags.
Claire spoke throughout about Ronan with obvious affection and interest: “He comes to school every day and beautifully dressed, very clean // and progressively through the day he becomes less clean” (turns 502 and 504). “He’s a lovely boy” (turn 528).

Ronan and mathematics at home: the views of his foster carer, Debbie

I interviewed Debbie in September 2010, a few weeks after Ronan had started at his new school, Cranfield. Some of the issues Debbie raised were similar to those raised by Skye’s foster mother: the situation at the previous school, being taxied to school a distance away, and issues around contact visits with members of the birth family.

Debbie’s view of what the previous school, Brookhouse, was able to offer Ronan and her other children was expressed in generous terms, as she noted that his new school was able to pay him more attention because they had fewer children with difficulties:

I’m not criticising [Brookhouse], but it did have a lot of children that needed extra help, and I don’t think it had the resources and the help to give them what they needed. The school that he’s at [now], he’s in the minority that need a lot of help, so he’s basically getting a real boost there. (R5, interview with foster carer, turn 32).

Debbie felt that at Brookhouse, Ronan had a reputation of being naughty, and that he sat with other boys who were naughty, “so he didn’t do an awful lot of work” (turn 32). She also said he had not had homework at Brookhouse; she thought perhaps the teacher did not set it for the lowest attaining children.

Being taxied to Brookhouse had added to the length of the school day, and on some days the children went for contact visits with their birth mother straight after school:

So, they’d have an extra half hour travelling to contact, the hour’s contact and then travelling home. They weren’t getting home till half past five or six o’clock. By then, too tired, too disinterested, they don’t want to get a reading book out or sit and do any homework. (turn 22).
Contact visits had been reduced since the agreement that Debbie and John could adopt the children, and the children had had a ‘goodbye visit’ with their birth mother during the summer holiday.

The transition to the new school had been managed carefully, organized by the foster carers with the school, with several steps aimed at helping the three primary-aged children feel comfortable with the move. They had visited Cranfield for the day during their last term at Brookhouse, met the head teacher, and he had introduced them to their class teachers and to children who would be in their classes. Each of the three children also visited their siblings’ classrooms. They had then been into Cranfield three times during the school holiday, meeting the teacher who was SENCO. She had lent each child books or games to use at home, until they visited again.

Debbie recounted how Ronan had been pleased not to be in a taxi on the first day at their new school, and had said to his younger sister, “Don’t forget, you, we’re just like everybody else with their mum and dad walking to school” (turn 12). Once the new school year started, there was still close contact between school and family; the SENCO frequently came out to chat to Debbie at the end of school, and Ronan had been busy at home, drawing, sticking and writing to make a book for his teacher: “He’d got to tell her his name, how old he was, all his favourite things, what he liked to eat, what he liked to do.” (turn 24).

The records that had been passed on from Brookhouse had noted Ronan’s low levels of attainment in reading and mathematics, but Debbie said that the new school “think he’s a lot better, he’s got a lot more about him than they expected. // He’s [had] a fresh start at this school. … They said he’s really eager to learn, he’s a lot more confident. // He’s really trying.” (turns 4, 6 and 8). Ronan had made friends and had joined two after-school clubs: dancing on Wednesdays, and swimming on Thursdays. “It’s really nice, he’s just a normal kid. He just joins in and does what the rest of them do.” (turn 38).

Ronan was in a special group with the SENCO for reading, and Debbie was spending five minutes a day with Ronan at home, practising the words that his teacher gave him. However, the school did not feel he needed extra help in mathematics, outside normal lessons, “because he’s on the low table over maths, and they’ve got a sort of
helper for the table. So he’s getting his boost in the class… He’s managing, he’s coping.” (turn 48).

Debbie said that she felt reasonably competent with mathematics herself, sufficient to help her foster children; she had learnt some new methods in arithmetic with her older children, but she might want guidance when the children started secondary school. She said, “I were never a great achiever, I don’t think. I never passed my eleven-plus. But [maths] wasn’t anything that I ever dreaded.” (turn 72).

Debbie and John both helped Ronan with homework when it was set, but they had had different experiences as to how willing Ronan was to co-operate. With John, Ronan had said he could not do things, and John had explained but then given up. Debbie felt she put more pressure on Ronan to try, and he did do more:

[I thought], this must have been exactly the same at Brookhouse… He was capable of a lot more than he gave. … [From John] it was all, ‘OK then, if you can’t do it, you can’t.’ But I’m a little bit more “You will do it, I know you can do it. You’re going to sit and do it!’ // And I suppose I shouldn’t have done, but [I’d say] ‘If you’re going to muck about here then you’re not going to the park’ and he done it no problem. (turns 96 and 98).

Ronan’s willingness to engage in homework had grown; he was now comfortable about working with John. He was a member of the Letterbox Club (the postal club providing books and number games; see Chapter One) and played the games with Debbie, John and his sisters. Debbie said he especially liked the calculator he had received in one pack:

He loved it. He was so proud because he worked out for himself he could check his sums. Before, I don’t think he connected: like two plus two – he wouldn’t have realized you could put it in and get the answer to come up. Absolutely loved it. (turn 104).

The mathematical activity that Debbie reported engaging in with Ronan at home was quite extensive. As well as playing games (including Ludo and card games), she practised counting with Ronan by asking him to fetch her small numbers of household items, and by encouraging him to count with his three-year old sister, ostensibly to teach her to count. When the family went out in the car, Debbie would ask Ronan to
read the numbers on road signs; at home, they sat together, drawing and practising writing numbers, as his numbers “used to be constantly upside down, back to front, and they’re not now.” (turn 64).

Debbie was knowledgeable about what Ronan could do, and she seemed inventive and thoughtful about the methods she could use. She said she had previously given the children a 50p coin each for their pocket money each week, but had decided that it was better to give them five 10p pieces, so that they had to count them to check they had the right amount. She was helping Ronan to learn to recognize different coins.

Debbie felt that the change of school had changed Ronan’s opinion of himself, including about his appearance: “He’s checking his hair, his collar’s straight. // His pride in himself has changed.” (turns 118 and 120). She did not mention the biggest change of all – that during the summer holiday, the children had been told that they would be staying with Debbie and John, and would be adopted. Before I left, I commented on this:

122 Debbie This school has done so much for them.
123 Rose And you – you have, too.
124 Debbie Well, I hope so. It’s just – to see how much he’s changed!

**Ronan in Year 4 at Cranfield with his teaching assistant, Alanna Coates**

Ronan’s new school had two parallel classes in each year group, and the children were ‘setted’ for mathematics, depending on their previous attainment. Ronan was in the ‘bottom’ set; his class teacher took the ‘top’ set, so he had a different teacher for mathematics. The bottom set was further grouped according to attainment, and Ronan was in the ‘bottom’ group, with three other children. As Debbie had told me, there was a teaching assistant who would normally work with this group, in the same classroom as the rest of the class and the teacher. However, because Ronan had seemed to have difficulty in settling down to work, from mid-September to January he had largely been taken out of the class by the TA, Alanna Coates – sometimes with the other three children, and sometimes on his own. There was not always another room available, so they often spent a while finding a space to work.

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Ronan’s class teacher and his mathematics teacher both felt that Alanna knew most about Ronan’s work in mathematics, so it would be better to interview her, which I did in February 2011. Alanna said the group was spending more time in the classroom now, but she still took Ronan out sometimes:

He is concentrating more on his work although he’s still quite a live wire. He wants to be the centre of attention and he would talk for England if he could, so keeping him on track can be tricky... He’d like to go to the toilet regularly if it gets him out [of class]. (R7, interview with teaching assistant, turn 53).

Ronan occasionally refused to look at the work she was asking him to do, and she knew that sometimes he copied one of the other three children: “Quite often I just have to move his seat just a little bit further away.” (turn 31).

The work for the bottom group was set by the teacher, but Alanna would often change what Ronan did, because she felt he needed easier work. She used worksheets photocopied from books in the school, and made up problems of her own. Alanna provided Ronan with counters, cubes and base ten equipment, but he preferred to use his fingers.

Alanna showed me Ronan’s exercise book (R4), and we talked through the pages. The topics covered ranged from counting to ten, to finding equivalent fractions. There was a new topic each day. I asked about subtraction, but Alanna said they had not done much yet; it would probably come later. She did not know how far Ronan could count successfully, but said she did think he had an understanding of ‘what is less and what is more”. However, I felt that the one worksheet he had completed on this showed a lack of understanding, as the questions Ronan had completed with adult help were correct, but the three questions he had then attempted on his own were all incorrect. There was little evidence that Ronan had completed any piece of work successfully on his own. I will discuss this further in Chapter 5.

Alanna said that the children in her bottom group were not given homework. Ronan had not engaged in mathematics with either his class teacher or his mathematics teacher during the year, and Alanna was effectively given sole charge of his work. It did not seem to match his level of attainment, and was sometimes marked as correct when it was actually wrong. In many cases, these pages had “Well done, Ronan!”
written at the bottom, because Alanna was trying to be encouraging. Alanna had said “I think he is catching up.” (turn 17), but I could not see any evidence that this was the case.

**Key issues from Ronan’s case**

Ronan’s case raised some similar issues to that of Skye, such as the foster carer’s concern about the delay in changing school and the time he spent in a taxi, and problems with communication between school and home, including about homework.

Although she was working in a class of children with many challenges, Ronan’s teacher at Brookhouse, Claire Berry, was knowledgeable about his mathematics and provided sensible mathematical tasks; she spent time with him individually. Claire was interested in his overall development and was willing to accommodate his anxieties (for example, about where to keep his bag). However, Ronan’s social contact with other children was inadvertently restricted, as he was often in a small group or on his own; his teacher did try to alleviate this, but it was still an area of concern.

Ronan’s move to a school described as ‘outstanding’ was beneficial overall, and the transition period was managed in an exemplary manner. Unfortunately, the move did not provide an improvement in the mathematics teaching that Ronan received; he spent all of his time with a teaching assistant whose skills in mathematics were low. However, his foster mother in particular was contributing a great deal to his learning in mathematics. These issues will be explored further in the final section of this chapter.
Kyle was aged 9 and in Year 4 at the beginning of the study. He had been in care since he was 5, because of neglect. He was initially in a temporary foster placement, and then in a ‘kinship’ placement (i.e. a placement with a family member) but this had broken down. His third placement was planned to be permanent, but sadly his foster mother had died. He was then placed in a further kinship placement with grandparents, but they were uncertain about whether they could manage to look after Kyle for much longer, and had frequent periods of ‘respite’ (i.e. where a child goes to stay with another carer for a short period).

Kyle’s birth mother moved home frequently, between England and Scotland, and contact with her had been unreliable and infrequent in the past. She now had younger children living with her, but Kyle had no contact with her or them. He did see other members of his extended family occasionally.

Figure 4.5: Care and school timeline for Kyle as at 9.03.11

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**Key:**
- For carer, pink is temporary carer; green is carer intended to be permanent.
- For school, orange is school in lower two Ofsted categories; green is school in higher two Ofsted categories.
- Child’s age is shown on the bottom line.

Kyle had a statement of special educational needs already in place when I met him, for ‘social, emotional and behavioural issues’. I was unable to find out when the statement had been established, but it was evident that Kyle had been in difficulties for some time, as he had been excluded from his nursery class at age 4. From the age of 6 years 5 months, for a year, he had spent one or two days a week out of school, in placements in two special units for children with social, emotional and behavioural difficulties.
The experience that school offered Kyle

Coincidentally, Kyle was at the same school (Brookhouse) as Ronan when my study started, although the two boys did not know each other. As described previously, the school served an area with high levels of deprivation; the summary information from the Ofsted website follows (accessed December 2011).

- Brookhouse Primary, for ages 3 to 11, had 440 pupils on roll; 38% on Free School Meals (FSM). Last three Ofsted reports to March 2011: all ‘Satisfactory’.

The head teacher at Brookhouse, Ms Brown, had been in post for less than two years, and had made many positive changes within the school. I talked to her in June 2010. She described Kyle as “very, very difficult indeed.” (K2, interview with head teacher). She said he had threatened her personally, saying he would smash her glasses, and that he used to get into fights with other children all the time, so he now had one-to-one supervision, with three TAs taking turns, including for playtime and dinnertime. One TA had been tripped over by Kyle, and broke her ankle. His grandmother had told the school that he had “trashed their living room” several times.

Ms Brown said that she knew his last foster carer had died, but that Kyle “just came back to school, hasn’t even mentioned her”. She said he had not shown any emotion about the death, as though he did not care what had happened.

Ms Brown said she did not know what to do for the best with Kyle – she thought he might do better with a male teacher, but she had not yet made the decision about which class Kyle would be in after the summer holiday. She was not certain whether the school could cope with him at all.

Kyle in Year 4 at Brookhouse with his teacher, Peggy Boden

I interviewed Peggy Boden in July 2010, when Kyle had been in her class for nearly a year. She was one of the longest-established teachers in the school. Peggy taught mathematics to her mixed-ability class with the children organized into five attainment groups: “one top, two middles and then one slightly lower, and SEN” (K5, interview with teacher, turn 10). Although Kyle should have been in the SEN group
because of his low attainment, Peggy had put him in the ‘lower’ group as it was easier to manage his behaviour there: “damage limitation, I suppose.” (turn 22). This was especially important in lessons when there was no TA; the woman who worked with Kyle one-to-one each morning stayed with him during playtime, and then had her break during the first part of the numeracy lesson, which was straight after playtime. Another TA joined the class for some lessons, and she would take Kyle and one or two other children from the SEN group at the beginning of the lesson for 10 minutes or so, to practise number facts. Whilst the school provided extra support for children with difficulties in literacy, in addition to the main literacy lessons, there was no additional support for mathematics.

When Kyle was in the main class without a TA, he was expected to join in with the topic in which the rest of the class was engaged; recently, this had included work on area, converting fractions to decimals, and dividing decimal numbers by ten.

We discussed some of the work that Kyle had attempted in his exercise book (K6). Peggy said that she found it difficult to tell what he understood, and that she sometimes felt he was capable of more than he was demonstrating. He completed very little work in any lesson, and would misbehave to avoid working. For example, when they were practising halving, she had helped him with four questions, then moved away to see other children: “And that’s when he starts distributing the pencils over the floor. But I can’t sit with him all the time.” (turn 92).

Peggy agreed that Kyle had major difficulties with writing. I suggested that perhaps he also found drawing difficult, and he might have difficulty in reading his own numbers. Peggy turned through a few pages of the exercise book, examining Kyle’s work with me. It seemed to me that he was being expected to do a great deal of copying out of questions, so I commented, “You don’t use worksheets very much, Peggy?” (K5, turn 125). She responded,

Hmm, no. … As a rule, we don’t do a lot of worksheets, no. // But I can see, looking at it now, that it might be quite a good idea for someone like Kyle, because then he’s not got to worry about the writing bit. // He can get straight to the maths; then wean him away from it or something. (turns 126, 128, and 130).
Kyle’s work in his exercise book will be discussed further in Chapter 5.

Peggy set homework for the class every week, but Kyle had never completed any. This was not unusual within Peggy’s class: she said there were about ten or twelve children who completed homework fairly regularly, out of her class of thirty, “which is quite good, really” (turn 208).

Kyle’s school report would be sent home in a few days. In Kyle’s report, Peggy had noted that he was now spending more time in the classroom. “He has a behaviour IP (individual plan) and it involves staying so long in the classroom” (turn 168); this measure of his behaviour was shared with his grandparents.

I asked Peggy whether she thought Kyle was given much help with mathematics at home:

I think at the moment they’ve got other things to consider, // to worry about with Kyle, than his academic things really. They do things with him – I know he’s done arty things and things like that. But I wouldn’t say they hear him read or things like that. // It can be [very difficult with him] … You know, I admire them for taking him on. (turns 214, 216 and 220).

Peggy felt that the major events that had happened to Kyle were the key influence on his behaviour: “I can’t possibly see how he could have the same level of concentration and listening and stuff that other children do have.” (turn 232). Kyle was sometimes very preoccupied with what was happening outside school, so that Peggy felt “he’s here, but he’s not here, sometimes” (turn 236). She said that he had had more settled periods; he had been quieter when he moved to the foster placement that was meant to be permanent, but after the foster mother had died, “he did some very strange things last year … very odd things” (turn 250). I asked Peggy whether she had been given any advice about how to support Kyle, but she said no, and she could not think of anyone that she could have asked for advice.

At this point in the interview, we were joined by the school’s SENCO, Joan Blanch, who had come to talk to Peggy about Kyle’s day. She said, “The biggest problem we have with Kyle is that you start to settle his behaviour, so you start to concentrate on his learning, but the minute you turn to the learning it can upset his behaviour.” (turn 283). Joan gave the example of the few weeks after Kyle’s annual review (a meeting
of the key adults involved with Kyle). It was agreed that his behaviour had improved, so they could reduce the amount of one-to-one supervision he had. However, his behaviour had soon deteriorated again, and Joan said, “within two to three weeks we’ve got major problems, with him in the Blue Room every day. The Blue Room is our isolation room… They go into there to calm down, and he has ‘lost it’ most days, big time.” (turns 285 and 287).

Joan thought that Kyle was upset today because he had had an argument with his grandfather, and because there was a court hearing pending, about the contact arrangements for his birth mother. With only a few days before the long school summer holiday, Kyle might also be agitated by the prospective change in routine. Joan added that Christmas was “always a traumatic time” (turn 314). The Christmas of this school year had been calmer, because he was with respite foster carers: “Ken and Vera were perfect, but they couldn’t retain him anyway, because they were in their seventies” (turn 320). Joan spoke about a period when Kyle’s birth mother had been living nearby with his younger siblings, but would not visit him: “And it turns out she passes [the house where Kyle was living] every day, and Kyle knows and he stands waiting to wave to her.” (turn 326).

Peggy commented on how lonely Kyle seemed: “He hasn’t really got any friends... I think that so many children are a little bit wary of him.” (turn 337). Peggy also felt that Kyle was “scared that as soon as anything nice happens and things get settled, he’ll be taken away. Or I think sometimes he’s just nasty because he doesn’t want to grow too fond of where he is.” (turn 369).

**Kyle and mathematics at home: the views of kinship carer, Brenda**

I interviewed Brenda during the school summer holiday, in August 2010. Kyle had been taken out by a social worker to a play scheme several miles away.

We began by discussing Kyle’s mathematics, and Brenda said that she knew he was very ‘behind’ in mathematics, but “they just give you the scales, to be honest, what level he’s at” and that did not mean anything to her. (K7, interview with carer, turn 4).
Brenda’s information from school was predominantly about Kyle’s behaviour. She attended the looked-after children review meetings and talked to his teacher there, but after school each day she went to see a member of the school office staff, Carol, before she collected Kyle: “She’ll just say what’s gone on and how he’s doing.” (turn 10). Carol’s information came from a little record book that was passed from one adult to the next throughout the day, to make notes of Kyle’s behaviour.

Brenda was uncertain about Kyle’s reading level, because she had been unable to get him to read at home, even though she had bought him a set of children’s encyclopaedias and several other books. However, she said, “His reading’s not that bad, I don’t think, because, you know if he leans over your mobile [phone] and reads a message, and he reads it quite quick”. (turn 20).

Brenda said that she wanted to help Kyle with homework, and she thought she would be more successful than the school at getting him to concentrate, so she had once asked Carol to get something for him to do the next day. The work was just one sentence, to copy into his homework book. He had sat at home with the work in front of him, refusing to touch it, for over half an hour. Brenda had said, “Kyle, it’s just one line, it’ll only take about two minutes, one line” (turn 62) but he had just shrugged and sat motionless.

I must admit, I was being a bit cocky // I was thinking, it’s a school environment, he’s not happy at the minute, he’s obviously not going to do it. But get back to your own environment, where it’s cushy and cosy, and … [it will only take] two minutes to do it! But no. It probably registers that it’s for the school, and [he thinks] why should I? I don’t know for sure, I’m just surmising. (turns 72 and 74).

Brenda thought Kyle was stubborn, but also that he was fearful of other people seeing his writing, because it was so poor. She had occasionally managed to get him to copy a sentence that she had written, and she had noticed that he did not look at what he was writing, but kept his eyes fixed on the writing he was copying: “[so] the letters [he writes] are miles apart and downhill.” (turn 68). Brenda had not mentioned her observation to anyone at the school.
Brenda had bought some laminated practice cards that were intended to help with addition and subtraction, but Kyle had only tried them once. When I asked about Kyle’s skill with money, Brenda said she did encourage Kyle to choose things when they went to the supermarket together. She did not let Kyle go shopping without her, because a boy on his own had been attacked near the local corner shop a few months before. She had told Kyle to start collecting up coins for the slot machines (from the loose change which was in various drawers and containers around the house) ready for a day trip to the seaside the following week, to see how many they had: “We’ve got absolutely bucket-loads of 2ps lying around the house, and I’ve told him he’s got to get his act together and get all these 2ps together”. (turn 156).

Brenda described mathematics when she went to school as something she “put up with.” (turn 106). She said that when she was about Kyle’s age, in the 1960’s:

> We had a teacher who was a … nightmare. He’d say, ‘You go away and learn your three times tables this week’… // And you’d have to stand at the front of the class and reel them off. And if you didn’t get it right, he used to wack the calf of your leg with a ruler, and it was painful, believe me. // So I am really good with times tables, I am. … I’m not too bad with adding up and things like that, but times tables – spot on! (turns 106, 108 and 110).

Brenda had also had problems with handwriting, because she was left-handed and some of her teachers had tried to force her to write with her right hand: “Absolutely ridiculous… Strange. // It never made any difference to me. You couldn’t turn me into a right-hander.” (turns 126 and 128).

In spite of her own poor experiences at school, Brenda was very positive about Brookhouse and their efforts to help Kyle. Her only criticism was that they had not been able to tell him who would be his teacher after the summer holiday, and she felt this had been very difficult for him. She had hoped the school would get in touch during the holiday, so that she could tell Kyle what was happening, as that would make him less anxious.
Kyle in Year 5 at Brookhouse with his teacher, Brian Black

Brian was new to Brookhouse and a mature entrant to the teaching profession, in his first year of teaching. I interviewed him in November 2010, when he had known Kyle for just over three months. He taught mathematics to his mixed ability class with pupils grouped according to their attainment, with a higher-attainers group, three ‘middle’ groups, and a low-attainers group of five pupils including Kyle. He felt that Kyle was the child with the biggest difficulties in mathematics in the class. Brian said he liked to teach mathematics using open-ended tasks that did not require children to stay in their attainment groups, but he was not able to do this for the majority of the time.

Brian acknowledged his lack of experience as a teacher, but was keen to discuss the advice he had been given and the dilemmas he was facing with Kyle. He had been advised to be very firm with Kyle, but he had soon decided instead to avoid confrontation. Brian felt Kyle was interested in many topics, and in the afternoons it was often possible to let Kyle choose a project of his own to engage him. Brian looked for opportunities to praise him, and he had put Kyle’s work on display.

One of the TAs from Peggy’s class in the previous year was continuing to support Kyle’s work in Brian’s class. Brian said he had started to feel uncertain about the amount of time that Kyle was spending with the TA, as he thought she had settled in a pattern of constantly telling Kyle “Please stop, don’t do that” (K7, interview with teacher, turn 60). He felt Kyle often directed his energy into trying to annoy her: “He’s not even difficult, he’s not disruptive, it’s strange. It’s quite… almost sneaky. // Manipulative. “ (turns 66 and 68). He was also concerned that the TA was concentrating on aspects of work that were not important, such as getting Kyle to copy out the lesson’s “Success Criteria” rather than getting on with the work to which this referred. Brian had now asked the TA to work with all five children in the low attainers’ group, not just with Kyle, and he was considering whether she could ‘mind’ the class while he worked with Kyle himself. He thought that he needed to spend more time with Kyle to establish a good relationship, and to gain a better picture of what he could achieve, as it was possible Kyle might be working at an inappropriate level, held back just by his writing. His view of Kyle was that he was intelligent and
articulate, but that if things went wrong in the classroom, he quickly “closed down, and you’ve lost him again.” (turn 84).

I asked Brian whether Kyle had been tested for dyslexia or other specific learning difficulties, but he did not think he had. (Later that week, I contacted the head teacher, to suggest that this might be useful.)

Brian had met Kyle’s grandparents at a parents’ evening, but day-to-day contact with them was undertaken by Carol in the office. Brian was uncomfortable with this arrangement: “It kind of isolates me...” (turn 74). He wanted to make stronger links with the family.

**Extending the period of study with Kyle**

I met Brian again briefly in July 2011, near the end of the school year, and he told me that Kyle was going to a special school for boys with social, emotional and behavioural difficulties after the summer. Earlier in the day, I had been given this news by Kyle, when I reminded him that this was my last visit to Brookhouse. Kyle had asked me if I could come in on Monday to meet his new teacher, but I explained that I had to be at a meeting that day. I said he should tell his new teacher that I thought he was a very interesting boy, and he had helped me a great deal with my research.

During the following week, I considered whether it would be useful to continue to track Kyle as he moved to his new school, Dunscroft. I was wary that my initial impulse to continue visiting Kyle was influenced by the fact that I had become fond of him. I also considered that his new teacher, Emma Dunton, might not find my visits helpful, as she might feel it would be easier to build a productive relationship with Kyle if fewer other adults were involved with him. However, I was also interested to see how Kyle would adapt to the new situation, and what the special school could offer him. I emailed Emma to explain what I had been doing, and to say that if I could help in any way with Kyle’s transition to Dunscroft I would do so, in the period up till December 2011, but I would understand if she felt he needed a fresh start. Emma replied that she did think it would help Kyle, as there was no other link
between his previous situation and the new one. She would find out whether Kyle would like me to visit him again.

Kyle was keen for me to see his new school. Emma and I arranged a visit for October, when Kyle would have had six weeks to get to know her and the other pupils in his class.

Dunscroft School’s Ofsted report earlier in 2011 had been ‘outstanding’. The school catered for about 50 boys aged 10 to 16; the provision for Year 6 (ages 10 to 11) was new. Most classes had between 6 and 8 pupils. 43% of pupils qualified for free school meals; all had statements of special educational needs for social, emotional and behavioural difficulties, and many had additional needs. A higher proportion of children were in care than in the mainstream (15%, compared to 0.5% across all schools). Most pupils came to school by taxi or other school transport.

Kyle in Year 6 at Dunscroft with his teacher, Emma Denton

Kyle’s class was in a classroom, set away from the main school building, across a playground. I arrived as Emma was welcoming her pupils and completing the attendance register. She was relaxed, confident, gently coaxing but very clear with her statements about what she expected from her pupils. She was warm and affectionate towards Kyle, hugging him and complimenting him on his new jumper.

Emma had six boys in her class, including Kyle, all new to the school that term. There was one teaching assistant already working in the class alongside Emma, and the school was holding interviews that week for a further TA to join Year 6. The range of attainment in mathematics across the six pupils was wide – Emma said that Kyle was the lowest attaining boy, at around National Curriculum Level 2; most were at level 3 or 4, and one boy was working confidently at Level 5. She was keen to provide mathematical activities that her class could engage in as a group, partly for social reasons, but the wide spread of attainment made this difficult. There were two computers in the classroom, so Kyle could take turns at using mathematics practice software, which he enjoyed. Her TA would often work individually with Kyle, and sometimes he would work with Emma and two other boys. Usually, they all remained in the same classroom, but there was another room available next door, which could
be used for quiet work, or where Emma or her TA could take a pupil whose behaviour was not acceptable.

The school had a consistent behaviour policy, praised by Ofsted, with a system of earning credits for good behaviour, which pupils could then exchange for toys or games. Kyle had been very well-behaved with Emma, and had earned a ‘gold badge’ which meant he was allowed to go across to the main building at break and lunchtimes without being accompanied. Most of the other boys were on ‘bronze’ or ‘silver’, so would have to wait until an adult was ready to go with them.

Emma said Kyle had settled well with his classmates but he had not started to work consistently yet, except when he had an adult sitting with him. When Emma was class teaching, “he’ll often just sit and stare into space” (K15, interview with class teacher, turn 4). If Kyle was expected to write, he would engage in distracting activity. Because of this, he had sometimes been kept behind at break and lunchtime to finish work.

Emma said that Brookhouse School had had a local authority adviser assess Kyle towards the end of the school year (K13, Learning and Autism Support Team Literacy Assessment), and it was evident that he was dyslexic, with some motor difficulties. On their advice, Emma had ordered some specialized equipment to help Kyle with his handwriting, and she was hoping this would arrive soon. She was uncertain about the kind of mathematical activities that would help him, as she had not worked with children at this low a level before, so she was keen to know what Kyle had been doing with me. We agreed that I would visit four times - about once every two weeks until the end of term - to explore Kyle’s mathematical understanding further.

**Key issues from Kyle’s case**

Kyle’s challenging behaviour was the sole focus for many of the adults around him, and his case shows the importance of considering other important underlying difficulties that such a child may have. For Kyle, this included unidentified specific learning difficulties (dyslexia) alongside his ongoing experience of loss, bereavement and instability. Close supervision in school was not matched with close attention to what Kyle found difficult, nor what he found interesting or engaging. Much of his
time in his mainstream school was spent with teaching assistants, not with a teacher, and the mathematics teaching he received was ineffective.

The three teachers with whom I saw Kyle, had different strengths. Peggy Boden was very knowledgeable about the situations that faced many children in care, including the effect their life outside school would have on their ability to form good relationships and to concentrate on schoolwork. Her way of managing was based on close supervision, usually by a TA. Brian Black was much less experienced, but was able to see some curriculum-based solutions to improve Kyle’s feelings about being in the classroom – although he also felt constrained by the advice he had been given to ‘be firm’. Emma Denton, experienced in social, emotional and behavioural difficulties, had begun by concentrating on forming a good relationship with Kyle, but wanted advice on teaching him mathematics.

Kyle’s kinship foster carer was keen to help, and had recognized details about his reading, writing and mathematical skills that could have alerted the school to his specific difficulties.

Kyle’s case will be discussed further with that of the other four children in the last section of this chapter.
Dylan was aged 9 and in Year 5 at the beginning of the study. He had come into care aged 3, initially placed under supervision with his birth mother. That arrangement had broken down just before he was six, and he had then had a succession of six different temporary foster carers over a period of less than two years. At the time this study began, he had lived with his current foster mother, Chantelle, for two years, and she had agreed that the placement should be permanent. Chantelle was single, with adult daughters. Her daughters and young grandchildren visited Chantelle and Dylan frequently.

Both birth parents had permission for regular contact visits to see Dylan, but visits had often been booked and the parent had not arrived. Dylan no longer saw his birth mother, but his father had maintained occasional contact. There were no known birth siblings.

Figure 4.6: Care and school timeline for Dylan as at 9.03.11

The experience that school offered Dylan

Dylan had joined Elmswell Primary School aged 4, and this school placement had been maintained across all his foster placements, including the current one. His journey to school by taxi currently took about 30 minutes each day in each direction.

The Ofsted website (accessed December 2011) gave the following information:
Elmswell Primary School, for ages 4 to 11, had 225 pupils on roll, with 55% on Free School Meals. The last three Ofsted reports to March 2011 were “Inadequate”, “Satisfactory” and “Satisfactory”.

The first member of staff I met, in July 2010, was Jill East, who was both the SENCO and the designated teacher for looked-after children in the school. Jill explained that I would not be able to meet Dylan’s class teacher for Year 5, as the teacher had left after competency proceedings had been initiated. The class had had a succession of supply teachers both while the class teacher was still in post, and in the term after she had left, and the school was concerned that the children had had very poor teaching as a result. The most experienced teacher for Year 6 (Lucy Earl) would be taking the class after the summer holiday, to try to compensate somewhat for the disruption in Year 5.

**Dylan in Year 5: information from Jill East and Lucy Earl**

Jill East had known Dylan since he was aged 5, and had seen him regularly, albeit sometimes just for a few minutes at a time, over the previous four years. She described Dylan as having difficulties in both reading and mathematics. He had additional support for reading with a TA, and sometimes with Vanessa Jones (from the local authority looked-after children team), but no additional support for mathematics, because that had only been available after school and he had to get his taxi. Jill said Dylan was “not good with new people” (D4, interview with SENCO), and that he had difficulty in working “peacefully” with other children; he worked best if he was sitting with quiet girls, but this was difficult in his class as there were 18 boys and only 5 girls (not all of whom were quiet). Dylan worked fairly slowly, and he did not like to write anything – Jill recommended that I should use scrap paper and a wipeable board when I worked with him, as he would balk at writing if he thought it was permanent.

Lucy Earl, who would be Dylan’s class teacher after the summer holiday, was the mathematics co-ordinator for the school. She offered to talk about the school’s arrangements for mathematics teaching, and to examine Dylan’s written work for Year 5 with me.
Dylan’s class was kept as a mixed-ability class for mathematics, organized into four attainment groups. Dylan was in the group for the lowest attaining pupils; from that group of five or six pupils, a sub-group of three children including Dylan would usually have worked with a TA, either in the same classroom or in a corridor space. Lucy had become aware that the TA was using explanations that seemed to confuse children. Lucy was seeing some of these children for one-to-one support: “I’ve had to say ‘Forget what you’ve been taught, when we do that next week we’ll be starting at your own pace.’ And I think that’s the problem with Dylan, it’s not been appropriately targeted for him.” (D5, interview with teacher, turn 23).

Dylan’s exercise book was further evidence of this lack of work at an appropriate level. Lucy (looking more and more concerned) pointed out some places where he had been working at a good level for him (for example, doing 8 + 8), where his work was neat, largely correct and of a reasonable quantity. When he was given more difficult items (such as 16 x 7), he still attempted them, but without success. Given fractions and decimals to tackle, his book had comments written in by the TA, such as “Refused to work for 20 minutes” and “Not enough done” (D6, exercise book) – with no recognition from the adult concerned that the work might be inappropriate. Lucy noted that there seemed to be days where mathematics was not taught at all. She speculated that the lessons must have been very boring as well as stressful for Dylan, with poor consequences for his behaviour. Lucy said that Dylan knew he was going to be in her class for Year 6, and his class had already had a day with her: “He’s generally not that naughty. What I find is, he can’t sit in his chair, he struggles to sit; he flits from here to there, not necessarily annoying anyone” (turn 176). Lucy felt this was due to anxiety, and it helped Dylan to be able to move about. She was determined to do her best for him in the coming year, and had already started teaching him mathematics for half an hour twice a week at 8am, when his taxi brought him in for the school’s ‘breakfast club’:

I’m hoping that he’ll do really well if he’s got the stability of a teacher that’s doing some work that he can access, with the kind of numbers he can cope with … He’s a bright young boy with the potential to do alright. //… It’s my mission, because I feel this school really failed him quite miserably [last year]. (turns 180 and 184).
Dylan and mathematics at home: the views of his foster carer, Chantelle

As described in Chapter 3, it took some time to arrange an interview with Dylan’s foster carer. The interview was in November 2011, when Dylan had been in Year 6 for nearly three months; the carer did not want the interview to be recorded, but was happy for me to take notes.

Chantelle said she knew Dylan had difficulties in mathematics: for example, he could not tell her any of his times tables past the 5 times, except for his 10 times table. She felt the teachers he had had in Year 5 were “not good at their jobs” (D7, interview with carer), but his teacher this year was excellent: Ms Earl was working one-to-one with him on his mathematics. Dylan had been pleased when he knew that Ms Earl was going to be his teacher after the summer holiday.

Chantelle had been able to look at his mathematics exercise books at parents’ evenings, and she could see he was working harder this year. Dylan was getting homework now, and he had begun to ask Chantelle for help with it – she thought this was because he did not like to ask his teacher, as Ms Earl was already helping him so much. Chantelle thought he would benefit from more homework, but at the moment she mainly helped him with spelling, not mathematics. She had told Ms Earl that she would like to help him, and the teacher had said that was good, but the school had not given Chantelle any advice on what to do. She said, “There’s a lot of things Dylan does different at school, to me – multiplying and division, and taking away. Number lines – didn’t do them. I don’t want to confuse him.” Dylan had a laptop, so Chantelle wanted to suggest a website – she wondered if there was a BBC one. “I know the GCSE one, because my daughters did that. So I’d like advice on that.”

Chantelle had realized that Dylan could not tell the time on an analogue watch: “He can tell the time now – we’ve done that. It only took half a week – I taught him that.” She had also been helping him to learn about money, and he could now recognize coins, but still had difficulty counting amounts of money or working out change. Chantelle gave him £2.50 pocket money on Saturday, then 50p some days, and talked to him about what he had spent and how much he had. She also involved Dylan with her “Avon” cosmetics sales, using the catalogue, looking up prices and then delivering goods with her: “I said he could have £5 for helping, and he said he wants to buy his dad a Guinness. He knows £5 is enough for that.”
I asked about Chantelle’s own experience of mathematics at school, and she said she had not done very well. She had recently started going to an adult literacy class and she had also enrolled for a numeracy course that would begin in January. She had told Dylan that she was going to college, and she thought she would be able to help him more as a result.

Because Dylan only had a year left at primary school, Chantelle had been looking up Ofsted reports for secondary schools on the internet. She had considered three different schools, and had talked to other parents about the school she thought would suit Dylan best. Ms Earl and Dylan’s social worker knew what she thought, and she had told them that the school’s report said it was “good”. She was sure that Dylan was capable of much more, if only he was given the right help.

