FOOD AND HEALTHY EATING: PROGRESSION IN THE CURRICULUM

By

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A thesis submitted to
The University of Birmingham
for the degree of
DOCTOR OF PHILOSOPHY

School of Education
The University of Birmingham
United Kingdom
May 2012

ABSTRACT

The study examined pupils' and teachers' experiences of the food and healthy eating topic within the Science curriculum, including documentary analysis of the National Curriculum, schemes of work and pupils' exercise books, and direct consultation with pupils and teachers. Pupils were consulted using questionnaires and focus groups, teachers with interviews.

Data collected illustrated that, although the National Curriculum outlined what should be taught in each key stage, demonstrating progression, errors of interpretation appeared in the schemes of work. Some concepts were introduced earlier than intended and revisited without progression at later times in the pupils' education. Pupils felt elements of the topic were repetitive due to content being covered in other school subjects and that lessons lacked preferred teaching and learning activities. Teachers were unclear about pupils' prior learning and although they knew what teaching and learning activities engaged the pupils they did not have the time to include them. Some teachers included concepts earlier than the National Curriculum intended to increase progression.

The study recommends clearer specification and guidance of when concepts should be taught, along with less frequent revisiting, supported by assessment of pupils' prior knowledge and the inclusion of a greater variety of teaching and learning activities.

ACKNOWLEDGMENTS

I wish to express my gratitude to the schools, teachers and pupils involved in the study who gave their time to assist me in this research.

In addition, I wish to thank my family who supported and encouraged me throughout the course of my research and my supervisors Dr. Roger Lock and Dr. Allan Soares for their guidance and humour.

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COMMON ABBREVIATIONS

BERA	British Educational Research Association
CASE	Cognitive Acceleration through Science Education
CAT	Cognitive ability test
CBI	Confederation of British Industry
DES	Department of Education and Science
DfEE	Department for Education and Employment
DfES	Department for Education and Skills
DT	Design Technology
GCSE	General Certificate of Secondary Education
GTC	General Teaching Council for England
ICT	Information and communications technology
IQ	Intelligence quotient
LEA	Local Education Authority
ncaction	National Curriculum in Action
NFER	National Foundation for Educational Research
NQT	Newly Qualified Teacher
Ofsted	The Office for Standards in Education
PE	Physical Education
PGCE	Postgraduate Certificate in Education
PhD	Doctor of Philosophy
PSHE	Personal, Social and Health Education
QCA	Qualifications and Curriculum Authority

SATs	Statutory Assessment Tests or Standard Attainment tests
SEN	Special Educational Needs
STEM	Science, Technology, Engineering and Mathematics
UNCRC	United Nations Convention on the Rights of the Child
WHO	World Health Organisation
YLO	Yearly Learning Objectives
ZPD	Zone of Proximal Development

ABBREVIATIONS DEVELOPED FOR THIS STUDY

CT	Class Teacher
Ex Bk	Exercise Book (used within tables only)
F&HE	Food and Healthy Eating
FG	Focus Group
HoD	Head of Department
KSX	Key Stage X (where x indicates the academic key stage 1, 2, 3 or 4)
NC	National Curriculum
PoS	Programme of Study
RQ	Research Question
SoW	Scheme of Work
SoWs	Schemes of Work
T&LAs	Teaching and Learning Activities
YX	Year X (Where x indicates the academic year 1, 2, 3, etc. as appropriate.)

CHAPTER 1

THE RESEARCH QUESTIONS IN CONTEXT

1.1 Introduction

Over recent years we have seen the growth of a research community investigating the views of school pupils. In part this has been due to the United Nations Convention on the Rights of the Child (UNCRC, 1989, [online]). Article 12 of the convention states:

> …parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child.