**Dylan in Year 6 at Elmswell with his teacher, Lucy Earl**

I interviewed Lucy Earl again briefly in February 2011, and she talked positively about the progress Dylan had made in Year 6. She felt the one-to-one work she was doing with him had improved his mental arithmetic in particular, as they had concentrated on learning number bonds and times tables facts. The class was still organized as it had been for Year 5, as a mixed-ability class with four attainment groups, but Lucy had a different TA, and the TA worked with each attainment group, not just the lower attainers, with Lucy herself working with the lower-attaining pupils in some lessons.

Dylan now had homework regularly, and Lucy said “He brings his homework back, and he is well-supported by Chantelle, his carer. // [The homework] is always in on time and it’s always completed.” (D10, turns 26 and 28). In lessons, Dylan still found it difficult to concentrate, but he was now willing to answer questions in class - especially questions on money.

**Discussion with Dylan’s head teacher, Mr Elliott**

Mr Elliott had been very welcoming when I began my study, and when I called to see him on my last visit to the school, we had a brief discussion (D14). He commented
that his school was one where a high proportion of the pupils had difficult lives, and
that, because Dylan was now living with a caring and conscientious foster carer, he
realised his attention as head teacher had shifted to those children who were on the
child protection register but not yet in care, for example those still living with parents
who had mental health, drug or alcohol problems. He had discussed this with the
school’s Governing Body (the group of appointed and elected people who oversee the
work of a school) and had asked one governor to do a “360 degree review” of Dylan
and other looked-after children in the school, to see what improvements could be
made to their situation. The governor was due to report back at the end of term.

As a Year 6 child in England, Dylan was expected to take national assessments in
English and Mathematics in May 2011, alongside his classmates. Mr Elliott had made
specific arrangements to help Dylan cope, to alleviate his anxiety and help him
achieve his best. Since Lucy Earl had said that Dylan could only concentrate for short
times, Mr Elliott had separated each 45 minute assessment period into three sessions,
and supervised Dylan in between each one. The results would be available in July,
and he would ask Lucy to pass them on to me.

**Key issues from Dylan’s case**

Dylan’s case was that of a child whose life in care had included a high level of
instability, with eight different foster care placements. As described in Chapter 3, the
first interview with his foster carer had been difficult to arrange, because Dylan had
said he did not want the carer, Chantelle, to be interviewed. On reflection, I felt that
perhaps Dylan had been testing Chantelle’s willingness to take him seriously; once
we had made it clear that the research would not go ahead if he did not want it to, he
was happy for it to go ahead.

Dylan’s school had stayed the same since he was aged four, but during Year 5 he had
had several different teachers, and his difficulties with mathematics had not been
alleviated. His foster mother was keen to help Dylan with his school work, but was
not always clear about how she could do this. Whilst many adults in the school were
very concerned to improve his situation (including the head teacher, SENCO,
mathematics co-ordinator and a governor) the circumstances within the school had
made this difficult to achieve. The issue of whether continuity of school placement is the best outcome for the child emerged in this case as well as in that of Skye and Ronan, and will be examined again later.
MILLIE

Millie was aged 10 and in Year 5 at the beginning of this study. She had come into care when she was only a few days old, and had been with the same foster carers since then. The foster parents had teenaged children and a younger son; the family had moved house twice during Millie’s childhood, and she had consequently changed primary school twice.

Figure 4.7: Care and school timeline for Millie as at 9.03.11

Key:
- For carer, pink is temporary carer; green is carer intended to be permanent.
- For school, orange is school in lower two Ofsted categories; green is school in higher two Ofsted categories.
- Child’s age is shown on the bottom line.

Millie had contact visits when she was younger with her birth mother and siblings, but these visits had become less frequent in the last few years, and Millie had recently said she did not want to have any further contact.

The experience that school offered Millie

Millie had started school aged 3, and had been at that school (with 44% of children on Free School Meals) for three years; the family had moved to a new area, and Millie attended her second school (8% on FSM) for two years. She was now at Flexford Primary:

- Flexford Primary, for ages 3 to 11, had 350 pupils on roll; 42% on FSM. Last three Ofsted reports to March 2011: “Satisfactory”, “Good” and “Good”. (from Ofsted website, accessed December 2011).
Millie in Year 5 at Flexford Primary with her teacher, Jessica Fellows

Millie’s class was taught by two part-time teachers on a ‘job-share’, and I interviewed Jessica Fellows, the teacher who was planning the majority of Millie’s work in mathematics in June 2010. Jessica explained that she and her teaching partner took turns in planning literacy or numeracy lessons for a few weeks at a time, and met each week to share information about the children’s progress and their plans for the coming week. Jessica had joined the school in January, so she had not taught Millie for the complete school year.

Mathematics was taught as a mixed-ability class, with four groups based on attainment so that work could be differentiated when needed. Each lesson, two or three low-attaining pupils were withdrawn from the class to work with a TA, but Millie was not one of them. Millie had been in ‘Group 4’ until a few weeks before, but Jessica had felt she was making very good progress so had moved her ‘up’ to Group 3. Jessica commented that the children did not know which group was which, in terms of attainment, as they were not labelled in a hierarchy. However, in my interview with her earlier in the day, Millie had told me that she was now in the next-to-top group, Group 2.

Millie was withdrawn from the class for literacy support in a small group with a TA, as her reading was poor. Jessica was aware that her lack of confidence in reading did have an adverse effect on her mathematics, in particular for word problems.

Homework was set each week, aiming to consolidate work done in the classroom during the previous two weeks, and the TA who marked it would tell Jessica if any children did not understand what they had to do, so that the teacher could see the child individually. Millie had not completed homework very often, and Jessica had talked to her foster mother, Sue, about this, but there had not been any improvement.

Jessica felt that Millie was not very confident in mathematics, and that moving her ‘up’ a group had encouraged her a great deal: “She works very hard, and she really does want to improve.” (M3, interview with teacher, turn 52). We agreed that Millie’s ability to concentrate, for 30 minutes or more at a time, was unusual.

Millie’s exercise book had a chart pasted into the front, listing the targets she needed to meet to improve her mathematics. Jessica was very knowledgeable about the items
that Millie would and would not be able to do when she was working with me, and
the work that Millie had been given to do in class seemed to be at an appropriate
level.

Millie and mathematics at home: the views of her foster carer, Sue

This interview took place a few weeks before the summer holiday, in July 2010. Sue
was very complimentary about Millie’s experience at Flexford:

She’s been at that school now for two years. //Very much organized that
school is, it’s a really nice school. // [At her previous school] she did try hard
there probably, but obviously schools have different ways of learning, so…//
[this school] suits her a lot better, and that’s probably why she’s come on in
leaps and bounds in the last, say, six to twelve months. (M5, interview with
carer, turns 8, 10, 12 and 14).

Sue said she and her husband were given regular information through looked-after
child reviews and through parents’ evenings about Millie’s progress. More time had
been spent on discussing reading and writing, since Millie found that more difficult
than mathematics. Sue and Philip knew that Millie was being given individual help
with literacy, and they were very pleased that she had ‘moved up’ a mathematics
group.

Sue knew that Millie was given homework every week, but whenever Sue asked
about it, “It’s ‘I can’t be bothered’… ‘I’ve not brought my book back home’. It’s
always an excuse and I suppose when she goes back to school it’s the same sort of
excuses.” (turn 26). Sue said that on the few occasions where Millie had brought
mathematics home and needed help, she had told Millie to ask Philip to help, as he
was better able to understand the methods Millie was trying to use. Sue said, “The
working out, it looks so much more than what we did, to get the same answer, do you
know what I mean?” (turn 36). She knew that schools ran classes to show parents new
methods, but would not go to these as she felt she ‘did rubbish” in mathematics at
school herself. (turn 54). Sue had much preferred English when she was at school, and
with their older children, she and Philip shared out the help they gave with
I asked Sue whether she or Phil did anything at home with Millie which she thought helped with mathematics, and she mentioned the Letterbox Club, and the monthly parcels that included number games. These were played by Millie, Sue, Phil and their younger child, Jamie, who was five. Sue said that Millie liked playing with Jamie, using the plastic and paper token money she had received with the games. Millie was also very competent with real money: “She knows exactly what she’s got and exactly how much she’s got to spend. She can work all that out.” (turn 50).

Sue said she was very pleased that Millie was “showing more willing” with mathematics at school:

Because I don’t want her to be one of these that’s like, ‘I don’t wanna do maths, I hate maths’. … I don’t want her to dread it. I’d sooner like, ‘Well, I’m a little bit behind but I’ll try my hardest’. (turn 68).

Millie in Year 6 at Flexford with her teacher, Jessica Fellows

When deciding which teacher to put with which groups of children for Year 6, the head teacher at Flexford had decided to prioritise continuity for the looked-after children in school. Since Millie’s class had had a change of teacher in January of Year 5, Millie and a group of other children from that class continued with Jessica Fellows (now full-time) into Year 6.

This second interview with Jessica was in November 2010, and she reported that Millie had continued to make good progress in mathematics. Jessica felt that Millie really did like consistency, and that this was a major reason for her continued improvement. Jessica had five attainment groups within her class now, and Millie was in the middle group. Although the class was organized in groups, Jessica said that she found it more effective for children to work in pairs.

Jessica said that Millie seemed to be doing more homework this year. I had talked to Millie the day before, and she had told me that she did her homework now because you have to work hard in Year 6. (M6, interview with child). Millie said her teacher had not said so, but she had thought of this herself; Jessica confirmed this, and said,
“A lot of [children in the class] have changed and [they are] thinking, ‘Oh, it’s Year 6, I’d better knuckle down.’” (M7, interview with teacher, turn 68).

To keep track of the children’s work, Jessica was using versions of the Year 6 national assessments for England from previous years, and she had been surprised to discover several gaps in Millie’s mathematical knowledge. I speculated that this could be partly because Millie had attended three different primary schools:

90 Jessica I don’t know. I didn’t realise that she had been at another school, to be honest.
91 Rose Because you’ve not been here the whole time anyway.
92 Jessica No, I haven’t.
93 Rose So you are newer than she is?
94 Jessica Yep.

We discussed Millie’s lack of fluency with multiplication and division number facts; Jessica said this would usually be covered in the first ten minutes or so of some lessons, and might also be tackled on the one morning each week when Jessica did not teach the class, and it was covered by another teacher. However, she acknowledged that it could be an area that needed further attention, and would help improve Millie’s mental arithmetic further.

**Key issues from Millie’s case**

Millie’s case was one of a child in a secure and nurturing foster care placement, and her current school (with a challenging catchment area, and with 42% of children on Free School Meals) was offering excellent support.

Millie’s teacher, Jessica Fellows, taught Millie in the context of the whole class, and was knowledgeable about her attainment in number. Jessica had direct contact with the foster carers, and they were keen to support Millie’s work in mathematics. The school’s decision to keep Millie with the same teacher for a second school year provided important continuity, which would give Jessica time to plan better for Millie’s needs.

The class teacher’s lack of information about the child’s background (and her changes of school) was an issue, but overall, it seemed the school’s practices were very helpful to the child and her foster family.
COMMON THEMES: ANALYSIS AND DISCUSSION

In this section, I will examine common themes across the five children’s experience, including the organization of mathematics teaching for these low-attaining pupils, and their teachers’ experience in working with looked-after children. Decisions about school placements and ways of supporting transition were issues raised by foster carers, and the relationship between school and home is discussed; lastly, I will consider the contribution of the foster families to the children’s mathematical learning.

The arrangements for teaching mathematics in each school in this study varied partly because of school policies (for example, about whether there would be ‘setting’), and partly because of the way in which each teacher used the resources available to them. A teacher’s previous experience of working with vulnerable children, the opportunities they take to build a good relationship with the child, and the support the teacher is given, are all issues that affect every aspect of the curriculum, not just mathematics, but may be particularly important when trying to engage with children who do not have a ‘productive disposition’ towards mathematics (Kilpatrick, Swafford and Findell, 2001).

Setting and grouping for mathematics

Only one school out of the six in the study, Cranfield (which Ronan attended after the summer holiday), used ‘setting by ability’. Within their own classes, each teacher decided whether and how to organize the class into groups. All ten teachers had a system of grouping children within the class according to their perceived levels of attainment, with the aim of providing work differentiated according to the children’s current level, for at least part of each mathematics lesson.

Millie was initially in the low-attainers group in her class, but moved to a higher-attaining group part way through the study. This had a very positive effect on her motivation and achievement, matching the findings of Nunes, Bryant, Sylva and Barros (2009), who analysed data from a large longitudinal study of pupils’ progress and reported that children’s self confidence in mathematics was predicted most
strongly by their ability grouping, and their attainment was influenced by their self-confidence.

Four of the children (Skye, Ronan, Kyle and Dylan) were considered to be amongst the lowest-attaining two or three pupils in their classes throughout the study; those four pupils were also frequently separated from the main class, by being taken from their ‘bottom group’ to be given individual work with a TA, or to work with one or two other children who had learning difficulties. This arrangement provides no opportunities for what Czech mathematics educator Milan Hejny calls “cognitive osmosis” (personal communication, 24th August 2011, International Symposium in Elementary Mathematics Teaching, Prague), where knowledge starts with one child and spreads across the class; there was a very limited field of participants for any discussion or peer explanation.

Boaler (2009) has commented thus about the situation of ‘low ability’ pupils: “In a setted class the main sources of help are the teacher or the textbook. … In mixed ability classes the students are organized to work with each other and help each other.” (p.107). The pupils in my study were not predominantly in setted classes, but the system of attainment groups within the class did prevent them from working with a mixture of other pupils. On the whole, in these bottom groups there was neither a teacher nor text books as a source of help – and the effect of poor reading skills would, anyway, have denied access for three of the pupils to any help from printed materials.

The lack of peer contact and support in mathematics was often compounded because the same children were withdrawn for literacy. Additionally, since these two curriculum subjects together comprise the majority of teaching time in any day, this did seem to have implications for Ronan, Kyle and Dylan in making friends (Howe, 2010).

**Assessing children’s mathematical understanding and providing appropriate tasks**

All of the ten teachers at some point talked about children’s *ability* in mathematics, rather than their *attainment*. The distinction is arguably particularly important for
looked-after children, who have had distressing and traumatic lives; their level of attainment is likely to have been depressed by the times when their education was interrupted or affected by their experiences (Social Exclusion Unit, 2003). It was not something I was able to explore with individual teachers, but I suspected that some felt that ‘ability’ is fixed and innate, and they were already convinced that the child they were working with was always going to work more slowly than others. These low expectations affected the arrangements they made for classroom teaching, including perhaps their willingness to delegate much of a child’s work to a TA. Ruthven (1987) concluded that ‘ability stereotyping’ was common amongst teachers of mathematics, and the view that pupils’ cognitive capability was fixed was in evidence even amongst teachers who favoured ‘mixed ability’ teaching. Research in the last decade has challenged this view, and indicates that cognitive capability can be enhanced (Goswami and Bryant, 2010): but for many teachers, their belief may still be that their difficulty in teaching a child is due to the child’s lack of ability, rather than due to their own lack of success in finding appropriate methods to promote the child’s learning. As to how to change this belief, Ruthven suggested:

The development of a pedagogy which improves the quality of information about individual pupils, which makes more effective use of this information to remEDIATE learning difficulties and to select appropriate learning experiences, and which reduces inappropriately differential treatment, enabling pupils to learn more successfully, is likely, in itself, to discourage stereotyped perceptions and expectations of pupils. (Ruthven, 1987, p.252).

Some teachers working with the five case study children did comment that they thought the child had the potential to ‘catch up’ – for example, Brian Black talking about Kyle (K9), and Lucy Earl talking about Dylan (D5). This idea of the child’s potential for learning is considered further in the next chapter, as is the difficulty of trying to assess a child who has established a repertoire of methods for copying others, or otherwise hiding their lack of understanding.

In order for a child to improve, the teacher needs to recognise their difficulties in arithmetic (Gervasoni and Sullivan, 2007; Houssart, 2007) and the need for well-targeted activity (Dowker, 2004). In this study, each teacher’s knowledge of an individual child’s understanding of the mathematics they were encountering, was
related to the amount of time they spent teaching the child. It seemed likely that those teachers who described in detail the aspects of arithmetic that a child could or could not do, would be more able to set appropriate tasks. Janet Allen talking about Skye exemplified this (S5): although Skye spent some time in each lesson with a TA carrying out work that Janet had set, Janet also taught Skye in additional periods of time each week. Janet scrutinised Skye’s written work (Ofsted, 2012a), and had used assessment items to help her judge Skye’s understanding and skills. Her role in uncovering Skye’s strengths and difficulties matched many of the principles of assessment for learning (Black and Wiliam, 1998).

By contrast, Ronan’s work in mathematics at Cranfield had been delegated twice. His class teacher did not teach him mathematics at all; she did not make any additional opportunities during the day for her to give him extra help. Ronan was in the lower set for mathematics with a different teacher; he was in the ‘bottom group’ of that set, and was at the bottom of that group. The teacher of the lower set had effectively delegated the entire teaching programme of the ‘bottom group’ to a teaching assistant (Alanna Coates), because even though the teacher set work for the group to do, the TA was usually expected to decide for herself what to do with the child, if she did not feel the work set was suitable. This had resulted in inappropriate, dull and sometimes confusing or mathematically incorrect work being provided (R4, exercise book; R7, interview with TA). Although Ronan was receiving one-to-one support, it was not effective because the TA was not sufficiently skilled (Muijs and Reynolds, 2003; Ofsted, 2012a). As Blatchford, Russell and Webster (2012) describe, Ronan was separated from the teacher and the curriculum of the mainstream mathematics class.

Admission to a school rated ‘outstanding’ or ‘good’ by Ofsted is a laudable aim for looked-after children (DfES, 2007), and is likely to improve their situation across much of the curriculum, but it does not of itself guarantee a purposeful experience in mathematics. In Table 4.3, I have collated information about the five children, the six schools they attended, and the ten adults they worked with, together with an indication of the extent of their mathematics time spent with a teacher. I have made two assumptions. Firstly, I have assumed that in every case, the teacher responsible for each child was more skilled at teaching mathematics than the TA with whom he or she was working; I did not see any evidence to the contrary during my interviews with the adults and children, or through scrutinizing the children’s exercise books.
My second assumption is that a teacher needs to spend time each week directly overseeing the child’s mathematical work, in order to carry out the necessary ongoing assessment of a child, to plan the child’s work effectively (even if it is then supported by a TA), and to provide at least some skilled personalized teaching. This time may be within a whole-class, small group or individual teaching situation; at the very least, the child would need to be in the same room as the teacher. Based on the interviews with the adults concerned (S5, S9; R3, R7; K5, K9, K15; D5, D10; M3, M7), I have estimated the percentage of time spent by each child under this kind of direct supervision by the teacher, for the weeks within which I carried out my first and second clinical interviews. This is shown in the next-to-last column of Table 4.3.

Finally, for simplicity, and acknowledging the limitations of the data on which my judgement rests, I have categorized the quantity of time spent with the teacher as ‘good’ or ‘poor’, with ‘good’ being a minimum of 40%.
### Table 4.3: Children’s mathematical experience judged by time spent with a teacher

<table>
<thead>
<tr>
<th>Child</th>
<th>School</th>
<th>Free School Meals</th>
<th>Last Ofsted judgement</th>
<th>Child’s year group</th>
<th>Teacher/TA</th>
<th>% of time spent with teacher</th>
<th>Time spent with teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye</td>
<td>Armthorpe</td>
<td>14%</td>
<td>Good</td>
<td>Y3</td>
<td>Janet Allen</td>
<td>50</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Armthorpe</td>
<td>“”</td>
<td>“”</td>
<td>Y4</td>
<td>Kelly Asher</td>
<td>10</td>
<td>Poor</td>
</tr>
<tr>
<td>Ronan</td>
<td>Brookhouse</td>
<td>38%</td>
<td>Satisfactory</td>
<td>Y3</td>
<td>Claire Berry</td>
<td>90</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Cranfield</td>
<td>13%</td>
<td>Outstanding</td>
<td>Y4</td>
<td>Alanna Coates</td>
<td>0</td>
<td>Poor</td>
</tr>
<tr>
<td>Kyle</td>
<td>Brookhouse</td>
<td>38%</td>
<td>Satisfactory</td>
<td>Y4</td>
<td>Peggy Boden</td>
<td>20</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td>Brookhouse</td>
<td>“”</td>
<td>“”</td>
<td>Y5</td>
<td>Brian Black</td>
<td>30</td>
<td>Poor but improving</td>
</tr>
<tr>
<td></td>
<td>Dunscroft</td>
<td>43%</td>
<td>Outstanding</td>
<td>Y6</td>
<td>Emma Denton</td>
<td>90</td>
<td>Good</td>
</tr>
<tr>
<td>Dylan</td>
<td>Elmswell</td>
<td>55%</td>
<td>Satisfactory</td>
<td>Y5</td>
<td>Year 5 teachers</td>
<td>20</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td>Elmswell</td>
<td>“”</td>
<td>“”</td>
<td>Y6</td>
<td>Lucy Earl</td>
<td>90</td>
<td>Good</td>
</tr>
<tr>
<td>Millie</td>
<td>Flexford</td>
<td>42%</td>
<td>Good</td>
<td>Y5</td>
<td>Jessica Fellows</td>
<td>90</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Flexford</td>
<td>“”</td>
<td>“”</td>
<td>Y6</td>
<td>Jessica Fellows</td>
<td>100</td>
<td>Good</td>
</tr>
</tbody>
</table>

Skye had had teachers within the same school who spent very different amounts of time with their lowest-attaining pupils; similarly, at Brookhouse, Ronan and Kyle’s teachers had different arrangements from each other. The experience and commitment to low-attaining pupils of the individual classroom teacher was a more important indicator of the quality of the child’s experience in mathematics, than how the school was rated by Ofsted. The five teachers who were spending good amounts of time with the children, engaged in mathematics, were all concerned to find more effective ways of working with the children: for example, Emma, who taught Kyle in Year 6, said that she had not taught children at this level in mathematics before, and would welcome advice (K15, interview).
The children’s exercise books, provided in July or September 2011, gave some indication of the level and pace of the work they had been set in the previous term (exercise books, S6, R4, K6, D6 and M4). One common feature of the children’s work was the frequent changes of topic that they experienced. It was rare to find a topic covered on two consecutive days, even with those teachers who had pitched the work at a good level for the child (i.e. Janet for Skye after April, Claire for Ronan, and Jessica for Millie). This will be considered further in Chapter 5.

**Teachers’ experience and relationships with looked-after children**

Because looked-after children comprise only about 0.5% of the school population, some schools will never have a looked-after child on their roll, and many primary teachers will have no experience of the range of issues that can arise for a child in care. Armthorpe and Cranfield were schools with very little experience in this area. The other four schools had a great deal of experience both with children in care and with supporting children at risk of coming into the care system. However, some teachers were relatively new to a school, such as Claire and Brian at Brookhouse; they were not as knowledgeable as some other staff, but were both interested in improving their expertise in supporting vulnerable children. In contrast, Peggy at Brookhouse was well-established and knowledgeable, having been a member of staff for more than twenty years; she perhaps had lower expectations of what a teacher might accomplish, after years of coping with difficult behaviour and unhappy or angry children. For teachers such as Peggy, using a TA to remove a difficult child from one’s classroom might be a way of acknowledging that one is in a stressful situation without sufficient support or advice (Webb and Vulliamy, 2002).

The behaviour of many children in care, particularly those who have been moved recently or frequently, can seem difficult to understand, as was discussed in chapter 2. For example, the lack of conventional distress (crying and sadness) shown by Kyle after the death of his foster carer had seemed evidence to his head teacher that he was not concerned about the bereavement, but her feeling that he showed no emotion was at odds with his teacher’s description of his angry and ‘very strange’ behaviour (K5). A first step in improving the situation, to help build a positive relationship between the adult and the child, may be to give the adult more information, initially about
looked-after children in general and then about the child whom they will be teaching. The designated teacher for looked-after children in every school (DfE, 2011c) could be one route for this support, but at present, designated teachers themselves often have no relevant experience and few professional development opportunities.

The involvement of governors, as initiated by Mr Elliott, the head at Dylan’s school, has some benefits, but similarly may not provide an expert view. However, it does raise the profile of looked-after children at a strategic level within a school, and it may be that having a ‘designated governor’ for looked-after children (i.e. a nominated person who will bring information and concerns to the governing body at appropriate times) would be helpful, alongside the role of ‘designated teacher’. The development of support materials for teachers and governors may be a useful area of work in the future. The role of the Virtual Head Teacher in each local authority (DfE, 2011c) also has the potential for providing guidance for teachers and head teachers with less experience of working with looked-after children, especially when children are first moved, and when new heads take up their posts.

One example where additional information, and the intervention and support of the head teacher, may have been useful was with Kelly Asher, Skye’s second teacher at Armsthorpe, with the aim of building empathy towards the child. Kelly complained that Skye was loud, immature and giggly (S9) – but may not have appreciated that as a child from a large and chaotic family, being noisy and demanding had been essential, to make sure she was fed and noticed. Skye was also a summer-born child (the youngest in the class) who was trying to make the most of a new life, with new parents, new friends and a new school, and without all but one of her siblings. Being giggly might be masking her anxiety to fit in, or might be seen as an indication of her positive attitude to her new opportunities. Whatever the cause, the lack of a positive relationship with her class teacher was sometimes impeding Skye’s learning.

In some cases, of course, experienced head teachers and other senior staff need support. As described by the headteachers of Brookhouse and Elmswell (interviews K2 and D14), being the head of a challenging school, where a high number of children are living in families close to breakdown, is demanding. Outside experts from the Special Educational Needs (SEN) teaching service, Educational Psychology and the children’s mental health teams were available to all of the schools with
looked-after children from this local authority, but they were not always called upon at an early stage. Sometimes this was because a child’s most obvious difficulty (for example, Kyle’s behaviour) was seen as a priority, and the possibility of there being multiple complex issues was overlooked; Kyle’s dyslexia was therefore undiagnosed until July 2011 (K13, SEN report) when he was 10, although he had been in care since he was 5, and symptoms of his special needs would have been evident since he was about 7 years old.

In terms of mathematics, it was difficult to see where expert advice could be gained, as local authorities’ reorganization meant that mathematics advisory services had been reduced, and the SEN teaching services did not have anyone with specific expertise in mathematics.

**Decision-making about the child’s school placement**

Decision-making about a child in public care can be a complicated process. In England, decisions about the child’s education are made at review meetings that usually include the child’s social worker, foster carer/s, teacher, and sometimes the child. There may also be a member of the local authority looked-after children team, and perhaps a school nurse, head teacher or SENCO in attendance.

I am not in a position to know all of the information on the basis of which decisions were made about each of the five children in my study. However, whilst acknowledging that I also have the benefit of hindsight, it seemed that the children’s situations may have been improved by making different decisions, particularly about when or whether a child should change school.

The adults working with a child are rightly concerned to minimize the disruption to the child’s life and to reduce the stress that change can bring. This may have led to a child being kept at the same school, when a well-managed, earlier move might have been better. For Skye and Ronan, their eventual move was carried out much later than their foster carers wished; the effects of a long taxi ride were a disadvantage, and it is more difficult for foster parents and young children to make friends and establish a social community at such a distance. When the decision was made that Skye should stay at her ‘home’ school until more than half-way through the next school year, it did
not seem that any attention had been paid to the fact that her new school’s head teacher, and Skye’s class teacher, were very experienced; as noted by Wang, Haertel and Walburg (1993), this level of detail (a ‘proximal variable’: p.278) could have been considered. An earlier move would have been a great advantage to Skye; although six months may seem a short time to an adult, when a child is only 7 years old, it is a long time to be waiting for more expert teaching. If the concern was to check whether the placement would be maintained, this should be weighed against the additional stress caused to the placement by not having local schooling for a primary-aged child – and if the placement did fail, the possibly minimal disadvantages of the child returning to her previous school later. Moving to a local school may make the child feel more confident that the placement is secure: hence Ronan’s pleasure that “we’re just like everybody else with their mum and dad walking to school” (R5).

The possibility of Dylan moving to a new primary school does not seem to have been considered at all, perhaps because he had had so many carers in such a short time in Year 2 and Year 3 (when, additionally, the school was deemed ‘inadequate’ by Ofsted). While it was clear that the SENCO for the school was committed to providing the best support she could to children in care, by the beginning of year 5 it was evident that the mainstream class teaching Dylan was receiving was exceptionally poor, and his difficulties in reading and mathematics were not being addressed. At that point, he had been with his foster carer for about 18 months, and she had agreed that the placement could be seen as permanent. Inspection of the prospectuses and Ofsted reports for two primary schools near the foster carer’s home, indicates the alternatives available for Dylan. The closest school was one with high levels of children on free school meals, experience of working with children in care, an Ofsted grade of ‘good’ for its last three reports (as opposed to ‘inadequate’ and ‘satisfactory’ for Elmswell), and with after-school clubs every day. This potential primary school also had a number of children who would eventually go on to the secondary school that Dylan’s foster carer favoured. Instead, though, Dylan had continued at Elmswell, being taxied every day for a further two years.

It seems possible that the emphasis rightly being put on continuity is actually leading to inertia when it comes to making decisions about the best school for a child. Multiple changes in foster carer or school are undoubtedly very harmful to a child, but a change of school can be positive. Staying in the same school does not guarantee
continuity of teaching (Siraj-Blatchford et al, 2011), and each case should be decided on its merits, looking at the alternatives available. In some cases (as with Ronan), the foster carers may press for this (R5); with some foster carers (as with Dylan’s) the carer may not have considered it (although she did realize the importance of choosing a good secondary school: D7). The head teacher at Elmswell, whose catchment area included many families and children in situations of gross disadvantage, wanted his school to do the best for Dylan. It may have seemed impossible for him to say that Dylan should move schools: he would not want to seem to reject a child. Dylan’s social worker might not know enough about educational matters to consider it; the local authority looked-after children team should also have considered it, but the team was small and under considerable pressure. But this assumption of ‘stay as you are’ needs to change.

Kyle’s head teacher made the decision to ask for a place for him at a special school after much deliberation, and after a further year of trying to manage his behaviour within her school. The changes she implemented for Kyle in Year 5 did improve his situation, compared to Year 4, but he continued to make little progress in reading or mathematics. His (kinship) foster carer had nothing but praise for Brookhouse, and would not have asked for him to move schools, but the move to Dunscroft did provide Kyle with more freedom and more personal attention, as Dunscroft was a smaller school with higher levels of expert staffing.

Supporting transition

When a child changes school or class, it is helpful to give the child and the foster carer as much information as possible about the change, and to consider ways of making the new situation more familiar (Strand and Demie, 2006). The induction organized for Ronan and his siblings when they moved to Cranfield was good, and elements of this should be possible for most looked-after children when they move schools or move classes: seeing the classroom, meeting the teacher, learning the names of a few of the children in their class, and touring the school were all important to Ronan, as were the visits during the long summer holiday, and being able to borrow books and games. Kyle’s new teacher came to meet him in his ‘old’ school before he visited his new school: he obviously felt this was important. The previous summer, he
had been very agitated because he did not know who his teacher would be at the end of term, and it may have been helpful for him to be told that during the holiday. Skye’s move had been made easier by the physical affection of her new class teacher (which would not be appropriate with every child, but was what Skye needed), and by her teacher’s obvious interest in her. She was also supported by the head teacher, who talked to her frequently, and by non-teaching staff in the school office.

The information passed on from one school to another usually included an assessment of the child’s National Curriculum ‘level’, but the experience of Skye’s new school showed that this is not always reliable as a guide to where the child should begin in mathematics. Millie’s school was the only one out of the original four where mathematics exercise books were passed on from one teacher to the next; in the others, the books were not even taken home, but were thrown way. The message that this gives children as to the status of their work in mathematics can only be guessed at, but it does not seem to be a positive one.

Millie’s school made the decision that her teacher should stay the same for the move to Year 6, and both the teacher and the child appreciated this. Whilst Millie’s care history included far fewer disruptions than for many children in care, since she had stayed with the same family since she was a baby, she had changed school twice, and there were still many personal issues for her to deal with, including the relationship and contact with her birth family.

Continuity of staffing may not always be possible or desirable: quality is also important. Kyle’s school had provided some level of continuity through using one of his teaching assistants from Year 4 to support him in Year 5, but this may not have been effective, because the TA’s established patterns of working with him were poor. Skye’s additional support twice a week in Year 4 from an untrained TA, financed by the looked-after children team, added another new person to those working with the child for mathematics; particularly when a more hierarchical aspect of mathematics such as number is being taught, the guidance given to the TA would need to be very specific to make this worthwhile. An alternative that would have provided continuity and quality would have been to approach Skye’s newly-retired Year 3 class teacher, to see whether she would return for a limited period to coach Skye for an hour each week, but this was not considered.
Communicating with foster carers and setting mathematics homework

All the schools had similar patterns of holding parents’ evenings and providing written reports, for all the children in their schools, and additionally holding the required review meetings for looked-after children. Foster carers with more than one child would obviously have a more time-consuming job to keep track of their children’s needs. Skye’s foster mother, Kate, commented that she and her partner Amy knew that both girls, Skye and her sister Megan, needed extra help, but they were more anxious about Megan; Kate was not clear from her parents’ evening interview whether Skye was getting any extra help, but had felt too flustered to ask more questions. Sadly, Skye’s second teacher, Kelly, had interpreted this as the foster carers not being interested in Skye (S7 and S5). Ronan’s foster parents had five children to consider, but perhaps because they were more experienced as parents, they were more confident about asking questions. They had, however, been reassured by Cranfield that Ronan did not need any additional help in mathematics, when additional skilled support would have been helpful (R5).

Kyle’s behaviour was the major focus of the information given to Brenda by the school, and the little information she was given about his mathematics had been expressed as a National Curriculum level, which meant nothing to her (K7). Dylan’s carer, Chantelle, had seen his exercise books when she went to parents’ evenings, and could see from them that he was not doing well, but otherwise had had little information in Year 5. Her experience of Year 6 had been much better, but she still felt unsure about what the school would like her to do to help (D7).

The exchange of information between school and home seemed to be very one-way, with teachers giving information (albeit sometimes incomplete) but not asking for the foster parents’ views of the children’s interests, activity or attainment in mathematics (Mayall, 2007). Yet the foster carers were all knowledgeable about their children’s attainment from what they did at home (discussed further below), and were often very observant, noticing specific aspects that school could have usefully built upon. For example, Brenda’s observation of how Kyle copied writing (K7), and his facility with text messages, could have signalled the need for a specialist literacy assessment. Debbie and John’s different levels of success, using their different methods of persuading Ronan to concentrate, would have suggested that the school could make
greater demands on him (R5), and could have become known if Alanna, Ronan’s TA, had talked to Debbie about her difficulties in getting him to focus on his work in school.

The mixed evidence about whether homework is useful (Canadian Council on Learning, 2009; Hallam, 2004), and the likelihood that it may be a source of stress for some parents (Solomon, Warin and Lewis, 2002), was reflected in the fact that the foster carers for the five children, and some of the teachers involved, did not expect homework to be completed. This did not mean that the foster carers would not try to help their children with mathematics. However, there was common agreement that children were often too tired to do homework at specific times (especially for those who were taxied from a distance, or who had contact visits after school), and that sometimes the work set was inappropriate: for example, Skye’s foster mother commented on her being asked to work on isosceles triangles (S7). There were several examples of teacher and foster carer not knowing what the other was doing: for example, Ronan’s carer, Debbie, thought that he was not being given mathematics homework from Brookhouse (R5), whilst his teacher was puzzled that such a conscientious carer was not making sure it was done (R3). The child’s attitude to completing homework was crucial – illustrated by Ronan’s decision not to take mathematics homework home, compared to his keenness to complete his book about himself (R5), and by Millie’s decision that homework was important when she started in Year 6 (her last year at primary school), although she had not done any in Year 5 (M6).

Every carer raised the issue of not being certain about the standard methods for arithmetic that were in use in their children’s schools, with varying levels of concern about this: Kate (S7) was happy to use her own methods, but Chantelle (D7) and Sue (M5) worried that they might cause difficulties for their children.

Thus homework was offered by some of the schools, but it did not seem to have a positive reception or an effective impact, except possibly with Millie in Year 6. What the foster carers chose to do at home, from their own initiative, seemed to be more useful, and will be discussed next.
Mathematics at home

it was evident that all five carers wanted their foster children to do as well as possible in school, and were keen to help. Their own confidence in mathematics was very varied: Skye, Ronan and Millie all had at least one adult at home who would help with mathematics; Kyle and Dylan’s carers were less confident, and seemed to have had less successful experiences in mathematics at school themselves. Dylan’s carer, Chantelle, was providing a good model for him, though, as she embarked upon a numeracy course herself at the local college (Brew, 2003). The broad community of people willing to help the child at home (Gregory, Long and Volk, 2004) was especially evident for Millie, who was helped by her foster father and mother, her sister, her sister’s boyfriend and by playing games with her little brother (M5, M6). All five carers wanted advice or reassurance about the things they were doing at home to help, but they were already engaged in purposeful and enjoyable mathematical activity with their child.

The most confident foster parent was Debbie, with Ronan, as she found everyday contexts to give him practice (for example, with his pocket money), alongside more formal methods that were closer to her own school experience (for example, to improve his written numbers, and to practice addition). Kate helped Skye recognize coins, and bought arithmetic workbooks for her, which they both enjoyed; Brenda’s purchases for Kyle were probably too difficult for him, but she had begun to involve him in counting money, and this was more successful.

Money was a useful medium within all five families, and involving the children in shopping, including with their own pocket money, is an example of the contextualized (and therefore motivating) mathematics undertaken at home, and discussed by Walkerdine (1988). Sue talked confidently about Millie’s interest in money, and it seemed this was one aspect of mathematics where this self-proclaimed ‘rubbish at maths’ foster mother (M5) felt able to help her daughter. Chantelle, too, encouraged Dylan to add and give change with coins, and this seemed to have inspired him to answer questions on money at school. Chantelle also realized that Dylan could not tell the time, and successfully taught him herself.

Playing games was another important activity that foster carers, children and other family members were engaged in. Two foster carers (Brenda and Chantelle) said they
would have liked information from their children’s schools about useful computer games and websites (K7 and D7).

All five children had at least one person at home who was willing to help them with learning number facts, evidenced by their willingness to help with spelling practice. This could be another productive area of co-operation between school and home.

In the next chapter, the focus moves from the context of school and home, to consider what each child knew and could do in mathematics. I examine each child’s attainment in number, their difficulties and some of the techniques that seemed to help move their understanding forward.
5. CHILDREN’S PROGRESS AND MOTIVATION IN LEARNING

In this chapter I will examine:

- the five children’s strengths and difficulties in number;
- the children’s views of mathematics learning and teaching;
- productive approaches in pedagogy that arose during the study.

The structure of this chapter follows that of Chapter 4: after general introductory information, each child will be considered individually, and I will then discuss the themes that emerge from this part of the study. Three children’s cases are presented in detail (Ronan, Kyle and Millie); these three have been chosen as they are the most representative of differences amongst the five, in terms of their learning in mathematics, and provide the “balance and variety” advised by Stake (1995, p.6). Additional data for Kyle from his interviews at Dunscroft Special School are provided in Appendix G. The cases of Skye and Dylan are presented briefly; further details of their data and analysis of their cases are given in Appendices H and I, to support the thematic discussion.

*Baseline assessments of children’s knowledge of counting, addition and subtraction*

As outlined in Chapter 3, the Letterbox Club assessments (included as Appendix C) were used with each child at the beginning of the study, and again about a year later. All five children were assessed using the Level 2 items initially, and the two oldest children, Dylan and Millie, also attempted the Level 3 items. Table 5.1 summarises their initial scores, which provided an estimate of their National Curriculum ‘level’ (in number, i.e. not accounting for other areas of mathematics such as shape and space) (DfEE/QCA, 1999). The children’s progress across the year will be discussed in the last section of this chapter.
Table 5.1: Children’s assessment scores at the beginning of the study

<table>
<thead>
<tr>
<th>Child &amp; Year Group</th>
<th>Date assessed</th>
<th>Letterbox Level 2 assessment</th>
<th>Letterbox Level 3 assessment</th>
<th>Estimated NC level 2010</th>
<th>NC level of majority of children in their year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye Y3, aged 7</td>
<td>28.04.10</td>
<td>30%</td>
<td>-</td>
<td>1</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Ronan Y3, aged 8</td>
<td>2.07.10</td>
<td>32%</td>
<td>-</td>
<td>1</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Kyle Y4, aged 9</td>
<td>29.06.10</td>
<td>65%</td>
<td>-</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dylan Y5, aged 9</td>
<td>7.07.10</td>
<td>63%</td>
<td>10%</td>
<td>2</td>
<td>3 or 4</td>
</tr>
<tr>
<td>Millie Y5, aged 10</td>
<td>10.05.10</td>
<td>83%</td>
<td>65%</td>
<td>3</td>
<td>3 or 4</td>
</tr>
</tbody>
</table>

All five children were in ‘bottom groups’ in their classes at first, but as has been described in Chapter 4, Millie was soon moved to a higher-attaining group.

Greater detail of the children’s performance in the Level 2 assessments is shown in Tables 5.2 and 5.3. Questions 1 to 10 (Table 5.2) examined counting, and posed simple word problems in which the child needed to decide whether to add or subtract. Questions 11 to 20 (Table 5.3) assessed knowledge of a sample of number facts for addition and subtraction. The assessments provided information as a starting point for the clinical interviews, as the questions uncovered particular items where each child was uncertain, inaccurate or less fluent in providing an answer.

The final column in Table 5.2 indicates the facility of each question across the five children (i.e. total score out of a possible 10). Questions 6, 7 and 8 caused the most difficulty: subtraction, and addition with a total greater than ten.
Table 5.2: Children’s accuracy and fluency with Letterbox Level 2 assessment items on counting and word problems: Initial assessment, 2010.

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

<table>
<thead>
<tr>
<th>Focus of Question</th>
<th>Skye</th>
<th>Ronan</th>
<th>Kyle</th>
<th>Dylan</th>
<th>Millie</th>
<th>Facility of question: total out of 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Counting in ones (&lt;10 objects)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>2. Counting in ones (&lt; 30 objects)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>3. Counting in tens and ones (&lt; 20)</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>4. Counting in tens and ones (&lt; 100)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>5. Mental addition: 4p + 5p</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>6. Mental subtraction: 10p − 4p</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7. Mental subtraction: 12p − 5p</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8. Mental addition: 8p + 6p</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>9. Counting in twos: 16p</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>10. Counting in fives: 25p</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

Total on this section (out of 20) | 6    | 10    | 14   | 13    | 13     |
Table 5.3 follows with questions 11 to 20, which aimed to check rapid recall of number facts.

**Table 5.3: Children’s accuracy and fluency with Letterbox Level 2 assessment items on addition and subtraction facts: Initial assessment, 2010.**

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

<table>
<thead>
<tr>
<th>Question</th>
<th>Skye</th>
<th>Ronan</th>
<th>Kyle</th>
<th>Dylan</th>
<th>Millie</th>
<th>Facility of question: total out of 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. 2+4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>12. 5-5</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>13. 7-3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>14. 0+7</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>15. 9-1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>16. 6+3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>17. 1+1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>18. 5-2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>19. 8-3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>20. 3+7</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total on this section (out of 20)</strong></td>
<td>6</td>
<td>3</td>
<td>12</td>
<td>12</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
Only one number fact was answered rapidly by all five children, with scores of 2: question 17, 1 + 1. Question 15, 9 – 1, was known by three children.

I was surprised that only one child knew the answer to 3 + 7 (question 20) as a ‘known fact’ (Askew, 2012), given the major focus on number bonds to ten in many English primary schools, but I wondered if the children would have been more confident with 7 + 3. Commutativity was therefore another area to explore in the interviews.

As Dowker (2004) observed, difficulties in arithmetic can be very different in different children. For example, Millie was completely confident with all ten addition and subtraction facts, although she had not been able to answer the subtraction questions posed as word problems (questions 6 and 7). In contrast, Kyle had understood the word problems, but needed to use his fingers to work them out, and he knew only three of the ten number facts. Subtraction questions, with the exception of subtracting one, were found to be the most difficult. Three children were also uncertain about adding zero (question 14) – a difficulty reported by Dowker (2005) amongst others.

Since the Level 3 assessment items were only initially attempted by Dylan and Millie, these are considered separately, later on.

Sources of data

As noted previously, Table 3.7 in Chapter 3 and Appendix D provide a summary of the data collected for each child. This chapter predominantly draws upon clinical interviews, stimulated recall interviews, discussion with each child (incorporated alongside the clinical interview), the Letterbox Club assessments, and examination of the children’s exercise books.

I have used the same conventions as in Chapter 4 to quote from transcripts of interviews. Quotations from stimulated recall interviews are shown in one of two ways. If the quotation is solely from the recall interview, the turn number is prefixed by R: e.g. R32. If the recall comments are shown as additions to the original transcript, they are provided in bold and aligned to the right, as shown here:
26 Kyle One, two, three; one, … one, two, three, four, five, six, seven.

K’s comment: I counted them all.

A summary of the time spent assessing and interviewing each child is given in Appendix F. The maximum time I could spend with a child on one visit was 50 minutes (the length of most numeracy lessons) but each interview finished when I felt the child needed to stop. The shortest session was with Ronan (22 minutes) and the longest with Millie (50 minutes).

Individual reports are provided in full for Ronan, Kyle and Millie in the next section, followed by summary reports for Skye and Dylan.
RONAN

I first met Ronan in his classroom, and he took me to the school’s ‘breakfast club’ room. I explained the purpose of the research, and that I hoped it would help other children in foster care; he seemed pleased, and said “I’m in care!” I read the ‘consent’ letter to him and he signed his name carefully. He told me he was not very good at reading, and that he was going to a new school soon.

Initial assessment at Brookhouse Primary, July 2010 (R1)

Ronan gave answers in a confident voice to every question from the Letterbox assessment items (R1), but whilst his counting was correct in questions 1 to 4, his answers to almost everything else were incorrect. When the question required subtraction, he sometimes attempted addition instead, but usually giving the wrong answer to the addition. He used his fingers occasionally (for example, for question 7, which required 12 - 5, he tried 12 + 5 and made 16), but most of the time he looked up at the ceiling, then said or wrote an answer without any observable calculation method being used.

Ronan had quickly become very fidgety and started asking when we would be going back to his class, but when I showed him my box of plastic fish, he agreed that we could spend a few minutes working with them.

Clinical interview with Ronan in Year 3, July 2010 (Interview R2)

For this interview, I decided to concentrate on numbers within ten, and to check subtraction within the context of fish ‘swimming away’. I also wanted to see whether Ronan realised that addition is commutative, initially by noting whether he commented that \(a + b\) gave the same answer as \(b + a\) (following the method used by Denvir and Brown, 1986).

I gave Ronan the box of plastic fish and drew two ‘ponds’ on a plain sheet of paper. Using the fish, he correctly answered \(2 + 3\), and \(3 + 5\). When I asked him to do \(5 + 3\), he counted the fish again without any indication that he realised this would be the same as \(3 + 5\). For the next question, I asked for \(5 + 3\) again, but he still did not say “I’ve just done that!” but started from scratch, counting the fish out again to get the
correct answer. He asked me if he could keep all the fish, and I said I might be able to
give him just one of them later on.

After a few more additions, I put out a new sheet of paper, drew just one ‘pond’, and
placed six fish there, which Ronan counted accurately:

29  Rose    Ok, right, and two of them are going to swim away, up the
         river. How many will be left?
30  Ronan   (moves two fish and counts) Four left.
31  Rose    OK, four left, so that’s very good.
            Ok, so there’s six to start with (putting fish back). There’s six
to start with, and then...five swim away.
32  Ronan   Yep.
33  Rose    How many will be left?
34  Ronan   Err...
35  Rose    You can do it, make the fish swim away.
36  Ronan   (touches fish but does not move them) One.

When I set similar problems involving fish swimming away, Ronan completed 6 - 3,
6 - 6, 6 - 2 and 6 - 4 correctly, using the fish, but always with some prevarication –
saying, for example, “I don’t know” (turn 46) or “Umm..” (turn 50) and waiting for
some response from me before he continued. As he had become even more fidgety, I
decided to finish by asking him to set a similar question for me:

54  Ronan   And then I can go?
55  Rose    Yep, I’ll walk back with you.
56  Ronan   Good, and I can choose one? (pointing to fish)
57  Rose    Just one fish, yep. Ok, what do you reckon? What are you
            going to make me do?
58  Ronan   Umm...you have to get three...
59  Rose    Ok (puts 3 fish in pond)
50  Ronan   And you get three more …
Yeah, so there’s three fish and then there’s three more…

(putting 3 more fish in the pond)

And then what’s left?

Well, how many altogether there. If there’s three and there’s three more, that’s six altogether. Have I got it right?

Ronan seemed relieved when I said “six”, and he said I was correct, but his form of question, “And then what’s left?” mimicked my wording when posing each subtraction a short time before (lines 29 and 33 above), rather than using the form of ‘altogether’ for addition. He then tried $3 + 3$ on the calculator, and knew where to find the keys for 3, + and = without difficulty (perhaps from his practice at home, reported by his foster mother: see chapter 4). I asked him what was $4 + 4$, and $5 + 5$, and he answered quickly and correctly without the calculator, but for $7 + 7$, he said “Nine” (turn 76), and for $6 + 6$ he used the calculator to get 12.

Ronan changed schools at the end of Year 3, and I waited until he had had a complete term in the new school before visiting him again.

**Clinical interview with Ronan in Year 4 at Cranfield, February 2011 (Interview R6)**

I met Ronan in the corridor near his classroom, and as soon as we had said hello, he said, “Do you know how long I’ve been in the same foster house now?// Two years. It’s two years.” I responded that it was good to stay in the same place, and that I had met his foster mother. He said, “Yes, you know her. I’m staying there.” He smiled and offered to carry my bag to the Deputy Head’s room, where we were going to be working.

For this interview, I wanted to explore subtraction further, and to check Ronan’s counting beyond thirty.

In contrast to the first time I met Ronan, he was calm and co-operative. He told me that they had been learning about the Second World War, and I said that was very interesting, because I had brought some old pennies for him to count today, like the ones that were used at that time. I gave him a pile of 25 old pennies; he commented on how heavy they were, and said “I wish I could show my teacher. She likes things
from the olden days”. Ronan successfully counted them one by one, and I praised him and said that we were going to try some taking away. His initial response was “No way!” (turn 54) but he agreed to try because we could pretend we were in the ‘olden days’ and he was spending money. I gave him a succession of problems, each of the form, “You have ten pence, and you spend …pence”. He used the coins for every question, but frequently seemed to have forgotten how much he was taking away, so I wrote each question down on paper. However, he did not refer to this at all, but kept looking at me. He answered the first three questions without counting how much he had left: $10 - 2 = 9$; $10 - 5 = 5$; $10 - 7 = 2$, so giving only one answer correct out of three. I then insisted he should count, and he did so successfully for the next four questions.

Next I posed some subtractions that would have the answer zero, starting with $7 - 7$. For the first two questions, he counted everything out using the coins, but then realised that he did not need to do so, and correctly answered six further questions that had the answer ‘none’. Part way through the questions, he showed that he was following the pattern:

133  Rose  Okay, next question. You’ve got 2 pence, right.
134  Ronan 2 pence.
135  Rose  Yeah.
136  Ronan  I know what this one is going to be. It’s going to be “take away 2 pence”.
137  Rose  It is.
138  Ronan  Yeah, it is going to be 2! (sounding excited)
139  Rose  And you are spending 2 pence. How much do you have left?
140  Ronan  None!

I returned to subtractions where he needed to take away one, two or three. For $7 - 3$, he answered 5, then 6, then 4. For $8 - 3$, he said 7, then 5. He was always correct when he had to take away one, but even though he used the coins, he often seemed to pick answers at random for any other calculation. He watched my face more often than he looked at the coins. I suspected that he was just guessing, and waiting to see whether I looked content with his answer.
I had a box of about a hundred modern pennies with me, and used this next to check his counting beyond 30. Ronan agreed to put them in rows of ten as he counted them onto the table, and had no difficulties until he got to the fourth row, when he counted “45, 46, 47, 48, 90” (turn 267). I helped him start counting again from 45, and he counted on accurately until “54, 55, 56, 57, 58, 60” (turn 475); further on, he said “77, 78, 79, 70” (turn 487) and then “81, 82, 83, 84, 85, 90” (turn 493).

There were 98 pennies in the box altogether. Ronan said I would only need two more to make a pound; I took another 4p from my purse, and Ronan counted “98, … 99, 100// 101, 102” and then said “One pound two” (turns 517, 519, and 521).

I knew from my interview with Ronan’s foster mother (R5) that she encouraged him to count amounts of money at home. He enjoyed handling money, and this seemed to be a useful practical aid to take him beyond counting on his fingers.

I asked Ronan if he would like to watch himself on the laptop, so that we could talk about the work he had been doing during that session, but before I could warn him he tried to start the film and accidentally deleted it. I reassured him but said that perhaps next time it would be better if I showed him what to press to run the film.

Examining Ronan’s written work at Cranfield, as at February 2011 (R7)

As outlined in Chapter 4, the TA with whom Ronan worked for mathematics, Alanna Coates, provided me with photocopies of some of his written work (material accompanying interview R7 with TA), which she and I had discussed in my interview with her. I re-examined these pages in the light of my clinical interview with Ronan, to compare the content with my assessment of his attainment.

The school’s practice was to glue a chart in each child’s book at the beginning of each term, indicating their targets. Ronan’s targets for the Autumn Term, and Alanna’s judgements on them at the end of term (i.e. in December 2010), were these:

- I can add a one digit number to a two digit number. (Not achieved)
- I can order numbers to 100. (Completely achieved)

Since, in my interview, Ronan was only confident with counting in ones up to about 45, and made several mistakes when counting from 50 to 100, I thought the second judgement was unsound. The target that Alanna felt he had not achieved, on addition,
was not repeated for the Spring Term; instead, he was given a more difficult target on subtraction: “I can subtract a one digit number from a two digit number”.

Ronan’s written work often seemed inappropriate. Some of the work set did not match the supposed learning objective: for example, see Figure 5.1 below, from September 2010, where the ‘learning objective’ (LO) was ‘I can read and write two and three digit numbers’, but which only uses two digit numbers and does not require the pupil to write them.

Although much of Ronan’s work was ostensibly set in a context, it was often unrealistic. In the same example, Figure 5.1, ten cars have to go into five garages, matched by colour but not presented in numerical order, and presenting considerable technical difficulty to the child, who assumed it was necessary to draw lines from car to garage. It is not a context that helps explain why rounding is important, and it certainly does not represent a ‘real life’ situation. Reaching the correct solution requires the child to suspend their knowledge of real life (as described by Cooper and Dunne, 2000).

**Figure 5.1: Rounding garages: example of work with non-authentic context**
There were several places in Ronan’s exercise book where work was marked as correct when it was incorrect, including in figure 5.1 above (where car 93 is joined to garage 20). For example, on a page of handwriting practice, Ronan had written many numbers reversed, but his TA had ticked his work (see Figure 5.2 below, from September 2010) because she said she wanted to be encouraging:

**Figure 5.2: Handwriting practice: example of incorrect work marked as correct**

![Handwriting Practice Example](image_url)

At home, Ronan’s foster mother was trying to make sure that he did write his numerals the correct way round consistently (see Chapter 4, interview R5), but this was not being expected at school.

There were several pages where Ronan was asked to complete subtractions, but the strategies suggested were not ones that he could complete successfully on his own. For example, see Figure 5.3 below, from 15th November 2010. He worked one-to-one with the TA, firstly using her fingers as well as his own to calculate 15-9, and then using a number line to count backwards for 20-7. Both strategies would be difficult to repeat independently for a child at his level of attainment, and he was given no further practice with either method. Not surprisingly, he found a way of escaping from his mathematics lesson soon afterwards: see the TA’s comment after number 4.
Ronan’s final Letterbox assessment, May 2011 (R9)

Ronan’s final Letterbox assessment showed very little improvement made in the eleven months. On questions 1 to 10, he had only improved when counting coins in tens and ones, twos and fives – all of which he had practised at home. His answer to question 5 had been correct the year before (perhaps by accident) but this year he said that 4+5 was 19. Table 5.4 summarises his scores.
Table 5.4: Ronan’s accuracy and fluency with Level 2 assessment items on counting and word problems: comparing 2010 and 2011.

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

<table>
<thead>
<tr>
<th>Focus of Question</th>
<th>Ronan 2010</th>
<th>Ronan 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Counting in ones (&lt;10 objects)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2. Count in ones (&lt; 30 objects)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3. Count in tens &amp; ones (&lt; 20)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4. Count in tens &amp; ones (&lt; 100)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. Addition: 4p + 5p</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6. Subtraction: 10p – 4p</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7. Subtraction: 12p – 5p</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8. Addition: 8p + 6p</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9. Counting in twos: 16p</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. Counting in fives: 25p</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total on this section (out of 20)</strong></td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

For questions 11 to 20, checking rapid recall of number facts within 10, he gave correct answers for 0+7 and 3+7, but gave wrong answers for all the rest, as is shown in Table 5.5. His wrong answers were much larger in 2011 than in 2010 – for example, he had answered “9” for question 13 in 2010, but answered “80” in 2011.
Table 5.5: Ronan’s accuracy and fluency with Level 2 assessment items on addition and subtraction facts: comparing 2010 and 2011.

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

Increased score: \[\text{\large \xmark}\] Decreased score: \[\text{\large \xmark}\]

<table>
<thead>
<tr>
<th>Question</th>
<th>Ronan 2010</th>
<th>Ronan 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. 2+4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12. 5-5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13. 7-3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14. 0+7</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15. 9-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16. 6+3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17. 1+1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18. 5-2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19. 8-3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20. 3+7</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total on this section</strong> (out of 20)</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

I asked Ronan how he had worked out the answers for questions 11 to 20, and he said he had just guessed. “You just have to think in your head and get a number. Then sometimes you are right.” (Assessment, R9). It seemed Ronan’s greater familiarity with a wider range of numbers through counting, may have been reducing his chances of accidentally getting the right answer to any question he was asked.

**Clinical interview with Ronan in Year 4, May 2011** (Interview, R10)

This was my final interview with Ronan, and followed directly after he had completed the Letterbox Club assessment. I decided to return to working with the plastic fish, initially on number bonds within ten, to explore whether Ronan recognised the links between associated addition and subtraction facts.
We started with ten fish, and used a set of playing cards numbered one to ten, to
decide how many fish were going to ‘swim away’ each time. Ronan used a
combination of guessing and counting (not always accurately) to reach his answers.
He gave correct answers to 10 - 8 and then to 10 - 2, and I commented on these:

65 Rose Eight. So ten take away two is eight. So look at this, … ten
take away eight is two, ten take away two is eight.
Two and eight…what’s two add eight?

66 Ronan Two add eight?

67 Rose Yes, what’s two add eight?

68 Ronan Nine. Ten.

69 Rose Which? Nine or ten? Two add eight?

70 Ronan (Thinks for a while) Ten.

Next, Ronan correctly answered 8+2=10, but he did not really see the connection
between 10, 8 and 2:

77 Rose And what’s ten take away two?

78 Ronan Easy, ten.

79 Rose No. Ten take away two?

80 Ronan Nine? No.

1, 2, 3, 4, 5, 6, 7 (pointing to fish as he counts the, then
emphasising seven).

81 Rose You didn’t count that one. (Rose points at a fish)

82 Ronan Eight.

83 Rose So ten take away two is…how much?

84 Ronan Eight.

Even after some discussion and further examples using 10, 8 and 2, Ronan still
prevaricated:
… and ten take away eight? (Indicates all fish, then covers eight with her hand)

Ten take away eight…equals… (stares at Rose’s face)  
(Rose moves hand away from the eight fish, and moves the fish instead).

Here’s the eight, they’re saying ‘Bye, Ronan, we’re going’, who’s left?

Two.

After that long exchange, I did not feel at all confident that Ronan could see the links between 2, 8 and 10, as he hesitated so often, and the only time he looked confident was on turn 78, when he was wrong. He had become quite fidgety. I felt that totals to ten were too large for him.

For the next few minutes, Ronan wanted to talk about children at his previous school whom he thought I might know, and then about how the singer Michael Jackson had died. This did seem to make him feel calmer. We then started again, but with six fish, and then just five, and with Ronan setting the questions for me to do. The opportunity arose to explore zero again (which we had tackled in the Spring Term, in interview R6):

Do you want to give me one more to do? Five take away…how many should I take away this time?

Four.  
Four (removes four fish). The answer is…

Zero. (Rose points at the one fish remaining) One.

Yeah, five take away four…

Equals one.

It’s one. (Moves fish back, so there are five again). How could I make the answer zero? What would I have to take away?
You have to take away four, and then the answer’s one.

Yeah, but if I want my answer to be zero, if I want it be none? If I want there to be no fishes left, how many have I got to take away?

You’ve got to take away…is it one? Four. Three.

Well, let’s see what happens, if I take away one (moves one fish away) No, there’s still four there. That’s no good, we can’t do take away one (puts all fish back).

Take away three? (takes three fish away; Ronan is watching attentively). No, there’s still two there (puts all fish back).

How many have I got to take away?

Take away one.

Take away one? (Takes one fish away). No, there’s still four there. I want there to be none left (puts all fish back).

Take away four. (Rose takes away four fish).

Take away five (Ronan grins).

Let’s see if that works (puts all fish back). Take away five (Rose takes away all five fish).

Leaves none (smiling).

Very good, you’ve found it, you’ve cracked that puzzle. Five take away five is none. What’s six take away six? What do you think that will be?

Erm, six take away six? (Puts his head on the table and sighs).

You can do it if you like (Rose adds one more fish to the group). There’s six fish there.

(Sits up again) Equals none. Six.

Show me.

Look, six take six is none (takes all six fish off the paper and grins).
After we put the fish away, I asked Ronan what he had been doing in maths that week, but he said he could not remember, and could not tell me what he found most difficult, or what he thought would help him. Ronan did say that he thought his maths lessons were boring. He said there were lots of things to help him in the lessons: “Calculators. // Number lines, rulers. // Cubes, bricks, white boards. // Dice” (turns 320, 322, 324 and 328), but that he did not use any of them; he did like using the fishes. I asked him whether he thought he could show me how to do a sum (for example, two add four) using the number line, but he said no, “I did that ages ago, we don’t actually really do it all the time” (turn 338), and he shook his head vigorously when I asked him to try. The opportunities that equipment can provide for discussion (Houssart, 2004) were not available to him.

I had not attempted a stimulated recall interview with Ronan after the first interview, because he had seemed too agitated, and it had not been possible after the second one, because Ronan had accidentally deleted the film. This time, I asked Ronan whether he wanted to watch himself on the film, but he said no, he would rather watch another boy, and asked whether I had film of any of the children he knew from his previous school. I said no, but he still did not want to watch himself.

**Key issues from Ronan’s case**

Ronan’s major tactic of guessing to achieve an answer was not serving him well, and this tactic was effectively reinforced by his TA and her desire to ‘encourage’ him: she did not give him clear guidance on whether his answers were right or wrong. The TA’s choice of work for him to tackle was also causing difficulties. The resulting lack of progress was similar to that reported by Webster and Blatchford (2012) in their summary of research into the deployment of teaching assistants.

It was sometimes difficult to persuade Ronan to work through a problem with equipment, but he enjoyed using the fish, and was happy to use money. The adult working with him needed to be persistent, to keep his focus on one aspect of calculation; he was then able to engage with a problem himself, and to come to an answer using practical equipment and counting, rather than guesswork.
Ronan’s previous experience in mathematics had taught him that he could survive the lessons using his extensive repertoire of strategies for disengagement. Ronan could not explain what he was doing, because he was not using logical methods – he was relying on luck, most of the time. Although his foster mother had realised that he could make progress if she persisted with the topic in hand, Ronan’s teaching assistant’s response when his work was incorrect, was to change the topic. I was dismayed that there seemed to be no effective plan in place to overcome this – and, indeed, that his problems had not even been recognised in his current school.

Ronan’s view of mathematics seemed to be that it was something that usually made no sense. This perspective needed to be challenged, and it will be considered further at the end of this chapter, and in Chapter 6.
**KYLE**

My first interview with Kyle was in June 2010. Kyle asked “Why are you seeing me?” at the beginning of our session, and I explained about my research. He was interested that I was working with children in care, and said “I’m in care, too”. I read him the consent letter and gave it to him to sign; he asked if he had to write his whole name, and I said no, just his first name would be fine, but he said, “No, I mean can I just put a K, not my whole name”. It took him a considerable time to write his first name above where I had typed it on the letter – then he underlined his typed surname.

**Initial assessment, June 2010 (K1)**

Kyle’s first comment when he saw the coins that I wanted him to count was “It’s real money!” His counting was accurate and efficient – when he counted the mixture of ten pence coins and pennies for question 4, he collected the ten pence coins first, and quickly reached the answer “67p”. He listened carefully to the mental mathematics questions 5 to 8, and was confident about whether he should add or take away, but he had to calculate the answers using his fingers. For question 7, “Pretend that I’ve got 12p. If I gave you 5p, how much would I have left?” he joked “I’ll have to use my toes for this one.”

After he had successfully counted 25p in five pence coins, he said “I can count to 100 in fives”, then did so without hesitation. However, when I asked him what comes next, after 100, he could not work it out. I said, “OK, let’s try a smaller number. What comes next after 30?” but he needed to start from 0 and count through in fives to 35.

In the second part of the assessment, checking rapid recall of number facts within ten, he was only able to answer 5 - 5, 9 - 1 and 1 + 1 quickly. For the latter, he said “That’s the sum I learned first”. For all the others, he used his fingers. He was very indecisive about question 14, 0 + 7, and said “Zero add seven – oh, it’s not zero. I could swap it around. Seven add zero. Zero add seven … Is it seven? Or not? I can’t do it.” I was impressed that he did not want to guess – he left the question blank.
Clinical interview with Kyle in Year 4, June 2010 (Interview K3)

My starting point for this interview was to explore adding nought. I decided the most useful approach would be to employ a ‘leading pattern’ (a term subsequently suggested to me by Sue Gifford, personal communication at BSRLM, March 2011) – that is, a sequence of calculations for Kyle to try, that could lead him to be convinced that 0 + 7 was 7.

We used seven plastic fish and two ‘ponds’ drawn on a sheet of paper. After some initial practice with smaller numbers of fish, I asked Kyle to place four fish in one pond, and three in the other.

11 Rose Then tell me as quickly as you can how many you’ve got altogether. Four in that pond (points).

12 Kyle They can actually stand up.

13 Rose They can, they’re brilliant fish.

14 Kyle How many in that one? (points to empty pond).

15 Rose Three in this one.

How many all together?

16 Kyle (Points to each fish as he counts slowly) One, Two, Three, Four, … Five, Six, Seven.

17 Rose : Seven. Four and three makes seven. Ok, now, suppose we move one of the fish. Take one of these fish...

I then asked Kyle to move one fish from the smaller group, to join the larger group, and when he had done that, he agreed that five and two made seven. I planned to make two more fish move in turn, but Kyle saw the pattern sooner than I expected, as is shown in turns 28 and 30:

Kyle moves one of the fish to make 6 in one pond and 1 in the other.

26 Kyle One, two, three; one, … one, two, three, four, five, six, seven.

27 Rose So we’ve still got seven. How many in this pond?

28 Kyle (turning towards Rose) It equals seven! Don’t it!
Rose smiles at Kyle’s reaction.

29  Rose  Yeah! So how many in this pond?
30  Kyle  (counting fast) One, two, three, four, five, six, and then we put that one in there (Kyle moves the last fish to join the other six) and, one, two, three, four, five, six, seven.
31  Rose  and how many in here?
32  Kyle  None.
33  Rose  So what’s seven and none?
34  Kyle  Seven. (Grins)

But knowing 7 + 0 is not the same as knowing 0 + 7; I wanted to check Kyle’s view of an addition starting with zero, so I moved all of the fish across into the other pond:

35  Rose  Suppose all these seven went over here, now we’ve got none and seven. How many have we got?
36  Kyle  (Shrugs his shoulders) Seven? I mean none?
37  Rose  Look. How many have we got, we’ve got none there and seven there, how many altogether? (Points to each pond)
38  Kyle  Seven?
39  Rose  Yeah. So what’s none and seven?
40  Kyle  Seven (confidently).
41  Rose  What’s seven and none?
42  Kyle  Seven.

Kyle remained confident, giving correct oral answers to 0 + 5, 2 + 0, and 0 + 2. I then wrote down eight questions for him to try (including 5 + 0, 0 + 5 and 2 + 0 + 0 + 0), and he wrote correct answers very quickly and confidently in a matter of seconds.

Next, I asked Kyle to make up a sum for me to do. He seemed surprised at this request, and checked with me several times: “Any sum, yeah? I can do any sum?” (turn 76) before giving me 100 + 100 to complete. When I got that right, he wrote down a more difficult sum for me: 100000 + 100000, and I read it out, “A hundred thousand add a hundred thousand. So it’ll be two hundred thousand” (turn 85). He
marked it with a C (for ‘correct’), and I asked for one last sum to try. Kyle counted the zeros out loud as he wrote them, and I commented on the number as I started to think about it, as I could not remember how many millions made a billion. Kyle thought I was having difficulty in reaching the written answer, and gave me hints as I struggled, as can be seen here:

91   Rose    So, it’s got ten noughts on it. *(pauses)*
92   Kyle    I could just tell you one thing, just change that number. *(points to the one at the beginning of 10,000,000,000).*
93   Rose    1, 2, 3, 4, 5, 6, 7, 8, 9, 10 *(counting the noughts).*
94   Kyle    No, really, what’s one add one? What’s one add one?
95   Rose    I want to be able to say the number. So it’s going to be two and ten noughts, but I want to be able to say what that number is... So, if it were there it would be thousands, if it were there it’d be hundred thousands, if it were there...that would be … so it’s two, … twenty thousand million. *(Laughs).* I think! I’m going to have to check that! A very big number.
96   Kyle    There’s a calculator in there, if you want me to get one for you.
97   Rose    It won’t work on a calculator - it’s too big, and that won’t tell us how to say it anyway, will it? That would just tell us what it is, in numbers. *(Rose gets a calculator and passes it to Kyle)* OK, you try it, ok? Do you know how to turn it on?
98   Kyle    Yep.
99   Rose    Yeah? Do you use a calculator in class sometimes?
100  Kyle    1, 2, 3, 4, 5, 6, 7.... It won’t do it.
101  Rose    No, it’s too big isn’t it? It’s too big for that calculator.
102  Kyle    We need a bigger, bigger calculator.
103  Rose    You’d need one that did more digits on the screen. This one will only do up to eight, I think. Is it eight different numbers you can put on?
Kyle keys numbers into the calculator.

104 Kyle 1, 2, 3, 4, 5, 6, 7, 8

105 Rose Yes.

106 Kyle (Kyle checks the numbers again) Yeah, eight.

Throughout this section of the interview, I felt that Kyle and I were working together, rather than that I was directing his work. I had given him a greater level of control than he was accustomed to in school, by asking him to make up questions for me; the fact that I was unsure about how to say the large number had interested him; and his comment in turn 102, “We need a bigger, bigger calculator” felt genuinely collaborative, because he said “we” not “you”.

I returned to questions involving zero for the last part of the interview, incorporating the calculator. I asked Kyle to try 124 + 0 mentally, then try it on the calculator; for both answers, he confidently said 124. He correctly answered 124 − 0 after a short hesitation, and then another addition. I commented, “You know what you’re doing now, definitely, don’t you!” (turn 128).

Kyle wanted to watch the film of himself working, and I agreed that we could watch the first half. This became the first recall interview I undertook, as described in Chapter 3 – an unplanned but henceforth important method of discovering more about children’s learning.

Stimulated recall interview with Kyle in Year 4, June 2010 (Interview K4)

As described before, I had not expected Kyle to comment on what he was doing on the film. Initially, his comments were very general, for example, “You can see me. I’m doing the fish. I’ve got a shark like, you can do it in the bath, it squirts.”

Then Kyle began to comment on his work, sometimes mentioning activity that had not yet happened on the video: for example, he said “You wouldn’t let me use the fish. I could have done it with my fingers” before he asked on the video whether he was allowed to use the fish and I had said, “No, not yet.” (turn 7, K3). While he watched, Kyle said comparatively little – he leant forward, concentrating on the screen. I quickly made notes of his comments and where they were made.
Kyle watched himself as he successfully did $4 + 3$ (commenting “There was seven” before he answered on screen), $5 + 2$, then $6 + 1$. This was the point in the original interview where he had noticed the pattern so far, and his comments demonstrate that he recognized this moment:

*Kyle moves one of the fish to make 6 in one pond and 1 in the other.*

26 Kyle One, two, three; one, … one, two, three, four, five, six, seven.

Kyle’s comment: *I counted them all.*

27 Rose So we’ve still got seven. How many in this pond?

28 Kyle *(turning away from the fish)* It equals seven! Don’t it!

*Rose smiles at Kyle’s reaction.*

**Kyle’s comment:** *Look at my face! I got it! Seven add nought is seven. I learned it!*

29 Rose Yeah! So how many in this pond?

30 Kyle One, two, three, four, five, six, and then we put that one in there *(Kyle moves the last fish to join the other six)* and, one, two, three, four, five, six, seven.

31 Rose and how many in here?

32 Kyle None.

33 Rose So what’s seven and none?

34 Kyle Seven. *(Grins)*

**K’s comment:** *I knowed that now. I knowed it, knew it, before, you know.*

Kyle’s realisation in the initial interview that $7 + 0$ must be seven (line 28), *before* he had moved the last fish, was accompanied by him turning round in his chair, looking up at me and grinning. His excitement when he watched himself on the video was apparent, too, even though he attempted to moderate it by saying that he ‘knew it before’.

When Kyle watched a later sequence of sums, his comments showed again that he recognised he had learnt something new:
Rose Very good, and what’s none and five?

Kyle Five.

**Kyle’s comment:** I’m getting good at it now.

Rose And what’s two and none?

Kyle Two.

Rose And what’s none and two?

Kyle leans back in his chair and stretches when he answers.

Kyle: Two. *(grins)*

**Kyle’s comment:** Look at me! I’m pleased, aren’t I!

Kyle confirmed this again after he watched himself completing several written sums involving zero:

Rose Brilliant. So now there’s something you can do that you couldn’t do before.

Kyle I could do it, It’s just I thought it was...

Rose It sounded silly?

Kyle Yeah.

Rose Yeah, you weren’t sure about the answer were you?

Kyle shakes his head.

Rose But do you feel sure now?

**Kyle’s comment:** Yeah, I’m sure now.

KyleYep.

Watching the last part of the interview, where Kyle made up sums for me to complete, he noted that he had been surprised by my request:

Rose … OK. Now, you make up a sum for me to do.

Kyle A sum for you to do?

**Kyle’s comment:** I never done that before.

Rose Yeah.
When the video finished, I attempted to have a conversation with Kyle about his work in his exercise book, and his mathematics lessons, but he just said “They’re boring”. As we walked back to his classroom, he commented that he had not realised before that calculators could not do everything, and that had surprised him.

**Examining Kyle’s written work at Brookhouse as at July 2010 (K6)**

Kyle’s Year 4 teacher said I was welcome to have his exercise books at the end of term, as otherwise, “they would only be thrown away”. I wanted to see whether the work he had been set, matched the level of attainment he had shown in my interview. Kyle started a new page for each lesson, and began with a ‘Success Criterion’ (usually referred to as ‘SC’) written at the top. Occasionally the SC was in the TA’s handwriting, but usually Kyle had struggled to write it; his handwriting was very difficult to read, as his teacher had acknowledged (K5) and his foster carer, Brenda, noted in my interview with her (K7, discussed in chapter 4). An example is shown in Figure 5.4.

*Figure 5.4: Example of Kyle’s handwriting, March 2010*

```
Tuesday 9th March    I can use a grid method
```

“Tuesday 9th March    I can use a grid method”
I wondered about Kyle’s motor co-ordination, and I suspected that each SC took Kyle a considerable time to write. On one page, Kyle had subverted the heading by writing “I can’t divide by 2”, and a page headed “I can review my learning” was otherwise completely blank.

I estimated that Kyle could not access over half the topics in his exercise book, as they were too difficult. He did not seem to have been given the opportunity to consolidate any area of work. For example, in one week in March, he had been set work on these topics: multiplication using the grid method; adding amounts of money up to 30p; dividing by 2; solving word problems; and giving change within £2. As Brown and Millett (2003) reported in their analysis of topics presented to low attaining pupils, those offered to Kyle did not address his greatest needs; additionally, the speed at which new topics were introduced, and the “objectives-led approach” (Kyriacou, 2005, p.178) were preventing him from engaging with mathematics at all.

Clinical interview with Kyle in Year 5, November 2010 (K8)

In this interview, I planned to ask Kyle about mathematics lessons in his new class, and to explore his strategies for addition and subtraction within 20.

Kyle’s teacher, Brian Black, had given us Kyle’s Year 5 exercise book to discuss. When I asked Kyle to tell me what he had done on each of the first few pages, he initially answered “Can’t remember” (turn 5), so as I turned the pages, I described what I thought he had done, and made small positive comments, for example, “It looks like you were counting up in fours there – and you did OK with that” (turn 8). It became clear that the ‘SCs’ did not help Kyle. When I asked what he was doing on a page about football teams, he just pointed to the SC at the top of the page, and I began to read it aloud:

18 Rose “I can use…” Tell me what it says.
19 Kyle I can’t even read it.
20 Rose How do you know what to write there, Kyle?
21 Kyle Cos, then, Mr Black puts it on the whiteboard and I copy it.
23 Rose Oh, right. So it’s up on the whiteboard and you copy it out.
Kyle Success criteria (sarcastically).

Rose Success criteria?

Kyle That’s what the “SC” is.

Kyle and I looked at several more pages together, and I said that I thought he was doing more work this year in each lesson. He shrugged, but did not comment. The only page where he showed any enthusiasm included a block graph on favourite television programmes, where he was keen to point out that his favourite, the Simpsons, had been chosen by the majority of children in his class.

In order to explore Kyle’s addition strategies within 20, I used a pack of playing cards. Kyle offered to shuffle the cards, but then gave them back quickly and asked me to do it, saying that when we had finished, he would show me a card trick. When he saw my slow shuffling technique, he took the cards from me and tried my method, reasonably successfully. His level of physical co-ordination was sufficient for the task.

I explained the activity to Kyle: I would deal out two cards from the pack, face up, and he must tell me what they added up to. The first two were a seven and an eight. He sat in silence, with his hands under the table, with his mouth moving as he counted, then said “15” (turn 84).

Rose Can you tell me how you worked that out? Show me what you did.

Kyle Using my fingers. I counted on my fingers 1, 2, 3, 4, 5, 6, 7 Kyle holds each finger out as he counts. But under the table.

Then I put 7 in my head, and then counted up to 8, so: 7, 8, 9, 10, 11, 12. Kyle counts from 7 upwards so that his first finger is 7, his second finger is 8, and so on. He hesitates on ‘12’.

No. 7, 8, 9, 10, 11, 12, 13, 14, 15. This time, Kyle counts from 8 upwards so that his first finger is 8, his second 9 and so on, until 15.

He had realised where he had gone wrong when demonstrating to me, and corrected himself. His method was laborious, though, as he counted through from one, so in the
following turns I wanted to suggest some possible strategies he could use. He provided one strategy himself immediately, but not in the way I would have expected: when I turned over a seven and a six, he reversed their order to put six first, and said “13” (turn 87) fairly quickly. With the pairs of numbers that followed, he no longer counted on his fingers, but said the number on the first card, and then counted on, using the markings on the second card. The only combination where he knew the answer instantly was a 10 and a five, when he said “15. I know that one off by heart” (turn 93).

We continued with three cards each time, and used the ‘picture cards’ to count as 10 each. He changed the order of the cards whenever there was a ten, to count the tens first, but was uncertain when adding a third number to 20: for example, for 10 + 10 + 5, he said that 10 + 10 was 20, and then add 5, was “15 … no … 20? …25!” (turn 111).

Kyle said he would like four cards next, and then after a few turns he asked for five cards. His strategies were these: prioritising tens; changing the order of the other cards, which did not always help him; and counting the markings. When he tried to add 5, 4, 3, 2 and 9, he grouped the 9 with the 2 and the 5, and said that was 15 (but sounding uncertain); he then moved all the cards several times, and finally said 23 (turn 117).

118  Rose  Okay. Can I show you how I would do that one? Because you’ve got a very good idea about swopping the numbers round to see how you could put them together.

I spotted 2 and 3 makes 5, add 5 makes 10.

*Rose groups the 2 with the 3, and then adds the 5 to the group.*

So I have got 10 there. That’s 10, and then add on the 9. 10 add 9?  *Rose waits for Kyle to add them together.*

119  Kyle  19.

120  Rose  19. 10 and 9 is 19, and then I add on the 4. 19, 20, 21, 22… *(pointing at each marking on the card as she counts)*

121  Kyle  23.
Rose: Yeah, so you can look for little groups of numbers that help you, because you know what they make. All right, 5 [cards] again, not got many left now!

Kyle: 6!

Rose: 6, okay. You’re sure?

The six cards were a 6, 7, 8, jack, queen and king. Kyle grouped the picture cards immediately, “10, 20, 30”, began to count the others, but went back to check the picture cards twice more, “10, 20, 30 … 10, 20, 30, …… 51” (turn 125). I offered him a calculator to check, and he added the three smaller numbers first:

Kyle: These are 14 (moving the 8 and 6 cards); that’s 7 (moving the 7 card), so that’s 21. Then add the tens… (hesitates) 15!

Kyle shows Rose the calculator and she points at the screen, which shows 51. Kyle looks uncertain, but does not speak.


Kyle’s reversal of ‘51’ to read it as ‘15’, had unsettled him; I wondered afterwards, when I viewed the film of the interview, whether he had shown me the calculator display because he realised it was wrong, but could not immediately see why.

Kyle quickly suggested that he could show me his card trick next. He was smiling and encouraging as I followed his instructions, and when he ‘found’ the cards I had chosen from the pack, he offered to explain the trick to me, so that I could try it on other people. His explanation was clear, covering both what I should do and what I should say.

At this point in the interview, there was less than ten minutes left until the end of the lesson. Rather than trying to carry out a recall interview in such a short time, I decided to continue with my original plan of exploring subtraction, using the playing cards to decide what number Kyle would take away from 10. I wrote down each calculation as he completed them, while he turned the playing cards over, and he worked quite quickly, completing 16 calculations in under three minutes, all correctly. We then discussed them, and he said he thought they were easy because he could just imagine his fingers. He did not think he knew them ‘off by heart’, except for 10 - 10 and 10 - 1. He had not thought about the links between, for example, 10 – 4 and 10 –
6, and was interested in looking for the pairs in the list of his calculations that I had written down. I realised that this was a new experience for him, as his own written work in the classroom did not provide sufficient clear examples for him to be able to draw any conclusions or to see patterns, and there was no evidence that the adult working with him (usually a TA) had acted as scribe for more than one or two calculations at most.

Taking away from 20 was evidently much more difficult for him; each calculation took longer, and he was much less confident, often repeating the question several times, and giving wrong answers (for example, $20 - 7 = 14$, turn 212). We finished with $20 - 10$, which he said he did know off by heart.

I had gathered evidence (including his inability to copy successfully, and the reversal of digits when reading a number, all compared with the more proficient level of his oral skills) that suggested Kyle might have specific learning difficulties. According to his school, his formal statement of special educational needs was entirely about his behaviour (confirmed later, in an interview with local authority staff, K10, March 2011). As mentioned in Chapter 4, I contacted the head teacher to suggest that an assessment for specific learning difficulties might be useful for Kyle. The screening was eventually completed in July 2011, and is considered next.

**Special Needs Teaching Service (SNTS) Literacy Assessment, July 2011 (K13)**

I was provided with a copy of this nine-page report by the SNTS team, with permission from the looked-after children team. The interviewer stated that she was unable to complete some tasks with Kyle (including a mathematics assessment, where he refused to continue), although she found Kyle to be generally co-operative. Kyle’s standardised scores on the Wide Range Intelligence Test (WRIT) (Glutting, Adams and Shelow, 2000) are given in Table 5.6.
Table 5.6: Test results for Kyle on the Wide Range Intelligence Test

Kyle’s chronological age at time of testing: 10 years 6 months (10:06)

<table>
<thead>
<tr>
<th>WRIT test item</th>
<th>Standardised score</th>
<th>Percentile</th>
<th>Age equivalent/ comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal analogies</td>
<td>112</td>
<td>79</td>
<td>13:06 in high average range</td>
</tr>
<tr>
<td>(verbal reasoning)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expressive vocabulary</td>
<td>86</td>
<td>18</td>
<td>8:06 in low average range</td>
</tr>
<tr>
<td>(defining common words)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matrices</td>
<td>127</td>
<td>96</td>
<td>18:00 + above average</td>
</tr>
<tr>
<td>(non-verbal reasoning)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diamonds</td>
<td>114</td>
<td>83</td>
<td>15:00 in high average range</td>
</tr>
<tr>
<td>(spatial awareness/ reasoning)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These high scores contrasted with Kyle’s performance when reading: his standardised score on the WRAT 4 reading test (Wilkinson and Robertson, 2006) gave a ‘reading composite’ score of only 82, a below average score (12\textsuperscript{th} percentile for his age); his standardised spelling score was 80, also below average (9\textsuperscript{th} percentile). The SNTS interviewer concluded, “There appears to be a clear discrepancy between Kyle’s underlying reasoning abilities and his current attainments, indicating specific, rather than generalised, learning difficulties” and “his literacy difficulties do appear to be dyslexic in nature”. Finally, she noted that Kyle’s handwriting was affected by an ‘intention tremor’, and recommended that his fine motor skills should be assessed by an occupational therapist.

This assessment was carried out on 1\textsuperscript{st} July 2011, and the report was provided to me during August, a few weeks after my last interview with Kyle at Brookhouse Primary.

**Kyle’s final Letterbox assessment, July 2011 (K11)**

Kyle’s second Letterbox assessment showed almost no improvement over the year. Table 5.7 summarises his scores on questions 1 to 10, with little change from 2010.
Table 5.7: Kyle’s accuracy and fluency with Level 2 assessment items on counting and word problems: comparing 2010 and 2011.

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

Increased score: ✈  Decreased score: ❌

<table>
<thead>
<tr>
<th>Focus of Question</th>
<th>Kyle 2010</th>
<th>Kyle 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Counting in ones (&lt;10 objects)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2. Count in ones (&lt; 30 objects)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Count in tens &amp; ones (&lt; 20)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4. Count in tens &amp; ones (&lt; 100)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5. Addition: 4p + 5p</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6. Subtraction: 10p – 4p</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7. Subtraction: 12p – 5p</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8. Addition: 8p + 6p</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>9. Counting in twos: 16p</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>10. Counting in fives: 25p</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total on this section (out of 20)</strong></td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

Within questions 11 to 20, he was now confident that 0 + 7 was 7, and he knew 2 + 4, but otherwise there was no improvement in his recall of number facts – he still needed to calculate items such as 5 – 2 using his fingers:
Table 5.8: Kyle’s accuracy and fluency with Level 2 assessment items on addition and subtraction facts: comparing 2010 and 2011.

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

<table>
<thead>
<tr>
<th>Question</th>
<th>Kyle 2010</th>
<th>Kyle 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. 2+4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12. 5-5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>13. 7-3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14. 0+7</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15. 9-1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>16. 6+3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>17. 1+1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18. 5-2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>19. 8-3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20. 3+7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total on this section (out of 20)</strong></td>
<td>12</td>
<td>14</td>
</tr>
</tbody>
</table>

Kyle did agree to try the first few items on the Level 3 assessment (whereas in 2010 he had refused), but he was only able to complete three of the 20 questions – those that required him to count amounts of money in 10p and 1p coins.

Clinical interview with Kyle in Year 5, July 2011 (Interview K12)

Because Kyle had made so little progress with number facts since my last interview, my intention in this interview was to concentrate upon addition and subtraction within 10, and to explore whether Kyle could learn a small range of number facts, given sufficient repetition. I also wanted to find out more about his views of mathematics learning and teaching.
Several factors seemed to make it difficult for Kyle to concentrate in this interview. Firstly, there was only a week to go until the end of term. I recalled from the previous year that Kyle had found the imminent changes quite stressful (interview with foster carer, K7). I did not realise until the end of the interview that Kyle had also been told he would be moving school. In addition, after we completed the Letterbox assessment, the room we were working in became busy with people coming in to access the cupboards, so we did not have the usual level of privacy. This affected Kyle’s willingness to speak during the interview; when someone else was in the room, he would nod or shake his head in answer to my questions, or just hold up a number of fingers to give the answer to a calculation.

I used a pack of playing cards, as I had done successfully in interview K8 in November, to generate questions; as each card was turned over, Kyle was to subtract that number from 10. To check whether he could begin to remember specific number facts, I aimed to use just five or six cards, then to shuffle them and use them again, for two or three repeats. It was quickly evident that Kyle was finding it difficult to concentrate, and I reduced the cards to four: a pair that made ten (four and six) to see if he noticed the connection, and two others (one and three).

Kyle completed the first calculation fairly quickly using his fingers, and I wrote it on the notepad so that he could see it: 10 – 4 = 6. The following three calculations took a considerable time, as Kyle engaged in diversionary activity (including pulling faces at the laptop screen, moving the cards, and repeating each question several times). It took 39 conversational turns to complete 10 – 6, 10 – 3 and 10 – 1 (turns 25 to 63).

We used the same four cards for three more rounds, but there was considerable time between each calculation and Kyle’s knowledge of the four facts did not improve. He continued to calculate each one with his fingers, and showed no sign of seeing the connection between 10 – 4 and 10 – 6. In the final round, when he had seen that the next card was three, he did look at the two calculations I had already written: 10 – 1 = 9, and 10 – 4 = 6, and said that “10 take away 4 is 6, so 10 take away 3 should be 5” (turn 96). I prompted him to use his fingers to check, but when he found the answer was seven he refused to do any more, and sat shaking his head vigorously.

I was uncertain about the best course of action to take next. I would have liked to explore the idea he had expounded, as he had tried to find a pattern, but I judged that
he was so agitated that any further work we attempted might be unsuccessful. Instead, I agreed that we had finished working, but said I wanted to ask him a few questions about what would help children in numeracy lessons, saying “I just wanted to get your opinion” (turn 99). He relaxed slightly; I offered to turn off the laptop so that he would no longer be videoed, but he said he wanted it on, and sat staring at the screen. However, he turned to face me, raised his eyebrows and nodded emphatically when I said that some other children had told me that maths was difficult, because just when they thought they were going to understand something, the teacher moved on to something else. He said that writing out questions took him “20 hours” if he had to do it himself (turn 108); he wanted to have an adult sitting with him (turn 141), but his TA would only rarely write things down for him. He then told me he was moving to a new school, and said that if I was not busy on Monday I could meet his new teacher, as she was coming to Brookhouse, but I explained that unfortunately I had to be somewhere else.

As described in Chapter 4, I arranged to see Kyle at his new school, Dunscroft Special School (for pupils with social, emotional and behavioural difficulties), for a sequence of interviews during the Autumn term, starting in October.

**Interviews with Kyle in Year 6 at Dunscroft Special School in 2011**

In these interviews, I wanted to explore Kyle’s mathematical understanding further, but also to experiment with approaches to learning that I thought might suit him. Here, I will report briefly on just two of these four interviews, concentrating on two particular elements: learning number facts, and the handwriting of numerals. Fuller accounts of these interviews (K14 and K16) are provided in Appendix G.

In the first interview, Kyle said he was feeling settled at his new school and he liked his teacher. I explained that I would visit four times in the Autumn Term; I said I realised that he had got so far behind in mathematics that it was difficult for him to see how he could get any better, so I wondered if he would like me to suggest some things that would help him. He nodded emphatically and agreed.

To help Kyle learn number facts, I provided several identical copies of a printed test for addition number facts within ten (Griffiths 2009b). On the first occasion that Kyle completed this, he finished in just under three minutes, using his fingers for more than
half of the twenty calculations. By the third repeat of the test, all within the same morning, he took less than a minute. This time, he had used his fingers for $3 + 4$ and for $4 + 3$, but, as far as I could see, for no other sums. Kyle showed that he was aware of how his knowledge had improved, as he said “The thing is, with that (*points to $2 + 2$*) and that (*points to $3 + 3$*), I just went ‘four’ and ‘six’” (K14, turn 297). As Karpicke and Roediger (2008) suggested, repeated testing had proven effective in helping Kyle improve his fluency with number facts.

As a change of activity, I asked Kyle to count a collection of pennies that I had brought. He was confident counting up to seventy, but then rather hesitant about eighty and ninety. He counted 100, then said “A pound” (turn 202) but he would not agree to count the remainder as 101, 102 and so on, as he said it would be too difficult (turn 206).

In my third interview at Dunscroft (K16) we concentrated on handwriting. We began with a worksheet that showed ‘how some children have written their numbers’, where he had to decide which numbers were written clearly enough, by comparing with a ‘good’ example next to them. He was able to distinguish which numerals needed improvement. Kyle then wrote the numerals 1 to 9. He was able to criticise these, perhaps because we had discussed someone else’s work first: he had a model to follow. Perhaps, also, it felt less threatening because I had made it clear there were many children who had difficulty with writing numbers. He decided that his ‘target numbers’ to improve were 2, 3, 6 and 7.

During the writing practice that followed, Kyle concentrated on each of these numbers in turn. Figure 5.6 shows the row of 6s he wrote (following an example of mine, marked ‘Rose’). I asked him to choose the one he thought was best, and he nominated one as ‘excellent’, one as ‘good’, and one for complete obliteration, saying “That’s not even a six!” (turn 146). The comparison with his previous sixes showed a major improvement.
Key issues from Kyle’s case

Kyle’s poor behaviour had been assumed to be the major cause of his difficulties in school, and his specific learning difficulties had not been recognised. He had developed a repertoire of refusal, diversion, working slowly and being excluded from the classroom at Brookhouse, so that the actual amount of mathematics in which he engaged was very low. The nature of the tasks offered to him in class was often inappropriate; using the categories suggested by Houssart (2005), the level of difficulty and the mode of presentation often led to him ‘opting out’.

The move to a special school did help Kyle cope with the school day, and his behaviour had improved immensely. However, his time spent engaging in mathematics was still very low and still predominantly with a TA. His class teacher was uncertain about what level of work he should have, and how to help him.

The issue of Kyle’s handwriting was not a trivial one. It was a barrier to him engaging in mathematical work, and the lack of written examples for him to scrutinise meant he was unlikely to see patterns and structures in his work that would help him make progress (as Mulligan (2013) outlines). His uncertainty when counting and his lack of knowledge of number facts were additional impediments.

Kyle’s ‘productive disposition’ (Kilpatrick, Swafford and Findell, 2001) inevitably varied in relation to the pressures of his life inside and outside school. However, he was very responsive to opportunities to reflect upon his own learning. As Watson (2005) suggests, teachers may expect high achieving students to explore the mathematics in which they are engaged, but provide a different diet for lower achieving pupils, which is focused on the practice of simple algorithms: indeed, this had been Kyle’s previous experience (see Chapter 4). Watching the initial video of himself seemed to shift Kyle’s beliefs about himself as a learner; as Schoenfeld
(1992) pointed out, the links between cognition and affect are strong. Kyle’s realisation that he had learnt something new (when he watched the video) and, later, his noticing that he did not need to use his fingers every time when tackling number facts questions, are examples of the way in which a focus on metacognition could improve a child’s productive disposition.

Several teaching strategies used in these interviews had provided him with the opportunity to improve his understanding and fluency in early arithmetic. The interviews had shown that he was able to concentrate for considerable periods of time, and that he could work quite fast.

These issues of behaviour and affect, assessment and productive approaches are ones that have already been raised in relation to Ronan, and were also evident in the cases of Skye and Dylan, which follow later.
MILLIE

Millie was the oldest of the case study children; although she had been in the ‘bottom group’ in her class when she was chosen for my study, she had been moved to a ‘higher’ group a few weeks before I met her in Year 5, and she was already assessed as being at National Curriculum Level 3. She had completed the Letterbox assessments at Level 2 and Level 3 in May 2010 with a teacher from the Special Needs Teaching Service.

Initial assessment, May 2010 (M1)

Millie’s performance on the Level 2 assessment tasks was reasonably confident when she was counting and adding, but she had been unable to do either of the subtraction questions set in a context. Her knowledge of number facts within ten was good, and she had answered questions 11 to 20, checking rapid recall of number facts, quickly and correctly.

Her answers for the counting and addition questions on the Level 3 assessment tasks were also correct, and she had been able to subtract 20p from 85p, but she had not been able to work out the change from £1 if she had spent 65p.

Clinical interview with Millie in Year 5, June 2010 (interview M2)

Millie was quiet and co-operative. We began by using the tens and ones from a set of place value cards to generate two-digit numbers for Millie to add, and I said she could use any method she wished to calculate the answers. She tried to answer the first three sums mentally, and she was successful with $44 + 55 = 99$, but gave the wrong answers to two calculations, saying $69 + 55 = 104$ and $37 + 44 = 87$. Her preferred option for all the calculations seemed to be using pencil and paper, in the standard vertical layout. (I later discovered that this was the method used at her previous school). This was not the method used predominantly in her Year 5 class at Flexford, where the teachers encouraged children to use a number line, but Millie’s attempt to use a number line at my request was laborious. Instead of using the number line to support her calculation, Millie worked out the total mentally (albeit wrongly) then tried to figure out what numbers to write on the number line, to make the diagram match the answer she had given.
Millie told me that she was good at addition and multiplication, but not at subtraction and division, and she did not understand decimals. She said that she worked with a partner in her mathematics group, and they often had to ask the teacher to help them: “Every lesson” (turn 190). She said that when she tried to work things out mentally, “You normally get it wrong” (turn 220) so it was better to use pencil and paper. I asked whether she had ever used tens and ones equipment, and she agreed that she had “a little bit” (turn 222) for addition and subtraction, and would try to show me how she would use it for subtraction, using numbers generated with the place value cards again.

The first calculation was 76 – 69. Although this was a subtraction where counting up from 69 to 76 would provide the answer very quickly, Millie counted out seven ‘tens’ and six ‘ones’ from the equipment, then removed six ‘tens’ and said that she now needed to take away nine (turn 240). She did this by taking away the remaining ‘ten’, and giving herself a ‘one’ – she did not attempt to swap the ‘ten’ for ten ‘ones’, as children are often taught to do. Millie counted the ‘ones’ she had left and gave the answer “Seven” (turn 257); however, she seemed very uncertain of this. I then suggested that we could try again with ten pence and one penny coins, pretending that she had 76p, and she was buying a lolly that cost 69p. Millie still did not use a ‘counting on’ method; this time she attempted to change one of the 10p coins for 10 pennies, but I would not let her do that. Instead, I defined our roles more clearly: I was the shopkeeper and she was a customer with 76p.

252 Rose: Ok, you’re going to buy this lolly, and it’s 69p. So how are you going to pay me?

Millie hands over 70p in 10 pence pieces.

And what will I do?

253 Millie: Give me 1p change.

254 Rose: Yeah, exactly, and how much have you got now?

255 Millie: 7p (confidently).

The context of shopping seemed to have made the problem clearer. This could have been simply because it was a second attempt at the same calculation in a different
context, but Millie did seem much more confident with the coins than with the tens and ones equipment.

**Clinical interview with Millie in Year 6, November 2010 (interview M6)**

Inadvertently, this interview was conducted without an audio recording, so the video record, field notes and Millie’s written work were used to write more detailed notes of the proceedings, in place of a transcript.

Millie said that she had moved up another group in mathematics, and was now in the middle group of five, and she was pleased that she had the same teacher as in Year 5. The major focus of this interview was subtraction from 200. As with her previous interview, Millie concentrated fully for the whole time available. She seemed able to explain how she had tackled each calculation, and she seemed confident about saying that she did not understand something, or did not know what to do.

We began with $200 - 49$, which Millie answered immediately as 151. For the next question, $200 - 63$, she asked for pencil and paper and wrote the calculation in a vertical layout. She changed the 200 to 1, 9 and 10 (using the standard decomposition algorithm). Initially, she said the answer was 70, but changed her mind several times, giving the answers 46, 36, and then 46 again. Using the calculator gave her the answer 137, but she said that could not be right, as she had counted up on her fingers from 63: 64, 65, 66, 67, 68, 69, 70. Although she was holding up seven fingers, she said “Six”, and then counted from the 60 in 63: 70, 80, 90, 100, so that she had four fingers to count: 40. Her answer was therefore 46, completely omitting the additional 100. Although she had written the question down in the vertical format, including doing the ‘crossings out’ for decomposition, she had actually calculated on her fingers by counting up.

Millie used a similar method of counting on to calculate $200 - 89$, reaching an answer of 21. This time, when she used the calculator and got the answer 111, she said that she must be doing something wrong, but she could not see what it was. I suggested she could make 200, using the hundreds, tens and ones equipment, and see what she got when she took away 89.

Millie took one of the blue ‘hundred’ squares and ten green ‘tens’, then exchanged one of the ‘tens’ for ten yellow ‘ones’. She then removed seven ‘tens’ and nine ‘ones’,
and said the answer was 121. When I asked her to count what she had taken away, she counted 79, and seemed puzzled. She explained that she had not counted the amount she had moved away, but instead had calculated 200 – 89 in her head, and decided she should leave 20 and one behind. Once again, she was not using the method it appeared she was using, but was trying to make the equipment match her faulty ‘counting on’.

We discussed the three places where she made errors:

- When she counted her fingers, she was accurate when counting on just one hand, but went wrong when counting a number larger than five.
- She began her ‘counting on’ from the ‘tens’ digit of the number she was taking away, rather than from the tens digit of the number she had counted up to in ones.
- She forgot that she was taking away from 200, not 100.

Millie agreed to try further subtractions, and to explore each one using four methods: counting on; using the calculator; using hundreds, tens and ones equipment; and using the number line. The five calculations (200 – 42, 200 – 74, 200 – 36, 200 – 18 and 200 – 55) were chosen randomly using place value cards, as in interview M2, to decide on the number to subtract. Each calculation was written down, as Millie said otherwise she sometimes forgot the numbers she had started with.

Several issues arose during these explorations. Millie immediately became better at self-correcting when she counted her fingers for numbers above five. She enjoyed checking on the calculator, and was keen to try again when her calculation and the calculator display did not match. She said that she had never repeated the same calculation using several methods before.

One element of Millie using the hundreds, tens and ones equipment only became evident when I watched the video later on. At one point, when I was looking away from Millie to write some notes, she quickly picked up a plastic ‘ten’ strip, and counted along the markings with her finger, checking that it was ten. Without the video, I would not have known that she was still uncertain about this. I wondered, too, if the different colours of the equipment (blue for 100, green for 10 and yellow for
one) added to this uncertainty, as the colours perhaps made it less obvious that ten single yellow ones would be the same as a ten ‘stick’ coloured green.

To help Millie to think about why her ‘counting on’ had been faulty before, I asked her to use the equipment in two ways: methods linked to the ‘taking away’ and ‘comparison’ aspects of subtraction (Fuson, 1992). For example, for the calculation 200 – 74, firstly, she carried out the subtraction by laying out 200, counting 74 to take away, then counting what was left to get her answer, 126. Next, starting afresh, we worked in the other direction: Millie counted out 74, then added amounts to that until she had 200, adding 6, then 20, then 100. This did seem to help with her subsequent efforts at ‘counting on’, and she began to get correct answers using that preferred method. The equipment particularly provided her with a reminder of the 100 that she had previously forgotten – she pointed to the plastic square each time, before giving her answer.

In her previous interview (M2), I had realised that Millie did not feel confident with using the number line. The likely reason for this seemed to be that she had changed schools, and her previous school had not used this method, but her current teacher did not know this (see Chapter 4, interview M7). When I asked Millie to show me how she would do 200 – 63 on the number line, she drew a line showing 0, 100 and 200, then put a mark showing where she thought 63 would be (see Figure 5.6).

**Figure 5.6: Millie’s number line for 200 – 63**

Millie said that she did not know what to do next, because you had to go backwards and you would just get 63 or zero for your answer, and she knew that both of those were wrong.

We tackled 200 – 74 together, on three successive number lines, as is shown in Figure 5.7. I explained that we would start from 200, and use the number line to help us count backwards, taking away 74, bit by bit. Millie said that now she remembered that was what you had to do, but she did not know how much you had to take away each time. Diagram (i) shows my demonstration, using ‘jumps’ in tens then ones; diagram
(ii) is Millie’s version, when I said she could use bigger ‘jumps’ if she wanted; diagram (iii) is a joint effort, using a bigger jump again.

Figure 5.7: 200 – 74 calculated on a number line (all ‘taking away’), to establish that you can use different ‘jumps’:

Having seen the three versions, showing that you could reach the same answer in a variety of ways, Millie seemed much more confident. She asked for another subtraction, to try on her own. This is shown in Figure 5.8.

Figure 5.8: Millie’s calculation of 200 – 36 on a number line

In retrospect, since I had started with both ‘taking away’ and ‘comparison’ examples, I wished I had also shown Millie that she could use the number line to count forwards, using her example of the number line with 63 marked on it. (I did return to this in my last interview). However, we continued with further calculations, using a mixture of methods to solve each one several times over. This was a useful approach, as Millie’s competence with each method improved.
Millie’s final Letterbox assessment, April 2011 (M9)

Millie’s first assessment in April 2010 had shown that she was already able to complete almost all of the Level 2 and Level 3 items in which I was interested, having difficulty only with subtraction. For this final assessment, I used just the Level 3 assessment items to check her accuracy and fluency in counting, addition and subtraction with numbers below 100. She no longer had difficulty with the subtraction items, and had only one item incorrect: 15p add 35p, for which she gave the answer 45p, but then corrected herself when I asked her to try again.

Clinical interview with Millie in Year 6, April 2011 (interview M10)

I had been uncertain in the previous session whether Millie would have preferred not to be videoed, as she had not wanted to watch herself on film. However, when I was slow to get the laptop out of my bag this time, she said anxiously, “You haven’t forgotten your laptop, have you, for filming me?” However, she did not change her mind about wanting to watch herself, so I did not complete any recall interviews with her.

My key aim in this interview was to revisit the subtraction methods that I had explored with Millie in November 2010. We began with her attempting 200 – 32 by counting on, and she gave the answer 188, “because I thought it would be 178, but I know I kept getting it wrong, so I have to change it” (turn 8) – sadly, changing it in the wrong direction. When counting on previously (see interview M6 above) Millie began her ‘counting on’ from the ‘tens’ digit of the number she was taking away, rather than from the tens digit of the number she had counted up to in ones. For 200 – 79, Millie gave the correct answer, 121, but then said that 200 – 41 was 169, and 200 – 98 was 112.

Millie said that her teacher had done further work with her on using number lines, because she now knew Millie had not used them at her previous school. Millie showed me some examples in her mathematics exercise book, where she had ‘worked backwards’ for subtractions. I suggested that she could try ‘counting on’ on the number line. I demonstrated with 200 – 32, then Millie independently drew the number lines shown in Figure 5.9, making ‘jumps’ from left to right, and reached the correct answers for each calculation.
Millie tackled several more examples, using the number line confidently and then counting on mentally. Finally, she tried 200 – 85 and 200 – 56, by counting on mentally without drawing the number lines, and gave correct answers for both without difficulty. Throughout the session, she worked with enthusiasm, discussing the methods we used.

**Millie’s national test results (SATs), July 2011 (email M11)**

Jessica Fellows, Millie’s class teacher, emailed me her results at the end of Year 6: “Millie did really well, getting a Level 4C in maths and a 4C in reading”. Millie had reached the target level for her age, and was no longer considered a ‘low attainer’ in mathematics.

**Key issues from Millie’s case**

Millie’s mathematical attainment did seem to have been affected by her changes of school – but mostly because her new teacher did not know this had happened, and was therefore attributing Millie’s lack of understanding, and gaps in her knowledge, to a lack of ability or application, since she assumed that Millie had been present for the whole of Flexford School’s mathematics curriculum.
The realisation that Millie had not been taught some methods of calculation that were prevalent in Flexford School had led to her teacher providing additional help; this had been especially effective because of the head teacher’s decision to allocate the same teacher to Millie’s class for another year.

Millie frequently appeared to be undertaking one method to perform a calculation (for example, pencil and paper decomposition for a subtraction), when she was actually using another method, her favoured method of ‘counting on’, to reach an answer. She made a number of small but significant and frequent errors when using ‘counting on’ but it was unlikely that these would have been noticed by her teacher in a whole-class setting, as the natural assumption would be that Millie needed additional help with the overt method presented.

These issues of support from a teacher who has had time to get to know a child well, and the use of a variety of methods of calculation, are considered further in the last section of this chapter.
SKYE

This account outlines the key issues for Skye; a more detailed account of her case, in a parallel form to that of Ronan, Kyle and Millie, is provided in Appendix H.

Skye’s lively nature was evident from the first time I met her, when she grinned, and told me “we are going in the library but we don’t have to be quiet”.

The initial Letterbox Level 2 assessment with Skye (S1) had uncovered two problems. Firstly, when she had been given some coins and asked how much money there was, she had counted how many coins, rather than using the value of each coin. Then, for the subtraction questions, Skye had tried to multiply, add or divide. For example, for $7 - 3$, she had counted in threes, tried to do “seven threes”, and answered 20.

Skye’s class teacher in Year 3 had begun to practise counting in twos with 2p coins with Skye. However, in interview S3 with me, Skye initially counted the number of coins, not the amount of money. A short discussion about why we had 2p coins, not just pennies, seemed to focus her attention more clearly on what was needed, and she successfully counted up a mixture of 2p and 1p coins to make 7p.

Skye was interested in being filmed. She often talked directly to the camera – in a manner that reminded me of television cookery demonstrations. In stimulated recall interviews, Skye was not able to explain what she had done, but these did give me an opportunity to explain to her why I was impressed with her work (including her counting with coins), and to model an explanation of how I thought she had completed a calculation.

Skye’s response to watching part of one interview (S13) was excited shouting, as she realized she now knew the answers to the questions I had previously asked her to do with the fish. Directly after I asked each question on the film, and before she said it on the video, she called out the answer several times. So, for example, when I said “12 - 4” on the film, she shouted “8, 8, 8!” and a few minutes in, she commented “Oh, she’s so slow!” whilst watching herself counting out the fish one by one. She enjoyed this immensely. Accidentally, we had found a strategy that was successful in motivating Skye to focus on ‘rapid recall’ of number facts.

Like Ronan, Skye did not seem to be completely familiar with common forms of addition and subtraction questions. When I suggested she could make up a question
for me, she asked me: “If one fish goes in here, what makes this fish go in here?”
(Interview S3, turn 54).

Working with a calculator gave Skye the opportunity to explore subtraction, alongside using the plastic fish. For example, to calculate $9 - 5$, Skye keyed in 9, but could not identify the subtraction sign, choosing $x$ and then $=$ instead, until I pointed at the correct sign; she read the digital display, 4, with no difficulty. We re-enacted $9 - 5$ with the fish, and got 4 again. I asked her to do $8 - 2$. She said confidently, “It is going to be ten!” but a few seconds later said “I done a mistake” and showed me a display showing 82. (S3, turns 108 and 110), before managing $8 - 2 = 6$. She repeated the problem using the fish, then with the calculator again, and got 6 each time. There was a moment then when I realised she was beginning to understand what was happening, when she said, “If you take away … Oh, OK!” (turn 127).

**Key issues from Skye’s case**

Skye’s behaviour – noisy, fidgety, with only short periods of concentration – was inhibiting her learning in mathematics. She acknowledged that in class, she often copied other pupils, or was ‘helped’ by the teaching assistant, without gaining any understanding of how to solve a problem herself; she also worked slowly (probably deliberately), and concentrated on neat handwriting. Yet when her attention was caught, she learnt quickly.

Further areas of Skye’s understanding or confusion in mathematics were uncovered by letting her take the lead – by her telling me the type of questions she wanted to be asked, or by her making up questions to ask me.

Filming Skye provided several benefits: it was an incentive for her to concentrate; it provided material to watch together to show her she was making progress; and it encouraged her to begin to work more quickly, as she tried to ‘beat herself’ when she watched the film. Similarly, using a calculator alongside practical materials was very productive, particularly when she was exploring subtraction.

These issues of behaviour and affect, assessment, and productive approaches will be discussed further in the final section of this chapter.
DYLAN

This account outlines the key issues for Dylan; a more detailed account of his case, in a parallel form to that of Ronan, Kyle and Millie, is provided in Appendix I.

In Dylan’s initial assessment (July 2010, D1), he was keen to count the amounts of money, and said “Real money! Yeah!” when he started. His counting in tens and ones was accurate in questions 1 to 4, and he was reasonably confident with the addition and subtraction questions in context, but he was not able to count the 2p coins in question 9, saying “I can’t count in my twos very well. Is 15 in the twos? I think it’s 15p.” Dylan’s difficulties when counting in twos were still evident in a later interview (D8, February 2011) when he missed out numbers as he counted.

Dylan’s answers to questions 11 to 20, checking rapid recall, were almost all correct, but slow. He seemed to know $0 + 7$, $9 - 1$ and $1 + 1$, and used his fingers to calculate all the other questions. In a later recall interview (D3), Dylan confirmed that he worked out most calculations on his fingers, but said that he did know $5 + 5$ made 10; for $10 + 4$, he said he did not know the answer, but “I can do it really quick on my fingers” (turn R41).

Dylan’s written work from his mathematics lessons for Year 5 (D6) indicated that he was frequently presented with work that was much too difficult for him, and his response was to stop trying: throughout his exercise book, there were comments from the TA such as “refused to work for 20 minutes”. In spite of this, during one interview he asked me to show him how to do percentages. I was struck by how anxious he was to learn, regardless of the poor experiences he had had.

There were times in my interviews with Dylan when he reached a level of panic that seemed to prevent him thinking. He said he often felt annoyed or angry in lessons, because lessons went too fast: “Like when you are trying to do something, we move onto another thing. So we change onto another subject … and I am left behind and I have to stay in at break time.” (Interview D13, turn 18). He said that when they started a new topic, “I get worried sometimes because I think sometimes I won’t catch up” (turn 36). He did not panic at the beginning of a topic, but did so “near the end. Cause you have to catch up” (turn 42).

When Dylan moved to Year 6, he had additional individual coaching sessions with his class teacher Lucy Earl at least twice a week for about half an hour, during which
Lucy concentrated on mental mathematics and learning number facts (interviews D5 and D10). Dylan’s second Level 2 Letterbox assessment showed some improvement over the year, largely through increased fluency with number facts. However, considering the high input of individual time that his class teacher had provided during the year, the improvement seemed relatively small.

**Key issues from Dylan’s case**

Dylan’s major calculation strategy was counting, but because he often missed out numbers when he was counting (especially when counting in twos or counting backwards), his answers were often wrong. He knew few number facts. He had been given work on many aspects of number during Year 5, including decimals, percentages and fractions, all of which had been too difficult for him, and there had been very frequent changes of topic. Consequently, his sense of himself as someone who could not do mathematics had become more entrenched.

In spite of this, Dylan was still keen to learn, but his levels of panic and anxiety were sometimes so high that he could not even sit still, and he found it very difficult to cope with getting wrong answers. His major tactic to help him manage his anxiety was straightforward refusal. However, when the context was practical (such as with the plastic fish) or in a game, he was more relaxed and could recognise a pattern or accept that he needed to try something again, and he made more progress.

The issue of making a detailed assessment of the child’s skills and understanding in number, so that they can be given work at an appropriate level, has already been raised in relation to Skye, Ronan and Kyle. The need to alleviate panic and promote a calmer and less rushed approach to mathematics was especially evident for Dylan; he wanted to learn, but the chance to receive more concentrated help had not been provided until Year 6. The year-long focus on end-of-year tests and constant revision that is common in Year 6 classrooms (Boaler, 2009; Reay and Wiliam, 1999) may have made it difficult for him to feel calm and to concentrate, in spite of his teacher’s best endeavours.
COMMON THEMES: ANALYSIS AND DISCUSSION

In this section, I will examine common themes across the five cases, including considering the children’s strengths and difficulties in mathematics, and their views of their own experiences of learning and being taught. I will also outline some positive approaches that were successful during the study and that may prove helpful in promoting children’s mathematical learning.

The initial Letterbox assessments of the five children had shown that Skye, Ronan, Kyle and Dylan were considerably below the level of other children in their year groups. Millie, the most settled of the five children in terms of her family, did not have the same level of difficulties. However, her case was still a useful one to consider, in particular when considering productive approaches to enhance children’s mathematical experience, and because the information that she had changed schools had not been shared.

The children’s difficulties in mathematics

The initial assessments of the five children revealed difficulties with counting, with subtraction, and sometimes with calculations involving zero. My aim here is to examine some common aspects, whilst acknowledging that these cases illustrated Dowker’s view (2004) that difficulties in arithmetic are different in different children.

Counting

For all of the children, the interviews showed that counting (including on their fingers) was an important method of calculation, so the mistakes they made when counting in ones, twos, fives, or tens, needed to be addressed if they were to make good progress. In terms of problems with the counting sequence (Buys, 2001), each child’s difficulty was different: for example, Ronan was unable to remember the names of ‘decade’ numbers, such as seventy and eighty, while Dylan regularly missed out single numbers earlier in the counting sequence, and Kyle panicked when asked to count above 100. These problems would only have become evident to their teachers if the children had been asked individually to count out loud, or if they had been
watched carefully when they counted on their fingers – which was particularly relevant for Millie. Apart from practice in counting in twos (for example, by Skye), there was no evidence that this assessment of their counting had happened.

Leading from this lack of assessment of their counting skills, there was no indication that the children had been given opportunities to practise counting numbers of objects, even for small groups. The only items that were evident in any of these Key Stage 2 classrooms for children to count (apart from their own fingers) were plastic ‘cubes’ or counters. Although the National Numeracy Strategy (DfEE, 1999) had encouraged teachers to place an additional emphasis on counting for the whole primary age range, these older low-attaining children seemed to view the use of counters and cubes as ‘babyish’ or shameful – or perhaps just boring. Ronan’s comment, that the cubes were there to help him but he did not want to use them (R10), was echoed by all but Millie.

Ronan’s counting gave particular cause for concern, because it was not clear that he realized that the number of items he counted would stay the same, whatever order he counted them. As Maclellan (2008) points out, a child needs to understand the purpose of counting as a method of determining quantity, in order to understand addition and subtraction.

Table 5.9 shows how the five children’s activity matched with the counting ‘types’ defined by Steffe, von Glasersfeld, Richards and Cobb (1983), and discussed in Chapter 2. These authors observed that children do not always use the most sophisticated ‘type’ that they have mastered; however, as Fuson (1988) noted, children who are not yet using verbal or abstract unit items benefit from having physical items to count, to improve their understanding of arithmetic. Skye, Ronan and Kyle were not being given this opportunity.
Table 5.9: The five case study children’s observed ‘counting types’ as defined by Steffe, von Glasersfeld, Richards and Cobb (1983)

<table>
<thead>
<tr>
<th></th>
<th>Perceptual unit items</th>
<th>Figural unit items</th>
<th>Motor unit items</th>
<th>Verbal unit items</th>
<th>Abstract unit items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Uses actual items to count)</td>
<td>(Can imagine items)</td>
<td>(Can use a motor act)</td>
<td>(Can use number words as countable items)</td>
<td>(No longer requires sensory-motor units)</td>
</tr>
<tr>
<td>Skye</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ronan</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyle</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dylan</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Millie</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Addition and subtraction

The use of counting equipment was an important part of my exploration of the children’s understanding of addition and subtraction. Skye, Ronan, Kyle and Dylan were not reluctant to use the plastic fish to help them carry out addition or subtraction problems. This may have been because we were generally in a private situation, but I suspected that they would have been just as interested if we were in a main classroom, since I had cubes and counters available as another option, but the children were keen to use the fish. Placing their arithmetic in the context of fish swimming between ponds was both more engaging and made more “human sense” (Donaldson, 1978) than the more abstract nature of counters and cubes. This matched Fuson’s (1988) tentative conclusion that young children’s counting was more accurate, for example, when she told them that a group of plastic horses were having a party, and she wanted to know how many were there, than when she just asked the children to count the horses.

As Hughes (1986) found, all of the children used their fingers for counting for some calculations, sometimes hiding their hands under the table to do so. This finger-counting was not always accurate (particularly for subtraction). However, as Cowan
et al. (2011) found in their study of Year 3 and Year 4 children’s methods in arithmetic with numbers under 20, generally, using their fingers made children’s counting strategies more accurate.

The children were more confident with addition than subtraction. Addition where the total was greater than 10 was found more difficult than adding within 10, but this was to be expected for children who were largely counting on their ten fingers to reach a total. As noted by Anghileri (2000), the addition of zero was puzzling for Skye, Ronan and Kyle, but was aided by seeing a physical representation in front of them.

Subtraction was more difficult for all five children. Skye did not seem to recognize the subtraction symbol at first, but using a calculator helped her focus on the appearance of the symbol as it was shown on the calculator key, and gave her the opportunity to explore this operation. Ronan’s overall tactic of guessing (discussed further below) meant his knowledge of subtraction was developing very slowly; during the interviews, he showed no understanding of the link between addition and subtraction, such as knowing that if $2 + 8 = 10$, then $10 - 8 = 2$. In contrast, Kyle was interested to see that these links existed, but seemed to have had no opportunity to explore them. Dylan and Millie were both aware of a variety of ways of approaching a subtraction, and were working with numbers larger than 20, including by partitioning (such as taking away 10 then 3, to effect the subtraction of 13). However, both had ‘procedural bugs’ in their methods (Ryan and Williams, 2007, p.231), and Millie’s covert use of ‘counting on’ whilst overtly appearing to use a pencil and paper or equipment-based method was causing confusion.

Children’s understanding of both addition and subtraction could have been supported by the use of the ‘empty number line’, recommended by the National Numeracy Strategy (DfEE, 1999). However, as Murphy (2011) has described, its introduction in England has often been as a diagram with algorithms to prescribe its use, requiring a burden on memory similar to that of pencil and paper algorithms. Skye, Ronan, Dylan and Millie all said that they knew the empty number line was meant to help them, but none of the four saw it as a support to their understanding.
Knowledge of addition and subtraction number facts

All of the children except Millie had a low level of fluency with addition and subtraction number facts within ten. Whilst Dowker (2004) suggested that learning number facts is important so that children can become more efficient at calculation and hence better at solving arithmetical problems, Cowan et al. (2011) note that there seems to be no direct causal relationship between a sound knowledge of number facts and more general measures of mathematics achievement. Cowan et al.’s study of a cohort of children in Years 3 and 4 (ages 7 to 9) found low levels of knowledge of number facts (compared with the expectations embedded in the national curriculum) but above average mathematical achievement. They also found that sometimes, children who seemed to ‘know’ number facts were actually finding rapid solutions or using counting. Cowan et al.’s conclusion was that there is a strong connection between knowledge of basic number facts (for addition and subtraction within 20) and higher attainment in mathematics, but that fluency (instant recall) with number facts may follow from an increasing understanding of number operations, patterns and strategies to derive facts. For Skye, Ronan and Kyle, their opportunities to improve this understanding seemed limited. However, Skye and Kyle showed that, given the opportunity for repetitive practice, they were able to learn number facts quite quickly.

Children’s progress over the year

Each child’s progress over the year of the study has been discussed earlier in this chapter. Table 5.10 summarises the children’s overall scores. The progress made by Ronan, Kyle and Dylan was slow: it represents less than 4 additional questions being answered quickly and correctly, out of the 20 items included in the Level 2 assessment, after a year of additional mathematics teaching. Skye made better progress. Millie was given just the Level 3 assessment at the end of the year. She was able to complete the addition and subtraction questions without difficulty; her lack of progress was within multiplication and division.
Table 5.10: Comparing children’s assessment scores at the beginning of the study and approximately one year later

0, 1 or 2 marks per question; 20 questions per assessment; maximum possible marks = 40.

<table>
<thead>
<tr>
<th>Child and Year Group in 2010</th>
<th>Letterbox Level 2 assessment 2010</th>
<th>Letterbox Level 3 assessment 2010</th>
<th>Letterbox Level 2 assessment 2011</th>
<th>Letterbox Level 3 assessment 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye Y3, aged 7</td>
<td>12</td>
<td>-</td>
<td>29</td>
<td>-</td>
</tr>
<tr>
<td>Ronan Y3, aged 8</td>
<td>13</td>
<td>-</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Kyle Y4, aged 9</td>
<td>26</td>
<td>-</td>
<td>29</td>
<td>7</td>
</tr>
<tr>
<td>Dylan Y5, aged 9</td>
<td>25</td>
<td>4</td>
<td>32</td>
<td>12</td>
</tr>
<tr>
<td>Millie Y5, aged 10</td>
<td>33</td>
<td>26</td>
<td>-</td>
<td>28</td>
</tr>
</tbody>
</table>

Children’s disposition and behaviour in mathematics

All five of the children had said that they found ‘numeracy’ difficult, and Dylan, Kyle, Ronan and Skye had variously described themselves as ‘rubbish’, ‘dumb’ or ‘no good’. In the terms of Kilpatrick et al. (2001) the children’s ‘productive disposition’ was very poor – they did not have a “a belief in diligence and one’s own efficacy” (p.5). Millie had begun to work with greater concentration and at a faster pace as soon as she had been moved into a ‘higher’ mathematics group, but the other four worked very slowly, completing very little work across the year. These four all expressed the view that they felt rushed or confused by frequent changes of topic; their exercise books showed that they commonly had a new topic each lesson. Between them, the four younger children used a variety of methods to avoid engaging with the mathematics they were offered, and to help them cope with their lessons. These included working deliberately slowly (such as when Skye concentrated on neat handwriting); copying other children’s work (used very blatantly by Skye and
Ronan); persuading or allowing the TA to complete the child’s work (Skye, Ronan and Dylan); guessing (Skye and Ronan); diversionary activity (such as Skye’s drawing and Ronan’s frequent visits to the toilet); straightforward refusal, particularly a refusal to write (Kyle and Dylan); wandering or walking away (Skye, Ronan, Kyle and Dylan) and such poor behaviour that they were excluded from the classroom (especially Ronan, Kyle and Dylan).

The mismatch between the work being presented to the children and their current levels of attainment was sometimes so great that it may have provoked poor behaviour (Holt, 1984; Houssart, 2004). At other times, the children were agitated or angry due to events that were not related to their mathematics lessons, and were unable to concentrate or to behave well enough to make progress. Each child’s concentration could vary from one session to the next – as, for example, I had found with Kyle, comparing his first and third interviews at Brookhouse.

O’Neill, Guenette and Kitchenham (2010) noted the detrimental effects on learning of high levels of anxiety amongst children with backgrounds of trauma and attachment disorders; the younger four children all displayed high levels of panic and anxiety at times, and this seemed to prevent them from being able to think clearly. For example, Dylan became less and less capable of completing a subtraction or just counting coins, when he realized he had made mistakes at the beginning of a calculation; he found it very difficult to cope with making mistakes. In contrast, although Ronan did sometimes panic, he was usually quite philosophical about getting things wrong – perhaps because he often got things right merely by chance. Lewis (2013) explores the links between anxiety and anger, and in Kyle’s classroom experience, his teachers reported that he often became angry during mathematics lessons.

Given an appropriate activity at a suitable level compared with their current level of attainment, Skye, Kyle, Dylan and Millie were able to learn quickly. All four were able to see patterns in the calculations they undertook, and could concentrate for considerable periods of time when their attention was caught. These four children were also able to recognize moments when they had learnt something new, and to explain how they had reached an answer.
Ronan did not display the same propensity to learn quickly. It was more difficult to overcome his use of avoidance techniques, particularly his use of guessing, delay (e.g. repeating the question) and diversion (e.g. starting new conversations), to avoid engaging in any problem. However, it was possible, as his foster mother had discovered (see chapter 4) to persist with him and to focus his attention. I had been able to do this in my third interview with him, when I asked him what he would need to subtract from five to make zero, and I used his guesses to demonstrate what would happen in each case.

**Reading, writing and recording in mathematics**

Skye had no difficulties with reading, writing or drawing. Ronan, Kyle, Dylan and Millie had all found reading difficult, and this had sometimes disadvantaged them in mathematics. Now that they were in Key Stage 2, the children were frequently given worksheets to complete where they needed to read instructions, or work from the whiteboard that they needed to read and copy. It was also common practice to expect children to read ‘learning objectives’ or similar statements of aims for each lesson, and each school’s teachers or TAs gave written feedback in children’s exercise books for the children to read at the beginning of the next lesson – comments which Ronan and Kyle could never read, and which Dylan found difficult.

Millie’s poor reading seemed to have contributed to the initial decision to place her in a ‘bottom group’ for mathematics, and her teacher acknowledged that her reading level did cause Millie difficulties with word problems. Fortunately, Millie’s reading improved across the year, as did her mathematics.

Alongside oral and practical activity, children’s own informal written recording, sometimes referred to as “jottings” (QCA, 1999), can serve as an adjunct to memory whilst they carry out a mental calculation. Written recording can also provide children with material to examine, consider and analyse for patterns (Reys, Lindquist, Lambdin, Smith and Suydam, 2004). The children’s handwriting and willingness to write were therefore an important consideration.
Dylan’s antipathy towards writing in mathematics seemed to be predominantly because he did not want any record of him making mistakes; his handwriting was clear and, when motivated, he could write at a reasonable speed – but he generally produced very little written work. Ronan’s problems were particularly with his reversal of numerals, as previously discussed, but he could read his own numerals, and his tactic of guessing was a bigger impediment than his writing.

Kyle’s major problems with written recording were impeding his progress, and were eventually confirmed to be due to his dyslexia and fine motor difficulties. Unlike Ronan, who was given a high number of worksheets to fill in, and whose TA frequently acted as a scribe (although not always to good purpose), Kyle was given no support for writing at Brookhouse; his TA rarely wrote things down for him; he was given no advice about how to improve his writing, nor practice in this area. The diagnosis of an ‘intention tremor’ and recommendation of help from an occupational therapist was useful. However, the referral to an expert led to Kyle’s teacher at Dunscroft taking no action for several weeks while she waited for advice about his handwriting. Simple suggestions for initial support (such as mentioning the usefulness of an adult scribing for Kyle) would have helped in the interim period.

Positive approaches for learning and teaching

In the final part of this chapter, I will outline some positive approaches that were useful with all five children:

- the clinical interview;
- video recording and visually-stimulated recall;
- using counting equipment to build understanding;
- using multiple strategies to solve the same problem;
- asking children to pose problems;
- providing density of activity to learn number facts;
- supporting written and drawn recording of mathematics.

None of these approaches were being used with the children by their schools.
In each session, it was important to pay attention to the child’s disposition. I accepted that a child might have periods when they would not be able to concentrate, and so patience was an appropriate response. At other times, I tried to find ways to overcome the child’s diversionary, avoidant, anxious or demanding behaviour, to demonstrate to the child that they were able to make progress.

*The clinical interview*

The clinical interview has been a useful method, both as a diagnostic tool and as an intervention aiming to improve a child’s engagement and understanding in mathematics. As Ginsburg (1997) describes, being able to tailor the interviewer’s activity, questions and discussion to each individual makes it possible to get a clearer picture of their understanding and attainment, and of the barriers that may be inhibiting their progress. In turn, this provides the information needed to offer activities or problems that the child can explore (rather than work which is far too difficult for them to access, or much too easy). By this means, the interviewer can also examine the child’s potential for learning.

The amount of time I spent with each child individually was relatively small (see Appendix F), but it provided a considerable amount of information. This was partly because of my previous experience of working with children with mathematical difficulties, so that I was more confident than most classroom teachers might be about directing the child’s work or about following their train of thought. However, many class teachers would find it valuable to have a period of time to work individually with a looked-after child in their class, and coaching for those teachers in clinical interview techniques (as suggested by Rowland, 1999) would be useful when working with a wide range of vulnerable children, not just those in care.

*Using video recording and visually stimulated recall*

The video recording of interviews was predominantly intended to provide data for analysis, but had several pedagogical benefits.
Using a laptop and software so that they could see themselves as they were recorded, was an important means of improving the younger four children’s attentional capabilities (Fuson, Smith and Lo Cicero, 1997); the children enjoyed watching themselves on screen and this increased their capacity to concentrate during the interviews. The threat that I would turn the video off was sufficient to persuade Skye and Ronan to return to the task in hand on several occasions. Additionally, as Williams (2011) has suggested in her work with younger children, the fact of being recorded seemed to help Skye see why she needed to explain what she was doing.

Video recording provided a means of promoting metacognition through visually stimulated recall. The children’s skills at recognizing when and how they learnt something new were improved by reviewing film of themselves engaged in activity, i.e. using stimulated recall (Lyle, 2003). Kyle was able to explain his thoughts and the methods he had used without prompting; in contrast, Skye was initially unable to explain what she had been thinking, but was keen to listen to my explanation of why her work deserved praise. A video recording of activity where a child is being successful could help dislodge their view of themselves as a constant failure. Even when a child has been unsuccessful, watching the film alongside their teacher can provide an opportunity to discuss alternative approaches to a problem, and to emphasise that we can all learn from our mistakes.

Skye’s final recall interview provided another fruitful idea, when she began to try to ‘beat herself’ by giving answers more swiftly to the questions she was being asked on the film. Her excitement and pleasure at her progress, made in the course of just one interview, was very evident. She realized that she had been working slowly, but was now able to reach answers quickly: the experience raised her expectations of herself.

Using counting equipment to build understanding

Skye, Ronan, Kyle and Dylan enjoyed using the plastic fish that I provided to investigate numbers below 20; they found the fish attractive, and this is likely to have increased the length of time for which they were willing to concentrate. The context of fish swimming between two ponds made sense to them, and helped them to
understand the underlying arithmetic. Using equipment of a more abstract nature such as cubes and counters would not have served the same purpose or been as motivating.

Using real money was appreciated by the children, and proved important when counting in different multiples, as well as when counting larger numbers. It is appropriate to any age, and lends itself easily to practice at home. Money was also useful alongside hundreds, tens and ones counting equipment when I worked with Millie, helping her to see the similar structure of the tens and ones in each form.

The equipment enabled children to see patterns and relationships in the calculations we completed. Skye and Kyle soon began to refine their strategies when counting, either without prompting (especially Kyle) or following a suggestion from me (for example, when Skye used counting in twos with the fish, described further below), to make them more efficient.

The fish were especially useful in establishing ‘leading patterns’, i.e. a sequence of calculations that aim to convince a child of a particular fact. Leading patterns were useful both when I chose each successive question to be enacted with equipment (such as when I helped Kyle see that $0 + 7$ was $7$) and when I followed a child’s successive attempts at an answer (as when Ronan tried guessing what he needed to subtract to make zero).

**Using multiple strategies to solve the same problem**

All five children seemed at some time to be surprised that I wanted them to try a different way of reaching an answer to the same problem, indicating that this was not a common way of working for them, and yet it was often very helpful.

Skye’s attempts at subtraction using equipment were supplemented by using a calculator. The process of searching for the correct signs and numbers on the calculator, and using physical equipment in parallel, was very productive. At times, when she was adding instead of subtracting, the result on the calculator was challenging her answer; later on, she was trying to match the calculator’s answer to her physical answer. Ronan’s foster mother had also commented on this use of a calculator, noting Ronan’s surprise that the calculator could provide a correct answer.
Combining a variety of ways of working on any one problem, provided children with reassurance and time to think more carefully about their arithmetic. In Millie’s case, it had uncovered some of the difficulties she was having, as we tackled similar calculations using tens and ones equipment, a calculator, money, the number line, and pencil and paper algorithms. Within any one method, there was more than one way of working – for example, using a number line, a subtraction could be done by adding on, or by taking away, and these approaches could in turn be shown with tens and ones equipment. The focus shifted from getting an answer, to understanding what was happening. There was a greater focus on discussion, exploration and explanation (characteristic of higher-attaining pupils), rather than rule-following and memory.

**Asking children to pose problems**

As well as asking the children to tackle questions that I had set for them, I occasionally asked them to ask me a question. This sometimes uncovered a lack of familiarity or understanding of common ways of phrasing a mathematical question (as when Skye asked me “If one fish goes in here, what makes this fish go in here?”). Interpreting a question can be difficult, and constructing a question provides an opportunity for the child to consider this further.

Kyle was surprised but interested in setting questions for me. He used larger numbers than I expected, so pupil question-setting was, again, an opportunity to learn more about the child. He responded positively to being given this element of control over our work.

Another way of setting questions that was successful with all five children was to randomize one aspect of choosing the numbers for each calculation, usually by using a pack of playing cards or a set of place value cards (showing numbers 1 to 9 and 10 to 90). The simple card game, where we added to find the total of the cards that had been turned over, mixed an element of chance with the child having control of how many cards would be turned over, and again the children were often more ambitious than I had expected. This is significant since all of the children had reportedly spent considerable time in the past, working slowly or otherwise avoiding mathematical activity in their lessons.
Providing density of activity to learn number facts

Fluency with addition and subtraction number facts within 20 is useful. Askew (2012) notes that knowledge of a reasonable range of number facts will enable a child to focus on more challenging mathematical activity, rather than being slowed down or diverted by having to concentrate on counting and adding. Thompson (2008) stressed the importance of children being able to think of numbers as compositions of other numbers, but this is not possible if they are not even able to recognize combinations that make ten. Gaining fluency requires sufficient density of activity that the child is able to become more familiar with the target facts, and thus to have a higher chance of learning them. Repetition is important.

One method that was useful in promoting a child’s knowledge of a related group of number facts was developed when I worked with Skye, using 12 fish to learn even-number addition and subtraction facts. Skye answered repeated questions such as 2 + 6 or 12 – 4 with the fish arranged in pairs in front of her, without being allowed to rearrange them, but using her knowledge of counting in twos. The repetition and the visual arrangement were effective in helping her become quicker at responding to each question. When we watched the film later, she realized she was able to answer each question faster than she did on the film, as she had learnt those number facts.

Karpicke and Roediger (2008) noted the value of repeated testing. Kyle was motivated by a time limit on using a printed test paper repeatedly: he was able to answer the same 20 questions in less time, and needed to use his fingers for fewer questions, until he reached a point where he realized that he now knew many of the combinations.

Supporting written and drawn recording of mathematics

Whilst children were sometimes being given support for reading difficulties, there was less attention paid to writing. The main reference to their difficulties (with both Kyle and Dylan) was when their teachers told me that I should try to avoid asking them to write anything.
The practical and oral nature of much of the activity that I undertook with the children meant that poor writing skills were not an impediment to most of our work. Where writing was needed, I was able to act as scribe, writing down questions as an aid to memory, and writing sequences of calculations so that the child could look for emerging patterns. Scribing for a child seemed to be undervalued within the schools, and yet can free the child to think about the mathematics they are doing. Similarly, pre-printed worksheets can be useful, where less writing is required – such as the tests that Kyle enjoyed.

I did not use the individual whiteboards suggested by Kyle and Dylan’s teachers. A child’s writing tends to be larger on those (because of the pens being used) so they can only see one or two calculations at a time, and the calculations are wiped away too quickly.

Discussion with Kyle about what was good and what was poor about a fictional child’s handwritten numerals was very useful; he was then able to critique his own numbers, and to prioritise one on which to concentrate. The improvement in writing the number six was almost immediate, and was a useful step while waiting for an expert view on how to improve the larger problems with his letters.

Acknowledging the complexity of children’s difficulties

There was considerable variation between the five children’s knowledge and understanding in the areas of mathematics that I was able to explore, and their difficulties were complex. There was not one solution that would guarantee improvements in their understanding and skills for every child in my study, but several approaches were successful.

The final chapter will draw together the influences on the children’s mathematical experience and attainment, examining the nature of their difficulties and the consequences (albeit sometimes unintended) of decisions made about their educational experiences. I will consider whether an acknowledgement that their past histories were affecting their current performance might help to persuade schools that these vulnerable children needed concentrated time with a skilled teacher, and could then make faster progress. I will also examine some of the ways in which future
policy and practice might result in improved outcomes in mathematics for children in care.
6. CONCLUSION

My two research questions aimed both to explore looked-after children’s underachievement in this core area of the curriculum, and to look for remedies:

- What are the difficulties faced by looked-after children in England aged 7 to 11 whose attainment in mathematics is low, specifically in number?
- What strategies are likely to improve looked-after children’s understanding and progress in number between ages 7 and 11?

This area of work has not been examined before, so my reading, observation, experimentation, discussion and analysis have drawn from a wide range of sources, including the three main fields delineated in my literature review: the circumstances of children in care and their educational achievement; low attainment in mathematics, particularly in number; and the respective contributions of school and family to children’s learning. The five case studies, where each child was in different circumstances, have given me the opportunity to consider both of my questions in detail.

I developed the model shown in Figure 1.1 (repeated below) to think about each child’s mathematical learning. The central part of the diagram, showing the child’s attainment and their productive disposition as mutually dependent, has been of particular interest to me. Each child’s attainment is dependent in part on their willingness to engage with learning, and on their view of themselves as someone who can be successful in mathematics – their ‘productive disposition’. In turn, an improvement in their attainment which they have recognised will make them more positive about engaging in learning. The study has thus increased my interest in metacognition and the links with affect (Schoenfeld, 1992).

I will use the structure of the diagram to reflect on my findings, drawing from the more detailed reports in Chapters 4 and 5, and considering:

- the children’s past experience of home and school;
- the children’s attainment and disposition in mathematics;
- the children’s current experience of learning at school;
- the children’s current experience of learning at home.
I will discuss the barriers that prevented the children from making good progress, and strategies that could provide more positive outcomes. Lastly, I will consider limitations and strengths of the study, and summarise proposals for further research and action.

Figure 1.1: Elements of each child’s mathematical learning.

The children’s past experience

For a child in care who has moved family and perhaps moved from one school to another, their past experience of learning at home and learning at school will usually be significantly different to their current situation. Since my field work began when these children were already in care, I was not able to look at their past experience in detail within the scope of this study, and there were limits to the information I could be given from children’s records, for reasons of confidentiality.

Children’s experience prior to coming into care will commonly include periods of poor health, poor diet and chaotic parenting – neglect that makes it more difficult to learn successfully at home or at school – and they are also likely to suffer the
debilitating effects of trauma, loss, rejection and lack of attachment (Cairns, 2013). As Berridge (2012) points out, it is not being in care that starts the vicious cycle of underachievement, but the child’s experiences before a care order is made. Sometimes, though, the difficult process of adjusting to a new family may be made worse because a shortage of foster carers or prospective adopters (and a shortage of therapeutic services) can result in a child moving care placement frequently, with damaging consequences. The positive effect of having a stable family was evident for Ronan and Millie, and was increasingly so for Skye and Dylan.

The children’s attainment and disposition in mathematics

Any child who is having difficulties in mathematics and for whom no effective remedial action is taken, will soon find their difficulties becoming more entrenched, as they fall further behind others in their age group. For a looked-after child, the danger is not just that they have low expectations of their own capacity to learn, but that their teachers and foster carers may not recognize that the child’s potential is hidden by the effects of their life experiences. This in turn reinforces the child’s view of themselves as unable to ‘do mathematics’.

Holt (1984) described teaching a child aged 10 whose attainment in mathematics was low, noting that it was difficult because she had learnt so many dysfunctional ways of working, and said “What she needs is a broom to sweep out her mind.” (p.186). I certainly agree that it is more challenging to teach a child like this, than to work with a younger child who does not have such a history. I have found a different metaphor useful when talking to teachers. Imagine the child’s knowledge as a piece of badly made knitting, messy with knots and holes. It needs unraveling and knitting up again – but this time around is not the same as the first, when the wool was straight and easier to work with. We are working with wiggly wool – with kinks in the yarn, more difficult to smooth out, the longer they have been there.

It is not easy to unravel the misunderstandings and gaps in a child’s knowledge of mathematics, and to start them on a new, more confident path. The ‘kinks in the yarn’ include the child’s tactics for surviving each mathematics lesson, as well as their lack of understanding.
Children’s difficulties in mathematics

My study concentrated on counting, place value, addition and subtraction. Each child presented with different specific difficulties. All five had problems with some aspects of counting, and this was impeding their progress but had not been noticed by the adults working with them: a common lack of diagnosis noted by Ryan and Williams (2007). Lack of knowledge of number facts was a problem for all but Millie. All the children found subtraction more difficult than addition. Three children (Skye, Ronan and Kyle) were initially puzzled by zero. Millie made good progress across the year of the study; Skye, Ronan, Kyle and Dylan were not as fortunate in their experience. The likely factors contributing to this lack of progress for each child are summarised later in this chapter.

Children’s disposition and behaviour in mathematics lessons

At the beginning of the study, all five children were operating with a high level of uncertainty within their mathematics lessons; they frequently did not understand what they were doing, or why they were doing it. Each child had a different repertoire of avoidance techniques to help them get through a lesson, including refusal, working slowly, wandering, copying, guessing, and obtaining ‘help’ from an adult who effectively carried out the required work. Millie was co-operative in class, but coped with her lack of understanding of the teacher’s algorithms by using her own method (often wrongly), then trying to provide evidence of the teacher’s way of working, so covering up her lack of understanding. The tactic of bluffing was also used by Skye, Ronan and Dylan, especially when they were asked to explain how they had carried out a calculation.

In some situations, the child’s behaviour was ‘redundant’: in other words, it used to be useful (from the child’s point of view, as a way of coping) and was now unnecessary, but might be embedded as a difficult habit to break. For example, this applied to Ronan’s copying (and guessing) in Claire Berry’s class; she knew he was copying, and he admitted it, but he was not yet convinced that there was an alternative way of working.
The children’s learning at school

Each child’s experience of learning was affected by their teacher’s expectations, the organization of the classroom, the assessment processes and the consequent planning of classroom activity.

Teachers’ expectations and relationships with looked-after children

The assumption of some teachers seemed to be that the children were of ‘low ability’ (not just low attainment), and possibly that ability was fixed (Ruthven, 1987; Boaler, 2013). Four of the ten adults had some previous experience of working with children in care (Janet, Peggy, Emma and Lucy) but none had had any professional development in this field. Additionally, the adults around each child were often not given information about children’s backgrounds and family circumstances that may have helped them to empathise with the child’s position, acknowledge the effects of trauma, and see the need for exceptional educational intervention recommended by Heath, Colton and Aldgate (1994). Sometimes useful information may have been deliberately concealed (because of a misguided understanding of confidentiality) but sometimes it was hidden because there was no institutional arrangement for sharing information at unscheduled times (as with Millie’s new teacher not realising that Millie was also new to the school).

Building a good relationship with a child who has experienced loss, rejection and poor attachment requires imagination and resilience on the part of the adult, and time spent with the child. In some instances (such as Peggy with Kyle, and Kelly with Skye) it seemed that, like the children, the teachers had developed avoidance techniques – for example, focusing on copying learning objectives, delegating responsibility to less skilled members of staff, and reducing the time that the teacher spent with the child. Skye, Ronan, Kyle and Dylan all had long periods of time when their work was entirely planned and supervised by a TA, with little or no supervision by a teacher, and this had resulted in their classroom experience being of a very poor quality.

Children’s experience of mathematics in school

Askew suggests that good teaching should include three elements, the ‘teaching tripod’ (Askew, 2012, p. 97): tasks (engaging activities), tools (including models and
manipulatives that have been introduced carefully) and talk (with peers and the teacher). These three elements are considered next.

**Talk:** Skye, Ronan, Kyle and Dylan had few opportunities for discussion with others, because the arrangements for setting and grouping by attainment that were used in their mathematics classes did not provide them with peers who were working on the same mathematical content. Within-class grouping involved some of the same issues as between-class grouping (Marks, 2013). In most instances, it served to isolate children from their classmates (as noted by Webster and Blatchford, 2013) and led to lower effort and motivation (Baines, 2012). Millie, when placed in the ‘bottom’ set, matched her pace of working to the same slow speed as the rest of the group, but became more engaged and worked faster, once she had been ‘moved up a set’.

**Tasks:** Only four of the teachers seemed to have a reasonably accurate idea of what their pupils could do, and what they found difficult: Janet with Skye (after an initial period of overestimating Skye’s attainment), Claire with Ronan, Lucy with Dylan and Jessica with Millie (after an initial period of underestimating her attainment). These were all teachers who spent a good proportion of teaching time with their pupils, and consequently, they were the most successful at providing work in number that was accessible to each child. However, there were still difficulties, in particular because there was a tendency to change topic frequently (often daily). There was no evidence of any teacher using a systematic form of assessment with the children; instead, they used general classroom observation as their main method, and consequently rarely noticed any specific difficulties (such as those in counting procedures). The lack of knowledge of number facts shown by Skye and Kyle seemed to be because there was little opportunity in their lessons for the repetition needed to consolidate understanding or to learn these facts, since both children showed that they could learn number facts very fast when given repetitive practice in a clinical interview.

**Tools:** The majority of the children’s work was pencil and paper-based activity. The children reported that although counters and cubes were available in their classrooms to help them with calculations, they rarely used them: in contrast, they were keen to use the manipulatives I provided in the clinical interviews. Teachers were more likely to offer models such as the number line and hundred square as aids to calculation.
(following the influence of the National Numeracy Strategy: DfEE, 1999), but the children did not find these helpful.

Within-school monitoring of children’s work was often focused on the child’s behaviour or time spent on task, rather than on their progress or understanding. Feedback to children on their classroom work was often written into their exercise books outside of classroom time, but for children whose reading was poor, this was ineffective. Children’s difficulties with reading and/or writing were another impediment to success in mathematics, but little attention was paid to this.

Decision making about children’s school placements and dealing with transitions
As noted by Davies and Ward (2012), the decision-making process for children in care is complex and sometimes slow. For two of the five foster families, the decision to move the child to a new school was delayed for several months, against the foster carers’ wishes, and this was a disadvantage to the children (Skye and Ronan). Schooling that required long taxi journeys meant that both children and carers were unable to develop local friendships and support. The desire to promote continuity by maintaining Dylan’s placement in the same school did not take account of the many supply teachers who taught him, and a change of school was not considered at all, although it could have provided a better experience. Moving to a school that was ‘Outstanding’ in its Ofsted report did not guarantee a better mathematics education: both Ronan and Skye experienced poor teaching in an otherwise ‘good’ school.

The transition from one school to another was managed well by Ronan’s foster parents, working closely with the school. Within-school transitions were also important: Millie’s school, Flexford, paid attention to maintaining the good relationship she had established with her class teacher by having the same teacher take her class for a second year, and this was valued by Millie, her teacher and her foster parents.

The children’s learning at home
I anticipated that each child’s experience of learning mathematics in their current family might be influenced by their foster carer’s experience of learning, the links
between school and home, and the carer’s interest and expertise in helping the child make progress.

The information that each school gave to the foster carer was never very detailed in respect of children’s mathematics achievement and, like within-school monitoring, often related more to behaviour than learning; some noted the child’s National Curriculum level, but without explaining what this meant. In addition to the normal school reports, each child was the focus of a review about every six months, producing a ‘PEP’ (Personal Education Plan), but these did not always include mathematics targets. Flexford was the only school to send exercise books home for parents to see.

Every child’s foster carer was interested in helping the child to achieve more in mathematics, including those carers who said they had found mathematics difficult when they were at school. Carers varied in their confidence about asking the school for information; even when carers asked how they could help, the schools did not provide effective advice. The foster carers were all attempting to help their child in some way – for example, by buying workbooks, or practising using money. Ronan’s foster mother used a wide range of effective methods to support his counting, early arithmetic and handwriting of numbers. All of the foster carers had detailed information about the way the child learnt at home, that could have been useful in school – but the schools did not make opportunities to discover this, and the carers may not have realised its significance.

**Barriers to progress in mathematics for each child**

My first research question aimed to uncover the difficulties the children faced in mathematics. Using my model in Figure 1.1, I have assumed that each child would be likely to make more progress if there was evidence of positive features in their experience: first, of them having a ‘productive disposition’; next, of school-based factors, including a good assessment of their needs, and time with a teacher who is both interested in them and wants them to do well, and who has sufficient pedagogical expertise to provide appropriate activity for them. In addition, they would benefit from encouragement and attention from their foster carer/s, enacted through spending time with them, showing interest, and providing appropriate mathematical activity at
home. In Table 6.1 I have summarised the situation for each child in their successive classes, showing how a lack of each element provided barriers to the child’s progress.

**Table 6.1 Barriers to the children’s progress in mathematics through lack of positive features**

**Key:**
- Lack is a serious barrier to the child’s progress: dark shading
- Lack is a moderate barrier to the child’s progress: medium shading
- No significant barrier to the child’s progress: no shading

Each child’s experience is shown with one row in the table for each school placement, listed in chronological order.

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<th>Good assessment</th>
<th>Time with teacher</th>
<th>Teacher interest</th>
<th>Teacher expertise</th>
<th>Time with foster carer</th>
<th>Foster carer interest</th>
<th>Foster carer expertise</th>
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<td>Dylan (a)</td>
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<td>Dylan (b)</td>
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<tr>
<td>Millie (a)</td>
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<td>Millie (b)</td>
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</table>

As outlined in Chapter 5 and earlier in this chapter, the only child to make significant progress during the study was Millie.
Strategies for improvement in children’s progress

My second research question aimed to explore positive strategies to improve looked-after children’s work in mathematics. Many of the factors that are likely to contribute to improving the educational attainment of looked-after children are well-documented, and are not specific just to mathematics: for example, Pecora (2012), working in the USA, lists maximizing placement and school stability, improved assessment, finding good remedial support, and treating mental health problems. Gilligan (2006) emphasized the importance of providing the child with adult advocates; Fursland (2013) notes that recent changes in the fostering regulations in England, in place since 2012, stress that foster carers, social workers and teachers should work together to improve children’s educational chances, with foster carers playing a more significant role than they have in the past.

The varied previous experience of these adults means that an initial consideration must be to provide information, professional development and ongoing support to foster carers, social workers and teachers. Background information such as that shown in the time-line diagrams that I devised (see Chapter 4) is a starting point, but children’s needs are so diverse that more expert individualized advice is needed, alongside better sharing of information between the adults around a child, and opportunities for key adults to form good working relationships. It is not clear at the moment whether this will become the role of the ‘Virtual School’ (Berridge, 2012), but it is certainly an area where further research and development is urgently required. It may also remain an area where progress is slow, because of the many pressures on children’s services.

Strategically, it has seemed during the course of this study that the increased focus on educational achievement for children in care in the last ten years has sometimes been expressed in large and general terms, when attention to close detail would have been more useful. For example, the realization that continuity can be helpful is enacted as ‘the child must stay in this school’ without looking at the other consequences of this decision, and whether it does, indeed, provide continuity of a high quality. Similarly, assumptions that one-to-one interventions will benefit a child do not always take account of the knowledge and skill of the adult providing these, or of the appropriateness of the content. Longer-standing preoccupations sometimes remain at
the top of teachers’ priority lists, leaving no time to consider others: behaviour and reading are frequently considered, but mathematics has been paid relatively little attention.

In the following section, I will summarise three interrelated areas where positive approaches could improve children’s understanding and progress in number:

- Detailed assessment
- Good teaching
- Family support.

*Detailed assessment*

A short initial screening using a practical and oral assessment (devised for the Letterbox Club) at a level likely to fit the child’s current attainment was helpful in pinpointing initial areas of strength or concern, and further development of materials like this would be useful, including everyday mathematical skills noted by the foster carers, such as telling the time and coin recognition. However, the clinical interview was the most effective method I used during the study, to explore children’s understanding. As discussed in Chapter 5 (and by Rowland, 1999) a comparatively short amount of time with a teacher can provide a great deal of information. Coaching in this method could also improve the quality of teachers’ ongoing classroom observation.

*Good teaching*

I experimented with a range of teaching approaches, described in Chapter 5, and found several ways of working that were effective but that the schools were not using. With Skye, Ronan, Kyle and Dylan, the schools’ approaches were predominantly using no context, and concentrating on pencil and paper recording of questions and answers; my focus was on using a simple context, equipment that matched the problems posed, and oral work where I acted as scribe most of the time. All five children benefited from the opportunity to compare multiple strategies to solve the same problem.
As Carpenter et al. (1999) noted, the debate about whether it is more important to teach for skills or for understanding is unproductive – both can be tackled together. The younger children’s understanding of how to reach an answer (by counting) was accompanied by growth in their knowledge of number facts, as long as they had sufficient opportunities to carry out the calculations more than once. Videoing the child’s work then showing it to the child was very effective with Skye and Kyle in this respect.

Using a mixture of approaches with each child was a key element in maintaining their interest and concentration; helping them to pay attention, as Langer (1997) suggested, required variation alongside sufficient time on one topic, so that they could begin to see patterns or otherwise understand what was happening. I tried not to rush a child, but at the same time to encourage them and reduce the factors that would slow them down (predominantly writing), so that the child themselves increased their pace of working. Sometimes a great deal of persistence was needed – for example, with Ronan – and I was sometimes uncertain about what to do next when a child was displaying signs of great anxiety or was dismayed by a mistake – as happened with Kyle and Dylan. Although I knew that sometimes the child might work deliberately slowly as an avoidance technique, I also recognized that sometimes they needed a few minutes rest, so waited for them to regain concentration without any intervention from me.

Using visually stimulated recall interviews was an important part of changing a child’s perception of their own capacity as a learner, and this chance to focus on metacognition with a child, helping them to begin to notice what they had learnt, and how that had happened, was very valuable. Kyle’s excitement at discovering that 0+7 was seven (an ‘Aha!’ moment as defined by Mason, Burton and Stacey, 2010) was reinforced by viewing himself on film, and in later interviews he began to comment on his learning without a film to prompt him. Being able to recognize his own learning led to the possibility of regulating it, with consequent effects on affect.

One element of metacognition that I wish I had explored more extensively was whether each child recognised their own range of avoidance techniques, and the purpose they had served; I had a brief discussion with Skye about copying other people’s answers and about her diversionary activity, but did not follow this line of
enquiry with any of the other children. In future research, I would also be interested to consider whether it would be helpful to give children in this age range the chance to think about the effects of stress, trauma, anxiety and uncertainty on our capacity to learn. Many adults know that a difficult event in their lives can reduce their competence for a while, but they have previous experience of being successful. For children like Kyle, all they know is failure – and they may therefore be attributing their position to lack of ‘ability’ (which they think cannot change) rather than temporary delay.

*Family support*

Compared to the national population of adults of working age, foster carers have a lower average level of educational qualification, as McDermid, Holmes, Kirton and Signorettta (2012) found in a review of research; however, they were not able to find any studies examining how this affects foster carers’ ability to support their children’s care or education. The five children’s foster families were keen to help them make progress; they were interested in what each child was doing, willing to give encouragement, and able to provide activity at home – particularly “little and often” activity, which would take account of the other pressures on their time. The foster carers wanted advice from teachers, for example about school methods of calculation – not necessarily to use them with the child (as Abreu, 2008, describes) but to acknowledge to the child that there was more than one way of completing a calculation. Foster carers, like other parents, had many ideas of their own that were useful in supporting each child in mathematics. Schools need ideas based on this good practice within families to suggest to other carers, rather than just aiming to repeat school activity at home.

*Reflection on the limitations and strengths of the study*

The five case studies have been revealing and thought-provoking, and the strength of the clinical interview as my central research method has provided detailed data, triangulated both with interviews with key adults and with documentary evidence from the children’s paper-based work and official records.
In my interviews with school staff, I relied on the goodwill and availability of staff in each school. I was able to interview at least one teacher or TA in each school year for each child; although I aimed to speak to each school’s head teacher and SENCO, this was not possible in every case. In my interviews with foster carers, my personal knowledge of the nature of a foster carer’s experience was mentioned by four of the carers (all except the new foster carer, Skye’s foster mother), and according to their unsolicited comments, this did seem to have made them more confident about being interviewed.

Liaison with local authority staff was made more difficult by the departmental reorganisations taking place at two points in the study, and by some staff being on temporary contracts. Some aspects of local authority record keeping provided less information than anticipated – in particular, individual children’s records did not include data about their current achievement in mathematics – but, of course, this was in itself revealing. I did not have time to pursue this with any of the children’s individual reviewing officers (IROs), who are appointed by the LA and whose role is to oversee each child’s situation at least annually.

My clinical interviews with the children were effective, and the additional stimulated recall (SR) interviews were very interesting. I did not gain as much information as I had hoped from the shorter interviews with each child where I asked about their work in the classroom, looked at their exercise books or tried to collect their ideas about improving mathematics teaching. It would have been more effective to build these questions into the clinical or SR interviews, and occasionally I did manage to do this. I did not ask any of the children apart from Millie about the mathematics they did at home, and that would have been useful to compare with their foster carers’ reports.

Although it was not a primary purpose of the study, there were points in my interactions with every child where I felt I had helped them to learn something new. In particular, the study was helpful to Kyle, as his attitude to learning mathematics began to improve and his previously unrecognized dyslexia was identified.

My five case study children were chosen to provide as much variety as possible in their care status and circumstances, drawing on the population of looked-after children who remain in care, and from those with the lowest attainment. One positive feature of the study was the opportunity to find examples of good practice that were
contributing to children’s welfare, such as the work of Skye’s first teacher, Ronan’s foster mother’s help at home, and Millie’s school’s organizational arrangements that provided continuity of good teaching: all examples of ‘what may be’ as described by Schofield (1993, p. 105) in his discussion of generalizability. Overall, I believe many of the findings would be generalizable to children who come into and out of care over a shorter period, and to other groups of children whose life circumstances make them vulnerable to low achievement.

**Influence on policy and practice and proposals for further research**

During the time of this study, I have been a member of the APPG (All Party Parliamentary Group) for looked-after children and young people, which brings together elected members of the United Kingdom Parliament with voluntary, non-statutory and research organisations. I contributed some early findings to the group’s report to the government (APPG, 2012). I have held discussions relating to the study with Fostering Network (a charity which supports the majority of foster carers in England with advice and training) and with the research team for the Children’s Commissioner for England (who advises the government on issues relating to children’s rights and well-being). The study has been undertaken at a time when national interest in the education of looked-after children has never been higher.

Since I began this study, the role of Virtual School Head has become statutory, so that every local authority in England should have this one lead person whose task is to promote the educational achievement of every looked-after child in their area. It will not be an easy task; there is a major need for support and professional development for Virtual Heads themselves, and the levels of staffing and funding under their control are very variable (Ofsted, 2012b). However, as noted earlier in this chapter, this person could become key to improved professional practice in relation to education, for class teachers, designated teachers, social workers and foster carers; research into how this support could be developed is currently lacking.

The recent publication of the government’s list of research priorities regarding children in care (DfE, 2014) notes that whilst data about comparative levels of achievement in education have improved, the causal relationships are still not
understood. I hope my study will provide a starting point for further work in this field. The areas in mathematics education where I think further research would be valuable for children in care include the following:

- Assessment: detailed individual attention to children’s understanding, using the clinical interview and stimulated recall;
- Effective teaching, which considers conation (the desire to try) as well as cognition and metacognition, and examines the links between these;
- Professional development: to consider ways in which the profile of mathematics can be raised amongst adults working with children in care, and to provide appropriate support and advice for those adults;
- Family support, to share existing good practice, to help schools see how they can help, and to help schools see what they can learn from carers.

In conclusion

Earlier in this chapter, I have summarized my recommendations to improve looked-after children’s attainment in mathematics as firstly taking account of the effects of the child’s background, and then looking at positive approaches through detailed assessment, good teaching, and family support. In respect of all children, the authors of the Cambridge Primary Review put my view most succinctly: “expect more, teach better, and children will respond” (Alexander, 2010, p.99). In turn, I think teachers, social workers and foster carers will (mostly) respond positively when shown practical strategies that help children make progress.

I began the study because of a keen desire to improve the lives of children who have had little opportunity to overcome the disadvantages facing them. I have learnt a great deal about becoming more systematic, more imaginative and more focused when analyzing a situation that needs to be both explained and changed (hence my two research questions). I have been glad to find some immediate ways in which children’s situations could be improved. My hope in the next few years is to be able to disseminate the findings of this study, and to continue to examine two particular aspects of this work: the remediation of children’s difficulties in counting and early arithmetic, and the contribution of families to children’s mathematical learning.
REFERENCES


Dunne, M., Humphreys, S., Sebba, J., Dyson, A., Gallannaugh, F. and Muijs, D.  
Effective teaching and learning for pupils in low attaining groups: Research Brief RB011. London: DCSF.


Marks, R. (2013) ‘The blue table means you don’t have a clue’: the persistence of fixed-ability thinking and practices in primary mathematics in English schools. Forum, 55 (1), 31-44.


APPENDIX A:

NATIONAL CURRICULUM FOR ENGLAND (DfEE/QCA, 1999)
MATHEMATICS ATTAINMENT TARGET 2: NUMBER AND ALGEBRA
LEVELS 1 TO 4

Level 2 is the expected level for the majority of children by the end of Key Stage 1;
Level 4 is the expected level for the majority of children by the end of Key Stage 2.

Level 1

Pupils count, order, add and subtract numbers when solving problems involving up to 10 objects. They read and write the numbers involved.

Level 2

Pupils count sets of objects reliably, and use mental recall of addition and subtraction facts to 10. They begin to understand the place value of each digit in a number and use this to order numbers up to 100. They choose the appropriate operation when solving addition and subtraction problems. They use the knowledge that subtraction is the inverse of addition. They use mental calculation strategies to solve number problems involving money and measures. They recognise sequences of numbers, including odd and even numbers.

Level 3

Pupils show understanding of place value in numbers up to 1000 and use this to make approximations. They begin to use decimal notation and to recognize negative numbers, in contexts such as money and temperature. Pupils use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers. They add and subtract numbers with two digits mentally and numbers with three digits using written methods. They use mental recall of the 2, 3, 4, 5 and 10 multiplication tables and derive the associated division facts. They solve whole-number problems involving multiplication or division, including those that give rise to remainders. They use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent.

Level 4

Pupils use their understanding of place value to multiply and divide whole numbers by 10 or 100. In solving number problems, pupils use a range of mental methods of computation with the four operations, including mental recall of multiplication facts up to 10 x 10 and quick derivation of corresponding division facts. They use efficient written methods of addition and subtraction and of short multiplication and division. They add and subtract decimals to two places and order decimals to three places. In solving problems with or without a calculator, pupils check the reasonableness of their results by reference of their knowledge of the context or to the size of the numbers. They recognise approximate proportions of a whole and use simple fractions and percentages to describe these. Pupils recognise and describe number patterns, and relationships including multiple, factor and square. They begin to use simple formulae expressed in words. Pupils use and interpret coordinates in the first quadrant.
**APPENDIX B: LETTER CONFIRMING CONSENT OF CHILD**

*Version for child was printed on university headed paper, including my contact details, and showing their full name printed at top and bottom of the letter.*

Dear

**Helping children do better in mathematics**

Thank you for agreeing to talk to me about your work in number, and showing me what you can do. You are helping me to find out why children sometimes have difficulty when they are learning about counting, adding and taking away.

When this research is finished, I will write a report so that people can find better ways of helping children do well in mathematics.

I hope you will enjoy the interviews you do with me. You will be helping other children who are in care, by taking part.

I hope to visit you four times altogether: in June, August, October or November, and in December this year. I will talk to your carer and your teachers, too, during the year.

You can change your mind and drop out of this project at any time if you want to – but I hope you will enjoy taking part!

With best wishes,

_Rose Griffiths_

_University of Leicester_

..................................................................................................................................................................................................................................................................................

I agree to take part in this research project.

Signed: Date:
APPENDIX C:
LETTERBOX CLUB LEVEL 2 AND LEVEL 3 ASSESSMENTS

The following principles were used when the assessment items were developed for the Letterbox Club (Griffiths, 2009a) and were equally relevant for the children in this study:

1. The child does not have to read any assessment items.
2. The assessment must not take too long, as otherwise many of the target children would find it difficult to concentrate, but it should not have a time limit, as this could make children feel anxious and impair their performance.
3. There needed to be some way of judging the child’s fluency as well as their accuracy, to show the progress of children who could only achieve correct answers by counting and calculating when they first tried the arithmetic items, but who did so using rapid recall of number facts later on (i.e. knowing number facts ‘by-heart’). Hence for arithmetic questions, a score of two is given for the correct answer achieved quickly (i.e. likely to have been answered by rapid recall), a score of one for the correct answer but achieved more slowly and/or using an observable method of calculation (for example, counting on fingers), and nought for being unable to get the right answer. A similar system is applied to the counting questions.
4. The assessment items are in two stages, and a child would only be encouraged to try the second stage (aligned with National Curriculum Level 3) if they had been successful with the first stage (aligned with NC Level 2, incorporating Level 1). These NC levels are listed in Appendix A.

Three types of item were developed for each stage:

(a) practical items to assess counting;
(b) small ‘stories’ to assess arithmetic in a context;
(c) ten pencil and paper questions to assess the child’s rapid recall of number facts.
(a) Assessing children’s counting

Denvir and Brown’s (1986) study, discussed in Chapter Two, influenced the devising of the assessment items. Their table of skills included counting in ones, counting in 2s, 5s, and 10s, and counting in 10s and 1s. I decided that the most appropriate context to use was that of money, using real coins; children see this as ‘grown-up’ and interesting, with a higher status than using plastic or card facsimiles of coins. The first two questions on the Level 2 Assessment uses a bag of 30 pennies, and children are asked:

1. Can you give me eight pence?
2. Can you give me 24 pence?

thus checking counting in ones with 10 or fewer objects (i.e. ‘within 10’), then counting in ones with fewer than 30 objects. Similarly, a bag with six 10p coins and seven 1p coins is used to check counting in tens and ones; counting in twos is checked with a bag of 2p coins, and counting in fives with 5p coins. When using coins worth more than one penny to check counting, the assumption is made that children aged 7 to 11 are familiar with the fact that, for example, a two pence coin counts as two, and not just as one. Where needed, this can be checked by the person administering the assessment.

The Level 3 assessment was also influenced by Denvir and Brown’s study (1986), where ‘Skill 33’ is listed as “Bundles objects to make a new group of ten in order to facilitate enumeration of a collection which is partly grouped in tens and ones” (p.30). Denvir and Brown were working with children who were likely to be familiar with using tens and ones equipment, but since this is currently less common, the similar Letterbox Club assessment item was one where the child was given six 10p coins and thirteen 1p coins. During piloting of this assessment item, it was evident that many children found it quite challenging, even though they had been able to count amounts that were provided as tens and less than ten ones.

(b) Assessing children’s arithmetic

The questions in this section are set in a simple context, for example: “Pretend that you’ve got 4p, and then I give you another 5p. How much do you have altogether?” so that the child has to decide whether they should add or subtract. The child is
provided with pencil and paper, and can use their fingers to help them. The teacher will repeat any question if the child wishes.

Van den Heuvel Panhuizen (2005) noted that a context can enhance a pupil’s accessibility to a problem, in comparison to a ‘bare number’ question such as 5 + 4. This can provide the teacher with more information about a child’s understanding. However, additional details in the context can prove problematic. For example, the first version of one question from the Letterbox Level 3 Assessment was: “I bought a box of three ‘Fab’ lollies. It cost me £1.80. How much did each lolly cost?” and one child in the piloting process said I should have gone to ‘Supersaver’ because I could have bought a box for £1.50. The brand of lolly diverted children’s attention from the focus of the assessment, so the word ‘Fab’ was deleted. This issue of children’s interpretation of context has been discussed by Cooper and Dunne (2000), observing that children may offer everyday solutions rather than the ones a teacher expects.

(c) Assessing rapid recall of number facts.

The final section is ten questions checking rapid recall of a sample of addition and subtraction facts (for Level 2) or multiplication and division facts (for Level 3). The teacher’s script includes a chart listing each question, and with columns for correct and fast, correct but slow, or unable to do. The child is given the ten questions in written form (for example, 2 + 4 = ), well-spaced, to do in any order they choose. The teacher observes the child writing down their answers, and ticks the most appropriate of the three columns on their script, using the differential scoring system described above.

The record sheets, teacher’s scripts and children’s answer sheets follow.
### Letterbox Club: Level 2 Maths

**Summary Sheet**

**Child's Name:**

**School:**

**Child's date of birth:**

**Unique Pupil Number/code:**

**Date of first test:**

**Interviewer:**

**Date of second test:**

**Interviewer:**

**Scoring:** This test aims to check the child's accuracy and speed with calculations. Score 2 per question for correct and fast, 1 for correct but slow, 0 for unable to do.

<table>
<thead>
<tr>
<th>Focus of each question:</th>
<th>First test</th>
<th>Second test</th>
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</thead>
<tbody>
<tr>
<td>1. Counting in ones</td>
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<tr>
<td>(less than 10 objects)</td>
<td></td>
<td></td>
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<tr>
<td>2. Counting in ones</td>
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<tr>
<td>(less than 30 objects)</td>
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<td></td>
</tr>
<tr>
<td>3. Counting in tens and ones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(less than 20)</td>
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<td></td>
</tr>
<tr>
<td>4. Counting in tens and ones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(less than 100)</td>
<td></td>
<td></td>
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<tr>
<td>5. Mental addition</td>
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<td></td>
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<tr>
<td>(answer less than 10)</td>
<td></td>
<td></td>
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<tr>
<td>6. Mental subtraction</td>
<td></td>
<td></td>
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<tr>
<td>(starting with 10)</td>
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<td></td>
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<tr>
<td>7. Mental subtraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(starting with 12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Mental addition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(answer less than 20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Counting in twos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(less than 20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Counting in fives</td>
<td></td>
<td></td>
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<tr>
<td>(less than 40)</td>
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<td></td>
</tr>
<tr>
<td>11-20. Mental recall for addition and subtraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>within 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SCORE out of 40</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Score of under 50%: Level 1 or below
Score of 50%-90%: Level 2
Score of 95% or above: try Level 3 test

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# Letterbox Club: Level 2 Maths

**Interviewer's script and record sheet**

**Child's Name:**

Date of test: ...........................................

Interviewer: ...........................................

## Part A

For questions 1, 2, 3, 4, 9 and 10: use coins as provided. Provide child with plain A4 piece of card on table in front of them, to use as a working space. Clear each set of coins before starting next question. Questions 5, 6, 7, 8: no equipment needed.

N.B. Annotations show the equipment used.

### Question 1

**Can you give me eight pence? (or nine pence)**

(from bag of 30 x 1p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

### Question 2

**Can you give me 24 pence? (or 25 pence)**

(from bag of 30 x 1p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

### Question 3

**How much is there here? (14p)**

(bag with 1 x 10p and 4 x 1p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>
Question 4
How much money is there here? (67p or 68p)
(form bag of 6 x 10p and 7 x 1p coins)

Correct and fast/confident
Correct but slow/hesitant
Unable to do

The next four questions are about money, but I want you to do them without any coins to help you.

Question 5
Pretend that you’ve got 4p, and then I give you another 5p. How much would you have altogether?

Correct and fast/confident
Correct but slow/hesitant
Unable to do

Question 6
Pretend that I’ve got 10p. If I gave you 4p, how much would I have left?

Correct and fast/confident
Correct but slow/hesitant
Unable to do

Question 7
Pretend that I’ve got 12p. If I gave you 5p, how much would I have left?

Correct and fast/confident
Correct but slow/hesitant
Unable to do

✓ Any comments/child’s wrong answer
**Question 8**

Pretend that you’ve got 8p, and then I give you another 6p. How much would you have altogether?

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>✔</th>
<th>Any comments/child’s wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 9**

How much money is there here? (16p or 18p) (from bag of 8x2p or 9x2p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>✔</th>
<th>Any comments/child’s wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 10**

How much money is there here? (25p or 30p) (from bag of 5x5p or 6x5p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>✔</th>
<th>Any comments/child’s wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
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</tbody>
</table>

**Part B**

For questions 11 to 20, give the child the answer sheet and a pencil or pen to write in their answers. Observe the child and complete the chart below:

<table>
<thead>
<tr>
<th>Correct and Fast/confident</th>
<th>Correct but Slow/hesitant</th>
<th>Unable to do</th>
<th>Any comments/child’s wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
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<tr>
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<td>16.</td>
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<td>17.</td>
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<td>18.</td>
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<tr>
<td>19.</td>
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<tr>
<td>20.</td>
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</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>$2 + 4 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>$5 - 5 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>$7 - 3 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>$0 + 7 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>$9 - 1 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>$6 + 3 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>$1 + 1 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>$5 - 2 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>$8 - 3 =$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>$3 + 7 =$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Letterbox Club: Level 3 Maths**

**Summary Sheet**

**Child's Name:**

**School:**

**Child's date of birth:**

**Unique Pupil Number/code:**

**Date of first test:**

**Interviewer:**

**Date of second test:**

**Interviewer:**

**Scoring:**

This test aims to check the child's accuracy and speed with calculations.
Score 2 per question for correct and fast, 1 for correct but slow, 0 for unable to do.

<table>
<thead>
<tr>
<th>Focus of each question:</th>
<th>First test</th>
<th>Second test</th>
</tr>
</thead>
</table>
| 1. Counting in ones  
  (Less than 50 objects) |            |             |
| 2. Counting in tens and more than ten ones  
  (less than 100) |            |             |
| 3. Counting in fives  
  (less than 100) |            |             |
| 4. Counting in tens and ones  
  (less than 200) |            |             |
| 5. Mental addition  
  (multiples of five, within 100) |            |             |
| 6. Mental subtraction  
  (multiple of ten from a 2-digit number, within 100) |            |             |
| 7. Mental addition  
  (2-digit numbers, within 100) |            |             |
| 8. Mental subtraction  
  (multiple of five from 100) |            |             |
| 9. Multiplication  
  (using 4 times table facts) |            |             |
| 10. Division  
  (using 3 times table facts) |            |             |
| 11-20. Multiplication and division facts for 2,3,4,5 and 10 times tables |     |             |
| TOTAL SCORE out of 40 |            |             |

*Score of under 50%: Level 2 or below*  
*Score of 50%-90%: Level 3*  
*Score of 85% or above: check for Level 4*
Letterbox Club: Level 3 Maths

Child's Name: 

Date of test: 

Interviewer: 

### Part A

For questions 1, 2, 3 and 4: use money as provided. Provide child with plain A4 piece of card on table in front of them, to use as a working space. Clear each set of money before starting next question. Questions 5 to 10: no equipment needed.

### Question 1
Can you give me thirty four pence? (or 35p)  
(from bag of 46 x 1p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

### Question 2
How much is there here? (73p or 74p)  
(bag of 6x10p coins and 13x1p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

### Question 3
How much is there here? (£80 or £85)  
(bag of 16 x 50p coins and 17 x 5p coins)

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>
The next six questions are about money, but I want you to do them without any money to help you.

<table>
<thead>
<tr>
<th>Question 4</th>
<th>How much is there here? (£152 or £153) (bag of 15 x token £10 notes and 2 x £1 coins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct and fast/confident</td>
<td>✓ Any comments/child’s wrong answer</td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
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<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 5</th>
<th>Pretend that you’ve got 15p, and then I give you another 35p. How much would you have altogether?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct and fast/confident</td>
<td>✓ Any comments/child’s wrong answer</td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 6</th>
<th>Pretend that you’ve got 85p, and then you give me 20p. How much would you have left?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct and fast/confident</td>
<td>✓ Any comments/child’s wrong answer</td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 7</th>
<th>Pretend that you’ve got 27p, and then I gave you another 47p. How much would you have altogether?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct and fast/confident</td>
<td>✓ Any comments/child’s wrong answer</td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
<tr>
<td>Question 8</td>
<td>Pretend that you had £1, and then you spent 65p on a magazine. How much would you have left?</td>
</tr>
<tr>
<td>Any comments/child's wrong answer</td>
<td></td>
</tr>
<tr>
<td>Correct and fast/confident</td>
<td></td>
</tr>
<tr>
<td>Correct but slow/hesitant</td>
<td></td>
</tr>
<tr>
<td>Unable to do</td>
<td></td>
</tr>
</tbody>
</table>

| Question 9 | I went shopping, and I bought 4 CDs. They were £7 each. How much did it cost me altogether? |
| Any comments/child's wrong answer |
| Correct and fast/confident |
| Correct but slow/hesitant |
| Unable to do |

| Question 10 | I bought a box of 3 ice lollies. It cost me £1.80. How much did each lolly cost? |
| Any comments/child's wrong answer |
| Correct and fast/confident |
| Correct but slow/hesitant |
| Unable to do |

Part B

For questions 11 to 20, give the child the answer sheet and a pencil or pen to write in their answers. Observe the child and complete the chart below.

<table>
<thead>
<tr>
<th>Correct and fast/confident</th>
<th>Correct but slow/hesitant</th>
<th>Unable to do</th>
<th>Any comments/child's wrong answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td></td>
<td></td>
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<tr>
<td>12.</td>
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<td>13.</td>
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<tr>
<td>15.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
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<td></td>
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<tr>
<td>17.</td>
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<td>18.</td>
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<tr>
<td>19.</td>
<td></td>
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</tr>
<tr>
<td>20.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Letterbox Club: Level 3 Maths Part B

Child's Name: 

Date: 

11. $4 \times 2 = $

12. $12 \div 2 = $

13. $5 \times 5 = $

14. $16 \div 4 = $

15. $4 \times 0 = $

16. $10 \times 10 = $

17. $18 \div 2 = $

18. $4 \times 8 = $

19. $21 \div 3 = $

20. $6 \times 4 = $

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APPENDIX D: TABLE D.1: SUMMARY OF CASE STUDY DATA COLLECTED (Table 3.7 from main text)

<table>
<thead>
<tr>
<th>Child &amp; D.O.B</th>
<th>Initial Letterbox Test; interviewer</th>
<th>1st interview with Child</th>
<th>Recall Interview</th>
<th>Interview with Teacher/s</th>
<th>Exercise books</th>
<th>2nd interview with Child</th>
<th>Recall Interview</th>
<th>Interview with Teacher or TA</th>
<th>Interview with LAC team member</th>
<th>Final Letterbox test/s (all RG)</th>
<th>3rd interview with child</th>
<th>Recall Interview</th>
<th>Other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye 07/02</td>
<td>28/4/10 (SENCO)</td>
<td>S1</td>
<td>12/7/10</td>
<td>S3</td>
<td>YES</td>
<td>12/7/10</td>
<td>S5</td>
<td>17/11/10</td>
<td>20/12/10 (Teacher)</td>
<td>9/3/11</td>
<td>17/6/11</td>
<td>17/6/11</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S6</td>
<td>S7</td>
<td>S8</td>
<td></td>
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<td></td>
<td>S14</td>
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<tr>
<td>Ronan 02/02</td>
<td>2/7/10 (RG)</td>
<td>R1</td>
<td>2/7/10</td>
<td>R2</td>
<td>2/7/10</td>
<td>29/9/10</td>
<td>R3</td>
<td>3/2/11</td>
<td>3/2/11 (TA)</td>
<td>9/3/11</td>
<td>27/5/11</td>
<td>27/5/11</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>R4</td>
<td>R5</td>
<td>R6</td>
<td></td>
<td></td>
<td></td>
<td>R9</td>
</tr>
<tr>
<td>Kyle 12/00</td>
<td>29/6/10 (RG)</td>
<td>K1</td>
<td>29/6/10</td>
<td>K3</td>
<td>YES</td>
<td>7/7/10</td>
<td>K5</td>
<td>18/8/10</td>
<td>12/11/10 (Teacher)</td>
<td>9/3/11</td>
<td>8/7/11</td>
<td>8/7/11</td>
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<tr>
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<td>K6</td>
<td>K7</td>
<td>K8</td>
<td></td>
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<td></td>
<td>K10</td>
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<tr>
<td>Dylan 08/00</td>
<td>7/7/10 (RG)</td>
<td>D1</td>
<td>7/7/10</td>
<td>D2</td>
<td>YES</td>
<td>14/7/10</td>
<td>D3</td>
<td>22/11/10</td>
<td>7/2/11 (Teacher)</td>
<td>9/3/11</td>
<td>13/6/11</td>
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<td>D4 + D5</td>
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<td>D7</td>
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<td>D11</td>
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<td>Millie 04/00</td>
<td>10/5/10 (Teacher)</td>
<td>M1</td>
<td>25/6/10</td>
<td>M2</td>
<td>28/6/10</td>
<td>2/7/10</td>
<td>M3</td>
<td>10/11/10</td>
<td>10/11/10 (Teacher)</td>
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<td>14/4/11</td>
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<td>M5</td>
<td>M6</td>
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<td>M9</td>
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284
Table D.2: Data on Skye

<table>
<thead>
<tr>
<th>Code</th>
<th>Date</th>
<th>Data</th>
<th>Video/Audio/Notes or Materials</th>
<th>Other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>28 Apr 2010</td>
<td>Level 2 test</td>
<td>M</td>
<td>Done by SENCO, Janet Allen</td>
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<tr>
<td>S2</td>
<td>5 Jul 2010</td>
<td>Head interview</td>
<td>N</td>
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<tr>
<td></td>
<td></td>
<td>Ms Adam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>12 Jul 2010</td>
<td>Child interview</td>
<td>V A M</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>12 Jul 2010</td>
<td>Child recall</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>12 Jul 2010</td>
<td>Teacher</td>
<td>A</td>
<td></td>
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<tr>
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<td>interview</td>
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<td></td>
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<td>S6</td>
<td>July 2010</td>
<td>Exercise books</td>
<td>M</td>
<td>Feb to July 2010; Homework bk</td>
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<td></td>
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<td>2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>17 Nov 2010</td>
<td>Carer interview</td>
<td>A N</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Kate</td>
<td></td>
<td></td>
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<td>S8</td>
<td>20 Dec 2010</td>
<td>Child interview</td>
<td>V A N M</td>
<td></td>
</tr>
<tr>
<td>S9</td>
<td>20 Dec 2010</td>
<td>Teacher</td>
<td>A N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>interview</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>Kelly Asher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S10</td>
<td>20 Dec 2010</td>
<td>Head interview</td>
<td>N</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Ms Andrews</td>
<td></td>
<td></td>
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<tr>
<td>S11</td>
<td>9 Mar 2011</td>
<td>LA staff</td>
<td>N</td>
<td></td>
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<td></td>
<td>interview</td>
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<td></td>
</tr>
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<td></td>
<td></td>
<td>Vanessa J</td>
<td></td>
<td></td>
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<tr>
<td>S12</td>
<td>17 Jun 2011</td>
<td>Level 2 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>S13</td>
<td>17 Jun 2011</td>
<td>Child interview</td>
<td>V N M</td>
<td></td>
</tr>
<tr>
<td>S14</td>
<td>17 Jun 2011</td>
<td>Child recall</td>
<td>N</td>
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Table D.3: Data on Ronan

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<tr>
<th>Code</th>
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<th>Data</th>
<th>Video/Audio/Notes or Materials</th>
<th>Other information</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>2 Jul 2010</td>
<td>Level 2 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>2 Jul 2010</td>
<td>Child interview</td>
<td>V A M</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>2 Jul 2010</td>
<td>Teacher interview Claire Berry</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>29 Sep 2010</td>
<td>Carer interview Debbie</td>
<td>A N</td>
<td></td>
</tr>
<tr>
<td>R6</td>
<td>3 Feb 2011</td>
<td>Child interview</td>
<td>A N M</td>
<td>Video accidentally deleted by child</td>
</tr>
<tr>
<td>R7</td>
<td>3 Feb 2011</td>
<td>TA interview Alanna Coates</td>
<td>A N M</td>
<td>Photocopies of some exercise book pages</td>
</tr>
<tr>
<td>R8</td>
<td>9 Mar 2011</td>
<td>LA staff interview Vanessa Jones</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>R9</td>
<td>27 May 2011</td>
<td>Level 2 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>R10</td>
<td>27 May 2011</td>
<td>Child interview</td>
<td>V N M</td>
<td>Audio tape failed</td>
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<td>Code</td>
<td>Date</td>
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</tr>
<tr>
<td>K1</td>
<td>29 Jun 2010</td>
<td>Level 2 test</td>
<td>M N</td>
<td></td>
</tr>
<tr>
<td>K2</td>
<td>29 Jun 2010</td>
<td>Head interview Ms Brown</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>K3</td>
<td>29 Jun 2010</td>
<td>Child interview</td>
<td>V A M</td>
<td></td>
</tr>
<tr>
<td>K4</td>
<td>29 Jun 2010</td>
<td>Child recall interview</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>K5</td>
<td>10 Jul 2010</td>
<td>Teacher interviews Peggy Boden + Joan Blanch</td>
<td>A N M</td>
<td></td>
</tr>
<tr>
<td>K6</td>
<td>July 2010</td>
<td>Exercise books 2010</td>
<td>M</td>
<td>Measurement bk plus Calculations book</td>
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<tr>
<td>K7</td>
<td>18 Aug 2010</td>
<td>Carer interview Brenda</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>K8</td>
<td>12 Nov 2010</td>
<td>Child interview</td>
<td>V A N M</td>
<td></td>
</tr>
<tr>
<td>K9</td>
<td>12 Nov 2010</td>
<td>Teacher interview Brian Black</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>K10</td>
<td>9 Mar 2011</td>
<td>LA staff interview Vanessa Jones</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>K11</td>
<td>8 Jul 2011</td>
<td>Level 2 test Level 3 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>K12</td>
<td>8 Jul 2011</td>
<td>Child interview</td>
<td>V N M</td>
<td></td>
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<tr>
<td>K13</td>
<td>July 2011</td>
<td>Literacy assessment SNTS staff member</td>
<td>M</td>
<td>Dyslexia report</td>
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<td>K14</td>
<td>11 Oct 2011</td>
<td>Child interview</td>
<td>V A N M</td>
<td>New school</td>
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<td>K15</td>
<td>11 Oct 2011</td>
<td>Teacher interview Emma Denton</td>
<td>A N</td>
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<td>K17</td>
<td>15 Nov 2011</td>
<td>Child interview</td>
<td>V N</td>
<td></td>
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<tr>
<td>K18</td>
<td>6 Dec 2011</td>
<td>Child interview</td>
<td>N</td>
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Table D.5: Data on Dylan

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<tbody>
<tr>
<td>D1</td>
<td>7 Jul 2010</td>
<td>Level 2 test Level 3 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>7 Jul 2010</td>
<td>Child interview</td>
<td>V A M</td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>7 Jul 2010</td>
<td>Child recall interview</td>
<td>N A</td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>7 Jul 2010</td>
<td>Teacher interview Lucy Earl</td>
<td>N</td>
<td>SENCO and designated teacher</td>
</tr>
<tr>
<td>D5</td>
<td>14 Jul 2010</td>
<td>Teacher interview Jill East</td>
<td>A N</td>
<td></td>
</tr>
<tr>
<td>D6</td>
<td>July 2010</td>
<td>Exercise books 2010</td>
<td>M</td>
<td>Numeracy book</td>
</tr>
<tr>
<td>D7</td>
<td>22 Nov 2010</td>
<td>Carer interview Chantelle</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>D8</td>
<td>7 Feb 2011</td>
<td>Child interview</td>
<td>V A N M</td>
<td></td>
</tr>
<tr>
<td>D9</td>
<td>7 Feb 2011</td>
<td>Child recall interview</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>D10</td>
<td>7 Feb 2011</td>
<td>Teacher interview Jill East</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>D11</td>
<td>9 Mar 2011</td>
<td>LA staff interview Vanessa Jones</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>D12</td>
<td>13 Jun 2011</td>
<td>Level 2 test Level 3 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>D13</td>
<td>13 Jun 2011</td>
<td>Child interview</td>
<td>V A N M</td>
<td></td>
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<tr>
<td>D14</td>
<td>13 Jun 2011</td>
<td>Head teacher interview Mr Elliot</td>
<td>N</td>
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<td>D15</td>
<td>15 Jul 2011</td>
<td>SATs results</td>
<td>M</td>
<td></td>
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<td>Data</td>
<td>Video/Audio/Notes or Materials</td>
<td>Other information</td>
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<tr>
<td>M1</td>
<td>10 May 2010</td>
<td>Level 2 test</td>
<td>M</td>
<td>Done by teacher</td>
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<td></td>
<td></td>
<td>Level 3 test</td>
<td></td>
<td></td>
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<td>M2</td>
<td>25 Jun 2010</td>
<td>Child interview</td>
<td>V  A  N  M</td>
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<td>M3</td>
<td>28 Jun 2010</td>
<td>Teacher interview</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jessica Fellows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td>July 2010</td>
<td>Exercise books 2010</td>
<td>M</td>
<td>Last book for 2010, photocopied by school</td>
</tr>
<tr>
<td>M5</td>
<td>2 Jul 2010</td>
<td>Carer interview</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M6</td>
<td>10 Nov 2010</td>
<td>Child interview</td>
<td>V  N  M</td>
<td>No sound on video</td>
</tr>
<tr>
<td>M7</td>
<td>10 Nov 2010</td>
<td>Teacher interview</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jessica Fellows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M8</td>
<td>9 Mar 2011</td>
<td>LA staff interview</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vanessa J</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M9</td>
<td>14 Apr 2011</td>
<td>Level 3 test</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>M10</td>
<td>14 Apr 2011</td>
<td>Child interview</td>
<td>V  A  N  M</td>
<td>No sound on video; actions not transcribed</td>
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<tr>
<td>M11</td>
<td>14 Jul 2011</td>
<td>SATs results</td>
<td>M</td>
<td></td>
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APPENDIX E: EXAMPLES TO ILLUSTRATE PROCESS OF ANALYSIS

Transcript: Example showing interim notes on interview transcript (Brenda about Kyle)

Table E.1: Example of interim comparison of two children (Ronan and Kyle)

Table E.2: Example of interim summary of features of one child’s mathematical experience (Skye)

Example showing interim notes on interview transcript: interview with Brenda (kinship foster carer) about Kyle, 18th August 2010

*Interview was difficult to transcribe at points because of noise from parrot.*

This extract covers the first half of the interview, to illustrate temporary constructs/initial themes: notes shown on right hand side in italics.

*These notes were originally hand-written in the margins of the paper text.*

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Rose</td>
<td>This is Rose Griffiths on the 18th of August, I think it is, I’ve lost track, talking to Brenda about Kyle. I’ll put the recorder there, lovely. I’ll keep it on my lap just in case.</td>
</tr>
<tr>
<td>2</td>
<td>Brenda</td>
<td>Oh, right.</td>
</tr>
<tr>
<td>3</td>
<td>Rose</td>
<td>What I wanted to ask first of all was about Kyle and his maths at school, I wondered how you thought he got on in maths, numeracy, at school?</td>
</tr>
<tr>
<td>4</td>
<td>Brenda</td>
<td>Well I’d heard that he was quite low down the scale at the moment, from meeting <em>inaudible</em> and such.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knows Kyle is poor at maths</td>
</tr>
<tr>
<td>5</td>
<td>Rose</td>
<td>Yeah.</td>
</tr>
<tr>
<td>6</td>
<td>Brenda</td>
<td>I ask a lot of questions, and they do say quite poor at the moment, well below average.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 minute</td>
</tr>
<tr>
<td>7</td>
<td>Rose</td>
<td>Yeah. Who do you get to talk to when you go in?</td>
</tr>
<tr>
<td>8</td>
<td>Brenda</td>
<td>His one-to-ones, and…Karen her…Carol her name is. I’m not sure what role she plays but…Carol, she updates me every day. Plus he’s got a little book.</td>
</tr>
<tr>
<td>9</td>
<td>Rose</td>
<td>Oh right, that he has to write things in.</td>
</tr>
</tbody>
</table>
They have to write in, through the day, what happens, how he gets on. [Phone ringing] Hello? Listen I’m in a meeting at the moment but…I’m at home, that lady, Rose has come. The one I was telling you about…Yes…Right, see you later, bye.

Yeah, I’m not sure what role she’s got, Carol, she’s, it’s awful to say, she’s in charge of the day to day runnings in the school, and we chat, cause I know her. So we chat and she’ll just say and what’s gone on and how he’s doing. But it’s the meetings that update me.

How contact with school is organised

Right, how often are they?

I think every three months.

Right, so you get about four a year?

Yeah, LAC reviews.

Oh right, Looked After Children, yeah. What’s his reading like to go along with his maths?

I’m not sure about that, cause he never reads here, what we do is…I spent £142 on a set of books.

Yeah.

And it’s “I wonder why”. They’re fabulous books.

And I got a complete set but…we try our hardest to get him involved in reading, it’s just very rare that he’ll get one or two of them out, and we’d flip through it, but he does read a little bit you know. And I’ve offered to buy him all sorts of little books and things like that but I just can’t get no involvement. But he does resort to those occasionally. But it is occasionally.

Wants to help: expensive books

Yeah.
20 Brenda But his reading’s not that bad, I don’t think, because, like, you know if he leans over your mobile and reads a message, and he reads it quite quick.

Notices what Kyle can do

21 Rose Yes.

22 Brenda So…I think it’s selective to be honest, some of it.

Looking for motive/explanation

23 Rose Yes.

24 Brenda I think it’s ‘don’t want to’, a lot of it.

25 Rose And maybe he’s just anxious about it.

26 Brenda Yes.

27 Rose He’s obviously not very keen on writing.

28 Brenda Oh gosh. That’s an absolutely filthy word.

29 Rose Is he left handed or right handed?

4 minutes I can’t remember.

30 Brenda I think he’s right.

31 Rose Yeah, I was just trying to remember.

32 Brenda Yeah, a lot of trouble with writing.

Knows Kyle has major problems with writing

33 Rose Yeah. So, what does the school tell you about what he does in maths? Do they tell you anything about what he does in lessons?

34 Brenda Not really, no. No, not a lot. They just say that he’s, you know, they just give you the scales to be honest, you know, what level he’s at. Nothing really more.

No information about content of lessons

35 Rose Do you know what level they’ve said recently? Did you get a report?

36 Brenda Yes I did, I put it away. (goes to get up)
37 Rose  That’s alright, don’t worry.

38 Brenda  No, he was two years behind.

39 Rose  I would have thought he’d be a Level One or Level Two.

40 Brenda  Yeah, a few years behind?

‘Levels’ may not be meaningful

41 Rose  Yeah, ok. So mostly, when they’re talking to you about what he does in class, is it about his behaviour rather than about the actual work he’s doing or…?

42 Brenda  Well I think it’s about half and half.

5 minutes  You know, mainly, well, if you understand it, if his behaviour’s been good, then obviously, they’ll say ‘well we’ve done this and he was really good at that, and he did that, and he wasn’t too good at that’ you know, ‘and he didn’t want to get involved in that’. But if it was an absolute uproar then it’s obvious that the whole things is ‘well he did this and he had to do that and we had to do that and we know you understand that we had to do this and that’, do you know what I mean? So, it’s only really if it’s a good day or a partial good day that I get the lowdown. Not deliberately, it’s just how it works.

Focus on behaviour

43 Rose  Well, it’s their priority obviously, yeah. Ok. This might seem a silly question, does he get homework for maths?

44 Brenda  He has done.

45 Rose  Alright, ok, how does that go?

46 Brenda  Absolute no no!

6 minutes  I’ve always…this was a little while ago but they’ve stopped giving him homework altogether now because, they’ve said to me, sometimes when he’s not had a good day they’ll say, “He’s got a tiny bit of work here, Bren, and all he’s got to do is copy that one line. And he wouldn’t do it, would you mind taking it home. He’s been there for half hour.”
Brenda: I said “all you’ve got to do is copy that line and you can get on with what you’re doing” but he’ll struggle and I’ve seen him sit there for an hour and a half.

Keen to support homework but not successful

Brenda: So it’s…I think a lot of it’s stubbornness, but maybe fearful of what his writing looks like.

Looking for motive/explanation

7 minutes: Probably that’s part… I don’t know, you know what I mean? It’s hard to…

Brenda: Yeah.

Rose: It’s hard to tell. Have you ever asked him why he sits there? Why he doesn’t just do it?

Brenda: Yeah.

Rose: What does he say? (Brenda shrugs shoulders) Just shrugs his shoulders?

Brenda: That’s it.

Rose: Yeah, yeah.

Brenda: I say ‘Kyle, all it is is one line, it’ll only take about two minutes, one line.’ I, when I actually got him, what he does is, he, well, me, if I’m
copying something, I’ll look at it and I’ll say right ‘the cats’ and I’ll do ‘the…cats…sat on the mat’ but he does that. *(demonstrates)*

**Detailed observation of writing difficulty**

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<tbody>
<tr>
<td>63</td>
<td>Rose</td>
<td>Oh he’s trying to look at it and write at the same time.</td>
</tr>
<tr>
<td>64</td>
<td>Brenda</td>
<td>Yeah, yeah. He doesn’t look at the pen when he’s doing it.</td>
</tr>
<tr>
<td>65</td>
<td>Rose</td>
<td>He doesn’t look at what he’s doing; he looks at what he’s copying.</td>
</tr>
<tr>
<td>66</td>
<td>Brenda</td>
<td>Yeah, that’s right.</td>
</tr>
</tbody>
</table>

*8 minutes*

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</thead>
<tbody>
<tr>
<td>67</td>
<td>Rose</td>
<td>Yeah, that makes it very hard.</td>
</tr>
<tr>
<td>68</td>
<td>Brenda</td>
<td>Which is why the letters are miles apart and downhill.</td>
</tr>
<tr>
<td>69</td>
<td>Rose</td>
<td>Yeah.</td>
</tr>
<tr>
<td>70</td>
<td>Brenda</td>
<td>But I can’t be sure if that’s deliberate or not. I can’t be sure of that.</td>
</tr>
</tbody>
</table>

*Looking for motive/explanation*

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<thead>
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<tbody>
<tr>
<td>71</td>
<td>Rose</td>
<td>It doesn’t sound deliberate, it sounds like he’s not got the hang of it. Ok, so what do you think about him not getting homework, do you think that’s a sensible solution or do you think they should still give homework?</td>
</tr>
<tr>
<td>72</td>
<td>Brenda</td>
<td>Erm, I’m not sure whether they do it for my convenience really. Because they know how difficult it is, and we had the sort of understanding at first, I mean I was sort of being a bit cocky about it and I said “no, no, you’ve got a bit to bring me, Carol, he’ll do it, don’t worry about that” you know, only a bit cocky I said “he’ll do it, give it me.” But when I actually experienced it I went ‘no’. Even with me I said “I must admit I was being a bit cocky about it” but, you know…</td>
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</table>

*School trying to help by not giving homework?*

*9 minutes*

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<tbody>
<tr>
<td>73</td>
<td>Rose</td>
<td>Yeah, it was more stressful that you realised.</td>
</tr>
</tbody>
</table>
Yeah, yeah, yeah, pointless. I was just thinking that I could get it out of him, you know. Because, I was thinking it’s a school environment, he’s not happy at the minute, he’s obviously not going to do it. But get back to your own environment, where it’s cushy and cosy and…two minutes to do it. But no. It probably half registers that it’s for the school, and why should I. I don’t know for sure I’m just surmising.

Search for explanation again

Yeah, a lot of it is guess work, isn’t it.

Well of course it is.

Trying to figure out what a child is thinking or…yeah. Do you do any things at home which you think might help Kyle with his maths? With money or…you know, just everyday things?

Well yeah he does do, well he has some money and his granddad…like he’ll erm, he’ll take the change off his granddad. And he’ll say “look that’s my change, I’m holding on to that.” And he hides his pennies, but not a lot really, you know, just try our hardest. And I bought him two really big cards, and you have a special pen with them and you can rub it off.

Wants to help: bought practice cards

Oh right.

And it does time tables and adds and subtracts on the other side but…cost about £10 but, he only bothered with them a few days, and just now and again I’ll say “get it out Ky, come on” and I says “tell you what, we’ll both do it”, and I’ll say how good or how bad I am. But not a great deal of interest, you know. He’s got other things on his mind.

Acknowledging child’s stress

If you go shopping, does he go shopping for himself or, you know, will he take money and go and buy things and get the change…
Oh, I don’t let him.

or anything like that?

Or is that not…?

Oh no I would do that. Oh sometimes yes, when we’re out what he used to do is he’ll say “Can I have another juice mammy?” And he’d sort of wait around and I’d say “you know where the counter is, you can get it yourself” and he will do that now, whereas before he’d say “no you get it mammy”, or granddad, you know. But I’d say to him “you can see, it’s not far away, here you are” say “here you are then, here’s another pound”. And he’s quite strong that way now, he’ll just wander off and get another whatever. Whereas, he wouldn’t have done that before but…

Kyle was anxious about shopping

Yeah. Do you think he’d be able to check his change to make sure he got the right…?

No. No, I don’t think so.

No.

You know, he would check his change, but I don’t think he’d have a clue of if it was the right amount, no. I could be wrong but I don’t think so.

Knows Kyle has problems with money
### TABLE E.1: EXAMPLE OF INTERIM COMPARISON OF TWO CHILDREN’S SITUATIONS: Kyle and Ronan, both at Brookhouse Primary School

(from handwritten notes compiled in October 2010; used particularly for Chapter 4)

<table>
<thead>
<tr>
<th></th>
<th>Ronan</th>
<th>Kyle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home</strong></td>
<td>Potential adoption by carers. With 4 siblings. Affectionate and close to foster carers. Contact with birth mother reduced.</td>
<td>Very unsettled; in kinship care with frequent respite care. Not allowed to play out. No other children, most of the time.</td>
</tr>
<tr>
<td><strong>School</strong></td>
<td>NC Level 1, Year 3 &lt;br&gt;‘Bottom table’ in maths. Sits with autistic child who has TA. Teacher’s comment: “quiet and polite”.</td>
<td>NC Level 2, Year 4 &lt;br&gt;Statement for Emotional and Behavioural difficulties. ‘Bottom table’ in maths but frequently out of class with TA. Teacher’s comment: “very, very difficult”.</td>
</tr>
<tr>
<td><strong>Child</strong></td>
<td>In first interview: agitated and anxious. Couldn’t sit still. Demanding presents. BUT at home: quiet, calm, smiling, close to carer.</td>
<td>At home: refused to see me; threw things down the stairs from upstairs landing. BUT in first interview: keen to try things. Very interested in video. Responsive and thoughtful.</td>
</tr>
<tr>
<td><strong>Teacher and classroom</strong></td>
<td>Works in main class, sometimes in ‘bottom group’ but occasionally in mixed group. Work is well-matched to his needs. Comments from teacher are forward-looking. BUT can he read the comments?</td>
<td>Says he mostly works with TAs outside the classroom. Very little work for the whole year; much of it looks inappropriate and much is difficult to read. Negative comments in book – which he says he cannot read.</td>
</tr>
<tr>
<td><strong>Foster Carer</strong></td>
<td>Confident in maths. Thinks school is not doing best for Ronan. Arranged move to new school with good induction over the holiday. Helping with maths at home. Says school holidays are great.</td>
<td>Scared of maths. Thinks school is good, and they are trying to help her. School contact is about behaviour. Keen to help with maths at home, but needs advice. Says school holidays are a nightmare.</td>
</tr>
</tbody>
</table>
TABLE E.2: EXAMPLE OF INTERIM SUMMARY OF FEATURES OF ONE CHILD’S MATHEMATICAL EXPERIENCE: Skye at Armthorpe Primary School.
(from handwritten notes compiled in August 2011; used particularly for Chapter 5)

<table>
<thead>
<tr>
<th>Progress and Motivation</th>
<th>Productive approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number:</strong></td>
<td>Discussion and explanation with coins</td>
</tr>
<tr>
<td>Counting - inaccurate</td>
<td>Video – beat yourself</td>
</tr>
<tr>
<td>Number bonds - can’t see links</td>
<td>Video – watch it and teacher models how to explain something.</td>
</tr>
<tr>
<td>Subtraction – doesn’t know symbol; lack of understanding</td>
<td>Video – aids concentration</td>
</tr>
<tr>
<td><strong>Coping strategies:</strong></td>
<td>Good, detailed assessment helped more than records from previous teacher.</td>
</tr>
<tr>
<td>Adult doing work for her;</td>
<td>Using calculator (espec for symbols)</td>
</tr>
<tr>
<td>Distraction and avoidance behaviour;</td>
<td>Child setting questions</td>
</tr>
<tr>
<td>Copying (espec. from ‘good’ child)</td>
<td></td>
</tr>
<tr>
<td>Poor concentration.</td>
<td></td>
</tr>
<tr>
<td><strong>Child's view:</strong></td>
<td></td>
</tr>
<tr>
<td>Doesn't like: number lines, take-aways, big numbers.</td>
<td></td>
</tr>
<tr>
<td>How can teacher help? Right speed of work.</td>
<td></td>
</tr>
</tbody>
</table>

These summary charts were drafted for every child, and revised each time additional data was collected.

The five charts were compared across all of the children, and data was reviewed again to look for further similarities and differences between the cases, to provide new or revised constructs and themes.
APPENDIX F:

SUMMARY OF TIME SPENT WITH EACH CHILD ON EACH VISIT

The table below gives a summary of the time spent assessing and interviewing each child. The maximum time I could spend with a child on one visit was 50 minutes (the length of most numeracy lessons), but all the teachers concerned said I could return the child to their class as soon as we had finished, and for four of the children (all except Millie) the teachers said that they thought about 10 or 15 minutes was the longest time for which the child would concentrate. Each clinical interview finished at a point where I felt the child needed to stop; the total time for each visit, and the individual interview times, therefore give an indication of the child’s ability to sustain concentration on that day.

Table F.1  Summary of time spent with each child on each visit, in minutes

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Skye</td>
<td>-</td>
<td>26</td>
<td>17</td>
<td>43</td>
<td>22</td>
<td>-</td>
<td>22</td>
<td>15</td>
<td>24</td>
<td>10</td>
<td>49</td>
</tr>
<tr>
<td>Ronan</td>
<td>15</td>
<td>7</td>
<td>-</td>
<td>22</td>
<td>30</td>
<td>-</td>
<td>30</td>
<td>15</td>
<td>32</td>
<td>-</td>
<td>47</td>
</tr>
<tr>
<td>Kyle</td>
<td>15</td>
<td>10</td>
<td>12</td>
<td>37</td>
<td>45</td>
<td>-</td>
<td>45</td>
<td>15</td>
<td>20</td>
<td>-</td>
<td>35</td>
</tr>
<tr>
<td>Dylan</td>
<td>15</td>
<td>10</td>
<td>11</td>
<td>36</td>
<td>35</td>
<td>10</td>
<td>45</td>
<td>15</td>
<td>16</td>
<td>-</td>
<td>31</td>
</tr>
<tr>
<td>Millie</td>
<td>-</td>
<td>42</td>
<td>-</td>
<td>42</td>
<td>46</td>
<td>-</td>
<td>46</td>
<td>15</td>
<td>35</td>
<td>-</td>
<td>50</td>
</tr>
</tbody>
</table>

Notes:

(a) Skye and Millie’s initial assessments had been completed by their teachers at an earlier date.

(b) The time given for the assessments is an estimate.

(c) I visited Kyle for 4 further sessions at his new school; each time, we used the full 45 minutes of his numeracy lesson.
APPENDIX G:

DATA FOR KYLE AT DUNSCROFT SPECIAL SCHOOL

As described in Chapter 4, I arranged to see Kyle at his new school, Duncroft Special School (for pupils with social, emotional and behavioural difficulties), for a sequence of interviews during the Autumn term, starting in October.

Interviews with Kyle in Year 6 at Duncroft Special School in 2011

In these interviews, I wanted to explore Kyle’s mathematical understanding further, but also to experiment with approaches to learning that I thought might suit him. Here, I will report on just two of these four interviews, concentrating on two particular elements: learning number facts, and the handwriting of numerals.

Interview with Kyle in Year 6 at Duncroft, October 11th 2011 (Interview K14)

On our first meeting at his new school, Kyle showed me through to the empty room next to his usual classroom, and began with some advice: that if I heard any shouting, swearing or breaking things from the classroom, I should just ignore it, as “it happens all the time here”. He was very calm, and agreed that it was a long journey on the bus each day, but he was feeling settled and liked his teacher. He showed me some pages in his mathematics exercise book; there was only a small amount of written work for the six weeks since the beginning of term. This included a section on multiplication and division facts, which Kyle said he had completed entirely with a calculator, and hence “I’ve got them all right!” (turn 54), but he was unable to explain any other way in which he could have reached the answers.

In the time since I had last visited Kyle, he had lost contact with several adults who were key to his everyday life, because of his change of school and changes in the local authority’s staffing. I wanted to make sure that Kyle was clear about the reason for my visits continuing, and for him to know that this was for a limited period. I felt he needed to be forewarned that this was not a long-term arrangement.

I also wanted to develop Kyle’s view of himself as a competent learner, who could think about how he learned best, and could contribute to changing his own level of attainment –
linking with Kilpatrick, Swafford and Findell’s (2001) idea of a positive disposition. I explained as follows:

63 Rose
Now, one of the reasons why I’ve come to see you again is because after I saw you the last time, which I thought might be the last time that I would see you, I thought to myself ‘I can think of some things that would really help Kyle get ever so much better at maths really fast’. Because you’re actually…you’ve got a really good brain, but you’ve got so far behind in maths that it’s quite difficult for you to see how you can get any better.

How do you feel when you’re doing maths?

64 Kyle
All right.

65 Rose
All right? But, looking at your book, you find it quite hard to do the things on your own. Yeah, is that true? (Kyle nods) Would you like to get better at it? (Kyle nods several times) Would you like me to suggest some things that I know will help you get better at it?

66 Kyle
Yeah.

I said that we would concentrate on two things: improving the way he wrote his numbers, and learning some number facts, and I had brought some number facts tests with me (Griffiths 2009b), to make a start on that.

71 Rose
And what you can do is do exactly the same test … (shows Kyle the test papers) See how many copies I’ve got of it … they’re all exactly the same. There’s eight of them here, I think.

72 Kyle
Why is there eight?

73 Rose
Cause you’re going to do it eight times.

74 Kyle
Seriously?

75 Rose
Yeah, seriously. You won’t do them all today, but you’re going to do it eight times, until you’re really good at it, exactly the same test. You’re smiling at me, does that mean it’s a good idea?

76 Kyle
I want to do all eight today.

77 Rose
I don’t think you’ll do all eight, I don’t think we’re got time.
Kyle was pleased to see that the test was one where the questions were written for him, and I explained that he would have three minutes to complete as many sums as he could. He finished in just under three minutes, using his fingers for more than half of the calculations. I marked them immediately, asking him to tell me what a number was, if it was not written clearly – predominantly where he had written a six (see Figure G.1).

**Figure G.1: Kyle’s answers on a 3-minute test**

Kyle had completed all 20 questions correctly, and when I suggested that next time he could try the test again as a two minute test, he was keen to try again straight away. This time, he finished in under two minutes, with every calculation correct again.

119 Rose Have you finished already? You’ve still got another thirty seconds to go. You have got quicker!

120 Kyle I’m getting faster by the minute (*grins*).

We changed activity for a few minutes; I asked Kyle to count a collection of pennies that I had brought. He was confident counting up to seventy, but then rather hesitant about eighty and ninety. He counted 100, then said “A pound” (turn 202) but he would not agree to count the remainder as 101, 102 and so on, as he said it would be too difficult (turn 206). Kyle
counted the remaining 79 pence correctly, told me I had £1.79, but could not write £1.79, because he was not sure how to write the pound sign.

Kyle’s teacher, Emma Denton, joined us at this point, and said we had just a few minutes left until break. I explained about the speed tests, and Kyle asked me to time him for a one minute test, while both Emma and I watched him. Once again, he completed it in this faster time, with all 20 correct. This time, he had used his fingers for 3 + 4 and for 4 + 3, but, as far as I could see, for no other sums. He asked what would happen with the remaining tests, and I said he could take them home if he wanted, for someone to time him: “The aim is to get to the point where you look at [the sum] and you straight away know the answer, you don’t have to do that” (Rose holds up her fingers as though counting a sum on them) (turn 296). Kyle showed that he was aware of how his knowledge had improved, as he said “The thing is, with that (points to 2 + 2) and that (points to 3 +3), I just went ‘four’ and ‘six’” (turn 297). As Karpicke and Roediger (2008) suggested, repeated testing had proven effective in helping Kyle improve his fluency with number facts.

Interview with Kyle in Year 6 at Dunscroft, October 25th 2011 (Interview K16)

When I arrived, Emma told me that Kyle had only had two mathematics lessons since I last saw him, as they had had a week of ‘project week’ and a half-term holiday. That morning, he had been working on a laminated hundred square, carrying out subtractions, and he brought this work through to the next-door classroom to show me. It was evident that he could not repeat any of the calculations he had done in the lesson (for example, 16 – 12), and he said he had had a TA sitting with him, pointing to where he had to draw on the hundred square. As Seeger (1998) points out, sometimes the use of a representation such as the hundred square presents a pupil with an additional difficulty, as they must now decipher the representation, as well as understanding the number problem that it should help them complete.

I showed Kyle the handwriting worksheets I had brought with me. We began with a sheet that showed ‘how some children have written their numbers’, where he had to decide which numbers were written clearly enough, by comparing with a ‘good’ example next to them. He was able to distinguish which numerals needed improvement, and made comments about what was wrong, such as “the hole’s too big” about a badly-written six, and “it’s the wrong way” about a reversed two.
I asked Kyle to write the numerals 1 to 9 for me. Kyle was able to criticise his own numerals, perhaps because we had discussed someone else’s work first: he had a model to follow. Perhaps, also, it felt less threatening because I had made it clear there were many children who had difficulty with writing numbers. The following exchange begins when I asked him why he said his ‘3’ needed improving:

62 Kyle Cause it’s all wobbly.
63 Rose The main thing is, you need to bring that bottom bit a bit further round.
64 Kyle On the line.
65 Rose And then move it up so it’s on the line. (Kyle changes the number 3 slightly) Yeah, that’s better, that looks better immediately. So that needs a bit of attention. Your 4 is beautiful. What about that? (points to 5; Kyle nods approval) What about that one? (points to 6; Kyle shakes his head)

66 Kyle Cause the circle. It’s not like, it’s not like that, it’s like, it’s like, that, so it’s not going like that. (Kyle demonstrates)
67 Rose Yeah, exactly, so you know where you’ve got to aim for the next one. That’s not too bad (points to 7), but it could do with the bottom stroke being a bit better. That’s perfect (points to 8).

Good, and that’s OK (points to 9). So the main ones to concentrate on are the 2, 3, …

68 Kyle 6, 7.
69 Rose So write that down here: 2, 3, 6 and 7.

Kyle writes them down.

Yeah, that 6 is definitely in need of attention, isn’t it.

70 Kyle I’ve always done my 6s like that.

71 Rose So you’ve got to change it, because it’s not easy to read. (Kyle nods).
During the writing practice that followed, Kyle concentrated on each of his target numbers in turn. Figure G.2 shows the row of 6s he wrote (following an example of mine, marked ‘Rose’). I asked him to choose the one he thought was best, and he nominated one as ‘excellent’, one as ‘good’, and one for complete obliteration, saying “That’s not even a six!” (turn 146). The comparison with his sixes in Figure 5.5 (above) shows a major improvement.

**Figure G.2 (Figure 5.5 in main text): Kyle’s practice sixes**

Kyle suggested that he should do handwriting practice as a timed activity. I had never considered this before, but it did prove to be useful, as his ‘30 second practice’ both motivated him and encouraged him to complete as many practice numbers as he could in a concentrated period.

The improvement in his numerals was less marked but still significant when he completed a further ‘Speedy Sums’ test at the end of this session.

*Further commentary on these interviews is included in Chapter 5.*
APPENDIX H: DATA AND ANALYSIS FOR SKYE
SKYE’S PROGRESS AND MOTIVATION IN LEARNING

My first visit to meet Skye was close to her 8th birthday, and she was keen to show me her birthday badge. She grinned, and told me “we are going in the library but we don’t have to be quiet”. I explained the research to her, and gave her my letter for her to sign to confirm that she would like to take part; when I offered to read it out to her, she said no, she would read it to me, and she did so without any mistakes, except being unsure about the words ‘University’, ‘agreeing’, and ‘interviews’. She signed carefully, in joined-up writing. She was confident with reading and writing.

Clinical interview with Skye in Year 3, July 2010 (Interview S3): Part One.

Skye’s teacher, Janet Allen, had used the Letterbox Level 2 assessment with Skye at the end of April, and then adjusted Skye’s level of work in class (see Chapter 4). Janet had given me a copy of the assessment, including her notes about Skye’s methods of calculation and her wrong answers. I wanted to follow up on three aspects of Skye’s responses:

- When she had been given some coins and asked how much money there was, she had counted how many coins, rather than using the value of each coin;
- Her initial response to $0 + 7$ was 0; she had then changed it to 7;
- She had tried to multiply, add or divide for the subtraction questions. For example, for $7 - 3$, she had counted in threes, trying to do “seven threes”, and had given the answer 20.

Skye was interested in being filmed, and asked if the whole school would be watching the film, but I explained that it would just be seen by me, her, and some adults who were interested in how children learned mathematics. At various points in the interview, she talked directly to the camera – in a manner that reminded me of television cookery demonstrations, explaining what you had to do next. In the pauses when I was writing notes, she pulled faces at the camera and made roaring noises, and laughed.

I began by giving Skye seven 2 pence coins, and asked her how much money that was. She counted and said “7p” (S3, interview with child, turn 6). We then discussed the differences between a 1p coin and a 2p coin (the size and the numbers on them), and exchanged amounts in 1p coins for amounts in 2p coins. Skye successfully counted amounts up to 10p, both with
just 1p coins, or using 2p coins and a penny if needed. I asked her why she thought we have a 2p coin, and she said it was to buy a 2p sweet, but I pointed out that the shopkeeper would let you pay with 2 pennies or one 2p coin, so that was not sufficient reason. She held some pennies in one hand, picked up a 2p coin, thought for a while, then said:

74 Skye  It helps cause if you have a 2p and, like, you had one 2p, it makes it easier because if you hold two [pennies] you might drop one of these.

75 Rose  Oh yeah, that’s a very good idea.

Can I just try something else with you? Can you tell me how much money I’ve got…that’s a shiny one isn’t it! How much money have I got there? [Rose puts out two 2ps and three pennies]

76 Skye  (Whispers, counting the 1p coins) 1, 2, 3. OK. (Starts again, with 2p coins) OK, 2, 4, (hesitates, breathes in), 5, 6, 7.

77 Rose  Oh, what a clever girl, well done!

I was not certain for how long Skye would be able to concentrate on our work together, so at this point, I asked her if she would like to watch what we had been doing, and she readily agreed.

**Stimulated recall interview with Skye in Year 3, July 2010 (Interview S4)**

Skye watched quietly as she counted seven 2p coins at the beginning of the film and gave the answer 7p. She asked me “Was it with the ones?” and when I showed her the 2p coins, she said dejectedly, “Oh”. I asked her to tell me what she had done on the film:

R33 Skye  They’re in 2s, yeah, there’s not seven.
R34 Rose  That’s right.
R35 Skye  But I don’t know how I figured it out.
R36 Rose  So, well, just…you did this …
R37 Skye  I just worked it out, and like, I say like 1, 2, 3, 4, 5, 6, 7.
R38 Rose  Ah, so where did you go wrong then? What should you have done, because they’re 2s?
R39 Skye  2, 4, 6, 8, …
R40 Rose  Yes, ah, very good girl, so you’ve spotted what you did wrong. Let’s go on and see what you did next.
Skye did not find it easy to comment on what she did in the film; her responses included “I just worked it out in my head” when I could see that she had physically counted (R29); “I’m not good at maths, am I?” (R92); and “I don’t know” (R132).

During the recall interview, as we watched the last section of the film (see turns 75 to 77 above), Skye put two 2p coins and three 1p coins on the table, and showed me again that she could count “2,4,5,6,7”, without me prompting her. I felt it was important to explain to her why I was so impressed, partly to model an explanation of how something had been done, before we returned to the clinical interview:

R182 Skye You think in your head really hard to get it right and…
R183 Rose You did get it right.
R184 Skye I got it right.
R185 Rose What you did really well there was you swapped over (Skye starts to put the coins away)...hang on a second...what you did really well was you counted 2, 4, and then you figured out, ‘Ah, I’m not counting in 2s any more, now I’m counting in 1s.’ So what you did really well was swapping over from counting in 2s, ‘2, 4’, to counting in 1s, ‘5, 6, 7’. And that was brilliant. Well done on that.

Later that day, when I discussed with her teacher how Skye had counted this mixture of coins, Janet Allen confirmed that Skye had been practising counting in ones, twos, fives and tens with her (S5, see Chapter 4). This complemented the additional discussion (albeit at a very basic level) in the clinical interview with Skye about why we have different coins, which had seemed to focus her attention more closely on them, alongside practising the exchanging of 2p coins for 1p coins.

Clinical interview with Skye in Year 3, July 2010 (Interview S3): Part Two.

In the second part of this interview, I wanted to examine the addition of nought, and if possible to begin to explore subtraction. Since Skye had been uncertain about 0 + 7, I began by checking addition to six, using small plastic goldfish and two ‘ponds’ drawn on a sheet of paper. I placed two fish in one pond, four in the other, and asked Skye to tell me how many were in each pond, and how many there were altogether. She answered
this correctly, and answered confidently each time as the fish ‘jumped’ back and forth from one pond to the other. When there were six in one pond, none in the other, and I asked how many there were altogether, she said “It’s always six!” (S3, turn 30) in a tone of voice that suggested I was asking a foolish question.

31 Rose  Ok, very good.

Now, we’ll just pretend there are fish (takes the fish away). Alright, this time there’s no fish in this pond (points) and there’s five fish in this pond (points). How many altogether?

32 Skye  Five.

33 Rose  Very good. How about if there’s three fish in this pond and two fish in that pond, how many altogether?

34 Skye  Easy! Five.

35 Rose  How about if there’s four in this pond and one in that pond?

36 Skye  Easy, five.

37 Rose  How about if there’s four in that pond (places four fish in the pond) and none in that pond, how many altogether?

38 Skye  Four.

39 Rose  Can you tell me, what’s eight add none?

40 Skye  Eight add none, eight.

41 Rose  What’s none add two?

42 Skye  (Laughs) Two.

43 Rose  And what’s four hundred and twenty-seven add none?

44 Skye  Four hundred and twenty-seven.

Her confidence with adding zero seemed strong.

To finish this section, I asked her if she wanted to make up a question for me, using the fish. She put a handful of fish in each pond, counted “altogether makes 13” (turn 52) although there were actually seven in each pond; then she moved one fish across, followed by another, and asked me: “If one fish goes in here, what makes this fish go in here?” (turn 54). I tried
another tack: “Would you like me to tell you how many fish are in here? (pointing to the busier pond) (turn 55). Instead, Skye asked, “How many fish are in here (points to busier pond) as in here? (points to other pond). More than, here more than here?” (turn 56).

However, Skye was not able to answer the question herself, and she started to make faces at the camera, with accompanying funny noises, so I abandoned thinking about the ‘difference’ aspect of subtraction.

I offered her my calculator, and asked if she would like to try taking away: 9 - 5. She keyed in 9, but could not identify the subtraction sign, choosing x and then = instead, until I pointed at the correct sign; she read the digital display, 4, with no difficulty. We re-enacted 9 - 5 with the fish, and got 4 again. Skye then tried 5 - 5 and got zero, and I asked her to do 8 - 2. She said confidently, “It is going to be ten!” but a few seconds later said “I done a mistake” and showed me a display showing 82. (turns 108 and 110), before managing 8 – 2 = 6. She repeated the problem using the fish, then with the calculator again, and got 6 each time.

There was a moment then when I thought she was beginning to understand what was happening, when she said, “If you take away … Oh, OK!” (turn 127).

Her last calculation was her own choice: 7-1. She said it would be six, confirmed this with the fish, then accidentally pressed the 7 button twice on the calculator but did not want to clear and start again. Her solution was to press 1 twice in compensation, so she did 77 – 11 = 66, and said “Seven take away one equals sixty-six” in a disbelieving voice; I responded, “77 – 11 equals 66” (turn156). She started again: “Seven take away one equals// six. I told you, I told you.” (turns 159 and 161).

When I turned off the laptop, Skye asked if I could give her another really big sum to do, adding zero. I offered “one thousand, two hundred and forty three add nought” and she said she would write it down for me: see Figure H.1.

Figure H.1: Skye’s way of writing 1243 + 0

\[
1000 200 43 + 0 = 1000 200 43
\]
This is not an uncommon way for young children to write large numbers (for example, see Worthington, 2011). Skye’s reaction when I showed her that the number should be written as 1243 was to shriek “No!!”, shake her head and look astounded. Her disbelief seemed genuine; she had been confident about her own logical method of writing the number.

I wondered how she would write a number in the hundreds, not thousands, since she was happy to conflate “forty three” as 43, not 403, but similarly, she wrote “four hundred and twenty seven add nought” as 40027 + 0. I suggested that she could talk to her teacher about writing numbers bigger than a hundred, to find out more about it.

Skye had brought her mathematics exercise book to show me, so I looked through for any places where she had written numbers larger than 100. There was just one exercise (S6, 30/3/10) on “finding small differences by counting on” which included questions such as “102 - 98” and 303 - 298”. Skye was unable to read the questions to me, and could not answer “102 – 98” when I read the question out loud, and said that she would have just copied “the right number to put” from another girl, or perhaps “the lady helped me, she said what to do” (presumably the TA). Skye said that she did all the writing herself, and that was why she had drawn a green traffic light next to her work (to show that she felt this lesson was one where she was confident: children were told to draw red if they needed more help, amber if they were gaining confidence, and green if they knew what to do). Another lesson’s work, on the same page, was similarly neat and totally correct. The ‘learning objective’ written at the top was “Multiply a tens number by a one-digit number” (for example, 19 x 5), and the TA had ticked every calculation and written “Target achieved” at the end, but Skye was unable to tell me the answer to any of the thirty items, or how to go about them, except to say that “you have to see what another girl has done.” It seemed unfortunate that Skye was able to copy from someone who completed the work correctly, as Skye’s own lack of understanding remained hidden for longer. Figure H.2 shows part of the page.
I asked Skye whether she still copied what other people did, and she said yes, “sometimes you have to!” Her more recent work was at a more suitable level after her teacher had re-assessed her, as described in Chapter 4. For example, on 1/7/10 (S6), Janet Allen had removed Skye’s focus on neat handwriting by writing the questions into Skye’s book herself, and Skye concentrated on figuring out how to complete each calculation: see Figure H.3.
Clinical interview with Skye in Year 4, Dec 2010 (Interview, S8).

For my second interview with Skye, at the end of the Autumn Term in Year 4, I wanted to explore her knowledge of number bonds within 20, including addition and subtraction facts, and the links between them. Skye was much more agitated than when I had seen her previously, rocking on her chair, jumping up and walking around the room, and taking things out of my bag.

The first task I asked her to do, using the fish and two ‘fish ponds’ as before, was $4 + 2$, which she completed quickly. Next, Skye wanted to use all the fish in the box, and counted them onto the two ponds, nine on one and five on the other. I asked how many there were altogether, and she counted them all again, correctly making 14, and jumped up to dance and sing with a pretend microphone: a song that they had been practising for a Christmas assembly. We struggled through $9 + 6$, interspersed with dancing, singing and drawing fish, then Skye said she was going to draw a star.

```
  3 + 5 = 8   18 \times 11
  9 + 4 = 13
 11 + 13 = 24
  9 + 7 = 16
  3 + 5 = 8
 16 + 8 = 28 \times 23
  9 + 5 = 14
  4 + 7 = 11 \times 11
 14 + 11 = 26 \times 26
```

45 Skye Actually I am going to do it really neat.
I just think you are trying to avoid doing any work. Now, you just did 9 add 6. What do you think 9 add 7 would be, Skye?

*Skye continues drawing stars on the paper.*

You’ve done 9 add 5: that was 14; 9 add 6: that was 15. What do you think 9 add 7 would be?

What?

9 add 7?

*Piano music and singing comes from another room. Skye joins in one line.*

(Sings) A very special day! (Writes a number)

What have you written? 16, very good.

I was surprised that she was able to achieve the correct answer because she was drawing and singing at the same time, and I was uncertain whether she had followed the pattern: 14, 15, 16, or guessed, or seen that it must be one more, or calculated afresh. My next question was therefore “What’s 9 add 9 then?” (turn 52). Without a pause, she said “19?” then tried the sum on the calculator, saying “Oh gosh, 18!” but when I asked her which was the right answer, 18 or 19, she ignored me and began trying other calculations on the calculator, after checking with me which button was ‘take away’: “9 take away 4, no, 9 take away 8...” (turn 68). I tried to return to our starting point, asking her to show me how she would do 9 add 5 on her fingers, but she said she was going to draw a mermaid instead. She began to concentrate again when I asked her to show us on the film how she would do 3 add 4 with her fingers, then she demonstrated 5 add 4, and 9 add 5. For 9 add 8, she wrote numbers 1 to 9 on my paper, then numbers 1 to 8, then counted up the numbers to get 17.

My last question was about 5 add 4 again: “4 add 5 is 9, so if you had 9 and you took away 5, what would you have left?” (turn 131). Skye said she did not know, and wanted to use the calculator, but I asked her to show me 9-5 on her fingers first. She held up nine, then counted down, starting on the hand with five fingers raised, “9, 8, 7, 6, 5, 4, 3, 2,...Oh, no // 9, no..., 9, 8, 7, 6, 5, 4. // 4.” (turns 148, 150 and 152). She was not immediately able to see the links between 4, 5 and 9 but still needed to count.

I did not carry out a recall interview on this occasion.
Skye’s final Letterbox assessment, June 2011 (S12)

Skye’s second assessment using the Letterbox materials showed that she had made progress in several areas. Table H.1 below shows the improvement in her ability to use coins and to count in tens and ones, in twos and in fives. She was still less confident with subtraction: she was able to subtract from 10, using her fingers (question 6), but for question 7, focusing on 12p-5p, she tried to count backwards, and gave the answers 10p, then 3p, then 5p.

Table H.1: Skye’s accuracy and fluency with Level 2 assessment items on counting and word problems: comparing 2010 and 2011.

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

Improved score: □ Decreased score: □

<table>
<thead>
<tr>
<th>Focus of Question</th>
<th>Skye 2010</th>
<th>Skye 2011</th>
</tr>
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<tbody>
<tr>
<td>1. Counting in ones (&lt;10 objects)</td>
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<tr>
<td>2. Count in ones (&lt; 30 objects)</td>
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<tr>
<td>3. Count in tens &amp; ones (&lt; 20)</td>
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<td>4. Count in tens &amp; ones (&lt; 100)</td>
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</tr>
<tr>
<td>5. Addition: 4p + 5p</td>
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<td>2</td>
</tr>
<tr>
<td>6. Subtraction: 10p – 4p</td>
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<td>7. Subtraction: 12p – 5p</td>
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<td>8. Addition: 8p + 6p</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>9. Counting in twos: 16p</td>
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<td>10. Counting in fives: 25p</td>
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<td><strong>Total on this section</strong> (out of 20)</td>
<td>6</td>
<td>16</td>
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</table>

Table H.2 shows that Skye’s knowledge of the sample of number facts in questions 11 to 20 had improved slightly: she now knew 5 - 5 and 0 + 7 as well as 1 + 1; however, there were still seven of these number facts that she did not know ‘off by heart’. She was able to
calculate all of these other facts using her fingers, and had no difficulty recognizing the subtraction sign this time.

**Table H.2: Skye’s accuracy and fluency with Level 2 assessment items on addition and subtraction facts: comparing 2010 and 2011.**

Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

Improved score: $\checkmark$ Decreased score: $\checkmark$

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<tr>
<th>Question</th>
<th>Skye 2010</th>
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<td>11. 2+4</td>
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<td>12. 5-5</td>
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<td>13. 7-3</td>
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<td>14. 0+7</td>
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<td>15. 9-1</td>
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<td>16. 6+3</td>
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<td>17. 1+1</td>
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<td>2</td>
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<tr>
<td>18. 5-2</td>
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<td>19. 8-3</td>
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<td>1</td>
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<tr>
<td>20. 3+7</td>
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<td><strong>Total on this section (out of 20)</strong></td>
<td><strong>6</strong></td>
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**Clinical interview with Skye in Year 4, June 2011 (Interview, S13).**

This was my final interview with Skye, and followed directly after she had completed the Letterbox Club assessment. I told her that she had done well. I decided to concentrate upon two aspects:
• Exploring methods of carrying out a subtraction.
• Investigating whether Skye could begin to recall number facts if given sufficient practice.

I began by following up the question that she had seemed to find most difficult: question 7, 12p - 5p, but within the context of the plastic goldfish that we had used before. Using the fish to count, she got the right answer to 12 - 5, but it was not a quick calculation. Next I asked for 12 take away 6; Skye started from scratch, counting out 12 fish, counting 6 and moving them away, then counting those left. Again, it was laboriously slow.

I decided to investigate whether it helped Skye to have the fish arranged in twos, and we set them out in pairs across a piece of plain paper. Then I told her that she was not allowed to touch them, but she could look at them very carefully. I hoped that eliminating the rearrangement of the fish would help her work more quickly, and might help her ‘see’ the patterns of numbers within 12, concentrating on even numbers at first. I knew that she was confident about counting in twos.

I demonstrated 12 take away 2 first, hiding 2 fish with my hand. I then asked for 12 - 4, 12 - 6, 12 - 8, and 12 - 10 in turn. Each time, Skye counted the fish in ones, but stopping at each pair: for example, “1, 2; 3, 4; 5, 6; 7, 8; 9, 10” (turn 56). 12 - 12 produced three answers from Skye: “12, 0, 12. What?” (turn 58), showing her uncertainty with zero again. Skye counted the fish again, and then said confidently, “Nothing” (turn 60).

Next, I repeated those same questions, but in a different order. 12 - 6, then 12 - 4, were each counted out in ones again, as before. I commented on this:

65 Rose I don’t think that is the quickest way you could do it, because you are good at counting in 2s aren’t you? So if...

67 Skye (pointing at pairs as she counts) 2, 4, 6, 8.

68 Rose That’s a better way of doing it.

Skye then answered 12 - 6, 12 - 4, 12 - 2, 12 - 12 and 12 - 6 accurately and more quickly than before, by counting in twos, and then I repeated the questions once more, in another order. Once again, she answered correctly, still by counting in twos. I swapped to addition:
Skye answered the next five repeats of the ‘take away’ questions accurately and quickly, looking at the pairs of fish to do so. Then I said she could make up some questions for me to do, and check them with the calculator. Skye had some difficulties because she wanted to hold the calculator in her hand, and that meant she often pressed the wrong key. With one calculation, I offered to help by drawing a number line, and she panicked:

145 Skye I don’t like number lines. Don’t, please, please.
146 Rose Why don’t you like them?
147 Skye They are too hard, I don’t like it.
148 Rose You don’t like them. Right okay. Right, could you put...
149 Skye Can I draw a picture? (sounds anxious)
150 Rose What are you going to draw? Is it going to be quick, because I want to talk to you about...
151 Skye Yeah, it’s going to be a person.
152 Rose Alright, make it really quick then.

Skye’s panic seemed acute, until I gave her permission to draw, and she drew a picture of her younger sister. We talked for a few minutes about her sister’s recent injury from being bitten by a dog, then I asked Skye to tell me what she found difficult in mathematics lessons. She listed number lines, take-aways, and take-aways with big numbers.
I then tried to broach the subject of Skye’s avoidant behaviour with her. My initial more open questions did not bring about an answer from Skye, other than “What?” (turn 240), so I tried more direct examples. Skye did listen attentively:

241 Rose Well, when you have been working with me, sometimes you concentrate really hard and do really, really good work. And then sometimes you say, ‘Oh, I’m going to do a drawing’ and you stop doing the maths and you start doing something else. And I am wondering, why you do that? Is it because you are worried that it is getting hard? Or is it just because you can’t concentrate, and you want to do something different and then get back to the maths after?

…

242 Skye When it gets hard.

243 Rose Perhaps you haven’t thought about this before. Has anyone talked to you about how you could concentrate a bit better?

244 Skye (sounds surprised) Yeah, you!

245 Rose That’s true, I just did. Has anybody else ever talked to you about that?

246 Skye No.

Of course, I have no way of knowing whether it was the case that no-one had talked to Skye directly about how she approached her work, but I felt that Skye was interested in thinking about what she did, and I suggested that we could watch part of the video from earlier that morning, to see herself doing subtractions with the fish.

**Stimulated recall interview with Skye in Year 4, June 2011 (Interview S14)**

Skye’s response to watching the first part of her interview (S13) was predominantly through excited shouting, as she realized she now knew the answers to the questions I had asked her to do with the fish. Directly after I asked each question on the film, and before she said it on the recording, she called out the answer several times. So, for example, when I said “12 - 4” on the film, she shouted “8, 8, 8!” and a few minutes in, she commented “Oh, she’s so slow!” while watching herself counting out the fish one by one. I paused the film to say how pleased I was that she had got quicker and quicker at getting the right answers, and we watched some
more, still with Skye managing to “beat herself” by getting the answers faster now than on screen. She enjoyed this immensely. Accidentally, we had found a strategy that was successful in motivating Skye to focus on ‘rapid recall’ of number facts.

In retrospect, I regret that I did not talk to Skye (or her teacher) about why I had presented the same small group of calculations several times in different orders, so that she could become very familiar with them. This density of practice was not evident in any of the written work she had done (exercise books, S6). I could not find any examples, apart from corrections, where she had repeated any calculation, even across the space of a month. Any mental mathematics taking place was apparently in the whole-class setting, engaging children across a wide range of attainment, so was unlikely to have involved much repetition. It did not seem surprising, therefore, that Skye was still having to calculate even quite simple items, such as 2 + 4 and 5 - 2 (Table H.2, above).

**Key issues from Skye’s case**

Skye’s behaviour – noisy, fidgety, with only short periods of concentration – was inhibiting her learning in mathematics. She acknowledged that in class, she often copied other pupils, or was ‘helped’ by the teaching assistant, without gaining any understanding of how to solve a problem herself; she also worked slowly (probably deliberately), and concentrated on neat handwriting. Yet when her attention was caught, she learnt quickly.

Further areas of Skye’s understanding or confusion in mathematics were uncovered by letting her take the lead – by her telling me the type of questions she wanted to be asked, or by her making up questions to ask me.

Filming Skye provided several benefits: it was an incentive for her to concentrate; it provided material to watch together to show her she was making progress; and it encouraged her to begin to work more quickly, as she tried to ‘beat herself’ as she watched the film. Similarly, using a calculator alongside practical materials was very productive, particularly when she was exploring subtraction.

These issues of behaviour and affect, assessment, and productive approaches are discussed further in the final section of Chapter 5.
APPENDIX I: DATA AND ANALYSIS FOR DYLAN

DYLAN’S PROGRESS AND MOTIVATION IN LEARNING

On my first visit, Dylan seemed pleased to be leaving his mathematics lesson (with a supply teacher), and showed me the way to a classroom that was being used for storage, as the school underwent major building works. He said he could not read the permission letter himself, but listened carefully when I read it to him and nodded emphatically when I talked about the research, explaining that it would help other children who were in care. He signed his name carefully, but would not write the date.

Initial assessment, July 2010 (D1)
Dylan was keen to count the amounts of money for the first three questions in the Level 2 assessment, and said “Real money! Yeah!” when he started, sounding pleased. His counting was accurate in questions 1 to 4, and he was reasonably confident with the addition and subtraction questions in context, but he was not able to count the 2p coins in question 9, saying “I can’t count in my twos very well. Is 15 in the twos? I think it’s 15p.” Dylan’s answers to questions 11 to 20, checking rapid recall, were almost all correct, but slow. He seemed to know 0 + 7, 9 – 1 and 1 + 1, and used his fingers to calculate all the other questions.
Dylan agreed to try the Level 3 assessment paper. His counting was reasonably confident; he counted 34 pence in pennies without an error. When he was given six 10p pieces and 13 pennies, he counted the tens and then the pennies separately several times, and did then correctly decide it was 73p. When counting token £10 notes and £1 coins, he reached the correct total of £152. However, question 5 made him panic: “Pretend that you’ve got 15p, and then I give you another 35p. How much would you have altogether?” and he shook his head, said “No way!” and refused to do any more.

Clinical interview with Dylan in Year 5, July 2010 (Interview D2)
Dylan had asked whether he could go back to his classroom as soon as we finished the assessments, so I was uncertain whether I would be able to persuade him to be interviewed. He agreed when I showed him my laptop and the box of plastic fish that we would use, and he spent a few minutes watching himself pull faces at the laptop screen before we started work again.
I decided to concentrate on exploring his knowledge of number bonds to ten, as he seemed to know so few number facts off by heart. He counted out ten plastic fish, and I drew two ‘ponds’ on a sheet of paper for the fish to live in. I wanted to see whether he realised that, however we redistributed the ten fish across the two ponds, there would still be ten. We began with five fish in each pond, and he confidently said there were ten altogether. However, when I moved two fish across from one pond to the other he counted every fish again to make seven in one and three in the other; when I asked how many altogether, he counted again, one to seven and then, quietly, “eight, nine, ten” (turn 10). Similarly, he counted again for the combination eight add two, and again for nine add one. There was no indication that he realized it would always be ten. When the last fish was moved, and Dylan had ten in one pond and none in the other, he said, “equals ten” (turn 22), and he was equally sure that “none add ten” would be ten as well, when I moved all of the fish to the opposite pond.

Next, still with ten fish, I asked him to choose how many fish would leap over to the other pond. He moved four fish, and counted them again:

32 Dylan One, two, three, four. There you go, four.
33 Rose Ok, so you’ve got four over there. How many here, then?
34 Dylan (Counts each fish in the first pond) Six.
35 Rose Six (then indicates both ponds, asking for the total).
36 Dylan (points in turn to each of the four fish in the other pond, adding them on) Ten. It’s going to be ten! Easy!

At this point, because of the change in his facial expression, I thought that Dylan had probably just realised that our total would always be ten, but I wanted to check this. I put all ten fish back in one pond, and asked him to choose another number of fish to move over. He moved seven; I covered the remaining three with my hand, and asked how many there were, hiding: he immediately answered “Three!” (turn 48) but I realised this might be just from memory, rather than calculating how many more made ten, so I tried an alternative approach, starting with ten fish in one pond.

57 Rose Still ten fish. I want you to shut your eyes. I’m going to make some come over here and hide. (Dylan shuts his eyes; Rose moves five fish
and hides them with her hands). OK, now have a look. (Dylan opens his eyes)

All right, so how many are over there? And how many must be hiding?

58 Dylan One, two. Oh, one, two, three, four, five. I’m missing five.

59 Rose You’re missing five. OK, very good. All right, we’ll do that once more. So there’s ten there to start with, still ten? All right, shut your eyes. (Dylan shuts his eyes; Rose moves seven fish and hides them with her hands)

Dylan laughs.

Ok, open your eyes.

60 Dylan One, two, three, I’m missing … (Dylan counts on his fingers)

I’m missing seven.

61 Rose Very good.

I felt he was now confident that there were ten altogether, no matter how they were arranged, but he did not know the number facts that added to ten off by heart.

Dylan wanted to use the four remaining fish that were in my box, so we spent a little time experimenting with combinations that made 14. He completed the sum 10 + 4 very quickly, but I was uncertain whether he knew the answer or used his fingers; for every other calculation he used his fingers.

Our last activity was one of Dylan’s choice. He asked me to show him how to do “them” (turn 114), pointing to the percentage sign on the calculator. We concentrated on finding 50% of a few amounts of money in pounds; Dylan was keen but anxious, made repeated mistakes when using the calculator, and then wanted to stop. He did agree that he would like to watch the first part of the film we had made, before he went back to the classroom.

Stimulated recall interview with Dylan in Year 5, July 2010 (Interview D3)

While we watched the film of our interview, Dylan confirmed that for most of the calculations he had worked them out on his fingers, but said that he did know 5 + 5 made 10. I asked him about 10 + 4, since I had not been sure about how he did that; he said he did not know the answer, but “I can do it really quick on my fingers” (turn R41).
However, for much of the time while he was watching, Dylan remained silent, even when I prompted him. He asked why his voice sounded different on the film, and he noticed that the film was ‘back to front’, as Photobooth films as though it is a mirror.

Towards the end, I asked Dylan about his interest in percentages, and he said he had been doing a test for his SATs (i.e. a practice test paper for the national assessments at the end of Year 6) and he thought he had got his percentages wrong, when he had been asked to calculate 8% of something. It seemed to me to be an inappropriate level of work to be expecting from him.

His written work from his mathematics lessons for Year 5 (D6) indicated that he was frequently presented with work that was much too difficult for him; in chapter 4, I have described the discussion with the school’s mathematics co-ordinator that I had about this. Throughout his exercise book, there were comments such as “refused to work for 20 minutes” and “Refused to do work despite being supported by TA”. In spite of this, he had asked me about how to do percentages. I was struck by how anxious he was to learn, regardless of the poor experiences he had had.

Clinical interview with Dylan in Year 6, February 2011 (Interview D8)

This interview had been delayed because Dylan had told his foster carer, Chantelle, in the Autumn term that he did not want her to be interviewed (see chapter 4). This was resolved after several meetings, including with Chantelle and Dylan together. It seemed possible that Dylan had been testing Chantelle’s responsiveness to his views, rather than being worried about the content of the interview, as he readily agreed to go ahead once she had agreed not to do so. However, I was also aware of his high levels of anxiety about his attainment in mathematics.

By the time of this second interview, Dylan had been in Year 6 with the mathematics co-ordinator, Lucy Earl, as his teacher for about six months. Throughout that time, he had had additional individual coaching sessions with Lucy at least twice a week for about half an hour, during which Lucy said she concentrated on mental mathematics and learning number facts (interviews D5 and D10). Following from my previous interview with Dylan (D2), I wanted to find out more about his confidence in counting, including counting in twos, and to explore addition and subtraction within 20.
I provided Dylan with £26 in £2 plastic coins to count. He did not touch the coins, but counted “2, 4, 6, 8, 10, 12, 14, 18, 20, 22 // 24, 28, er, 30. (turns 4 and 6), omitting 16 and 26. To make sure he had to move the coins, I asked him to give me £14 using the £2 coins. He did this successfully, and checked the coins twice, saying “[It’s] always good to check again. That’s what shops do.” (turn 8). However, when I asked for £18, he missed out 16 in the counting sequence again, so gave me just £16. I pointed this out, and he did not miss it out when I asked him next for £20, which he counted correctly.

I asked Dylan what he thought was the biggest number he could count up to in twos, and he said “I could just keep going in twos, // over and over and over and over and over” (turns 20 and 21), so I asked him to count out loud for me, stopping at 30:

| Dylan  | 2, 4, 6, 8, 10, 12, 14, 18, |
| Rose   | No, you have missed something out there. |
| Dylan  | Oh. 16. |
| Rose   | Very good. |
| Dylan  | 18, 20, 24, no, 22, 24, 28, no, 26, 28, 30. |
| Rose   | Very good, lovely. |

Dylan’s counting in tens and ones was much more assured; given a pile of token £10 notes and plastic £1 coins, he successfully counted £74, £120 and £139, and was able to tell me that he would need another £6 if he wanted to buy something that was £145.

I provided some real pennies next, and Dylan counted out 20, so that he could try subtracting from 20. I explained that he could use any method he wanted: taking away coins from the twenty, using his fingers, or he could try in his head or on paper.

My first question was 20 – 2 and he immediately gave the answer 17. When he repeated the calculation with the pennies and got 18, he seemed to panic, and asked if we could start the video again. He put his head on the table, saying “Oh, I got it wrong” (turn 91). I decided to carry on, but beginning with some questions I thought he might find easier, as he had previously seemed more confident with amounts in fives (assessment D1).

| Rose   | It doesn’t matter [that you got it wrong]. What’s 20 take away 5? |
| Dylan  | 20 take away 5 (still with his head on the desk) |
| Rose   | Yes. |
Dylan spent the next few minutes trying to reach the answer to 20 – 13, using the pennies, but his counting was inaccurate and he kept forgetting what calculation he was trying to do, although I had written it down. He gave the answers 6, 10, 11 and 13 in an increasing panic, until I helped him see that it was seven. He wanted to delete the video (turn 141), and I stopped the recording but did not agree to delete it.

I suggested that we should play a game next, and Dylan agreed with relief. We used a pack of playing cards; I explained that we would each turn over two cards, find the total, and then whichever of us had the largest total would win all four cards. I thought this game would provide a reason for him to be pleased when he turned over larger numbers to add, and it was a context in which checking each other’s totals was an expected activity. After a few turns, Dylan agreed to turn over three cards each time, and he soon suggested using four then five cards. His addition was not always correct, but he did not get agitated if I pointed out an error, and soon put it right, using his fingers to count and sometimes swapping the order of the cards to put larger numbers first. He was also quickly able to say without adding, which
of our two sets of cards was going to have the larger total, by glancing across the numbers. The game was a satisfying way to finish the interview, and fortunately he also won the most cards.
Dylan then asked if he could watch the video of himself working, as “I want to see all my mistakes.”

**Stimulated recall interview with Dylan in Year 6, February 2011 (Interview D9)**
As in the previous recall interview (D3) Dylan was silent for most of the time while he watched the film, but he did comment on his counting, noticing that he forgot to say 16, and noting how quickly he had counted in tens and ones (turn 54): “My hands are really fast!”
Referring to his quick answer to the question 20 – 5, he said “All I done, it’s natural, easy, everyone knows it” (turn R7), and for 20 – 10 he said “The same!” (turn R8).
As he watched himself beginning to count backwards to try to work out 20 – 13 (in turn 105, given above) he commented as follows: “I didn’t think. I could take away 10, take away 3! But I didn’t do it. I tried counting back, it’s too hard, no good. It’s 7 – dumb Dylan! What was I thinking!” (turn R9). I said that it did not matter if you sometimes chose a method that did not work – and that he had now suggested a very good way of reaching the answer – but he seemed to be only partially reassured, as he asked me whether we could delete the video. I asked if I could just turn it off, and he nodded agreement.

**Dylan’s final Letterbox assessment, June 2011 (D12)**
Dylan’s second Level 2 Letterbox assessment showed some improvement over the year, largely through increased fluency with number facts, as is shown in Tables I.1 and I.2.
Table I.1: Dylan’s accuracy and fluency with Level 2 assessment items on counting and word problems: comparing 2010 and 2011.
Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

Improved score: $\checkmark$ Decreased score: $\times$

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<td>8. Addition:</td>
<td>8p + 6p</td>
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<td><strong>Total on this section (out of 20)</strong></td>
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</tr>
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Dylan agreed to try the Level 3 assessment paper again. In 2010, he had successfully completed the first four items, counting in ones, or tens and ones, within 100, but had then said the reminder of the paper was too difficult. In 2011, he tried four further addition and subtraction questions. He answered two questions correctly, calculating 15p + 35p, and 85p – 20p, but for 27p + 47p he said 77p. He said he could not work out the change from £1 if he spent 65p, and similarly said he could not do any of the remaining questions on the paper.

Table I.2: Dylan’s accuracy and fluency with Level 2 assessment items on addition and subtraction facts: comparing 2010 and 2011.
Key: a score of 0 indicates no correct answer; 1 is an accurate answer achieved more slowly or with evidence of calculation; 2 is accurate and fluent, i.e. with no hesitation.

Improved score: $\checkmark$ Decreased score: $\times$

<table>
<thead>
<tr>
<th>Question</th>
<th>Dylan 2010</th>
<th>Dylan 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. 2+4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12. 5-5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13. 7-3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14. 0+7</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>15. 9-1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>16. 6+3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>17. 1+1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18. 5-2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19. 8-3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20. 3+7</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total on this section (out of 20)</strong></td>
<td>12</td>
<td>16</td>
</tr>
</tbody>
</table>
Considering the high input of individual time that his class teacher had provided during the year, the improvement seemed relatively small.

**Final interview with Dylan in Year 6, June 2011 (Interview, D13)**

For my final interview with Dylan, I had hoped to find out whether he had become more confident with subtraction within 20; I also wanted to find out his views on some aspects of mathematics teaching and learning. However, Dylan had a plan, too – he wanted me to video his new haircut from several angles, in particular so that he could see the back of his head and the razor pattern of lines that the barber had drawn. We agreed that we would talk about what he felt about mathematics lessons first, and he could view his haircut afterwards.

Dylan said he often felt annoyed or angry in lessons, because lessons went too fast: “Like when you are trying to do something, we move onto another thing. So we change onto another subject … and I am left behind and I have to stay in at break time.” (turn 18). He said that when they started a new topic, “I get worried sometimes because I think sometimes I won’t catch up” (turn 36). He did not panic at the beginning of a topic, but did so “near the end. Cause you have to catch up” (turn 42). His suggestions for things that would help children were “counting stuff, counting blocks – but I don’t like them” (turn 52) and he also thought that number lines were a help, but could not show me how he would use one as “I’ve forgotten how to do it” (turn 83). He did not think that homework was helpful; he said he did do homework sometimes (turn 93) but he did not like it.

Dylan had become very fidgety, and I felt that he would not manage to concentrate any further, so we watched the film of his new haircut then walked back to his class.

**Dylan’s national test results (SATs), July 2011 (email D15)**

Lucy Earl emailed me Dylan’s results at the end of Year 6:

“Dylan did very well – [level] 3A.
“He was miffed he didn’t get a [level] 4 but we heaped praise upon him because for him this was excellent progress. He made more progress this year than he had in his previous 3 years at [our school].”
Key issues from Dylan’s case

Dylan’s major calculation strategy was counting, but because he often missed out numbers when he was counting (especially when counting in twos or counting backwards), his answers were often wrong. He knew few number facts. He had been given work on many aspects of number during Year 5, including decimals, percentages and fractions, all of which had been too difficult for him, and there had been very frequent changes of topic. Consequently, his sense of himself as someone who could not do mathematics had become more entrenched.

In spite of this, Dylan was still keen to learn, but his levels of panic and anxiety were sometimes so high that he could not even sit still, and he found it very difficult to cope with getting wrong answers. His major tactic to help him manage his anxiety was straightforward refusal. However, when the context was practical (such as with the plastic fish) or in a game, he had been more relaxed and could recognise a pattern or accept that he needed to try something again, and he made more progress.

The issue of making a detailed assessment of the child’s skills and understanding in number, so that they can be given work at an appropriate level, is raised in Chapter 5 in relation to Skye, Ronan and Kyle. The need to alleviate panic and promote a calmer and less rushed approach to mathematics was especially evident for Dylan; he wanted to learn, but the chance to receive more concentrated help had not been provided until Year 6. The year-long focus on end-of-year tests and constant revision that is common in Year 6 classrooms (Boaler, 2009; Reay and Wiliam, 1999) may have made it difficult for him to feel calm and to concentrate, in spite of his teacher’s best endeavours.