Some research undertaken in the area of pupils' views has indicated that initially positive attitudes towards school Science later declined and that the degree of this decline became greater with age. For example, research by Murphy and Beggs (2003) into the perceptions of primary age pupils (Appendix 1.1) towards school Science showed a strong decline in the interest and enjoyment of this subject in the final years of primary schooling, possible reasons for this including a lack of experimental work, repetitive topic revision and inappropriate curriculum content. A similar decline has also been described during the secondary years (Bennett and Hogarth, 2005; Braund and Reiss, 2006; Lord and Jones, 2006).

The decline in interest and enjoyment of science, along with other factors, such as the availability of a greater range of courses, may be leading to pupils not taking up science subjects at A-level. Indeed, a decline in the uptake of science subjects at AS and A2 level was described by Vidal Rodeiro (2006). This decline may contribute to the observed shortfall of science students at university and consequently, science graduates in industry. The Confederation of British Industry (CBI) issued a news release (CBI, 2010, [online]) stating that this shortfall must be addressed especially in state schools, and further warned that:

> Unless the numbers taking science and maths subjects at school and university rise, Britain faces a skills shortage which will weaken our economy.

My own research has focused on pupils in key stage (KS) 2 and KS3 and has explored whether the structure of the science curriculum and its progression influenced pupils' views about science.

1.1 Researcher Position

In part, this study arose from personal concerns developed during my years both as a teacher and as a mother. The specific context for this study became apparent to me when I started to link these various experiences together. The first such experience was during my time as a secondary school Science teacher; when a common feeling expressed by pupils was that they had 'done this before at junior school'. In particular, they voiced great discontent at completing similar experimental work. For example, during my first term as a teacher, a Year 7 (Y7) pupil voiced dismay at having to complete a filtering practical. I was put in a difficult position as the experiment was in the scheme of work (SoW) and it was expected that it should be completed by the pupils. In discussion with this pupil I could not find any difference between her level of knowledge and the outcome expected from this lesson. She already knew the correct scientific terms and the names of the apparatus and how to set up the practical work. I was left with a vague feeling of guilt about not providing her with adequate progression. Over time this experience was repeated with other pupils and in different academic years. When I consulted the National Curriculum (NC) Programme of Study (PoS) (Department for Education and Employment[1] (DfEE) and Qualifications and Curriculum Authority[2] (QCA), 1999) I could see a clear difference in what I would have expected the pupils to cover at primary school and the knowledge they held. For example, from reviewing the NC PoS I would have expected a pupil entering KS3 to know that plants need water, air and light to grow but I would not have expected them to know the scientific term for this, photosynthesis. Yet some pupils would enter the school knowing this scientific term. In general, I found it difficult to act upon this knowledge at the time because I was adhering to the school SoW and merely offered my reassurance that we would be learning new material during the topic. In some ways I discounted what they said, believing that they could not have covered it in the same detail as I would be covering with them in senior school because the KS2 and KS3 NC PoS were clearly different. Further, I could not understand why KS2 teachers would have taught KS3 material to their pupils because that would have effectively made more work for themselves and increased pressures on their time.

I am a mother of two children and this has provided me with another perspective as they have passed through the education system. It was not until my older son was in primary school that I realised there were many echoes of with what my pupils were telling me. He started to develop a scientific vocabulary that I felt was advanced. However, as he was not bringing books home from school, I assumed that this was because he had heard me

1. A government department
2. A executive non-departmental public body

talking about such things at home. On entering junior school (KS2) he was expected to do homework and would therefore bring books home. One day, in Y3, he came home with his science book to revise for a test. I was astonished at the level and detail of the material that he had covered. He was particularly excited about the topic ‘rocks’. He could name the different types of rock, their properties and how they were formed. I felt a certain amount of pride - shortly followed by a sinking feeling. This kind of detail was exactly the kind that I would have expected to cover as a teacher of KS3 pupils. I could also see that he had not innocently picked up on the scientific terms by chance, as I had earlier assumed, because these terms actually formed part of the teaching and learning activities (T&LAs) he had completed. There was a table including all the key data and scientific terms, and this had been marked by the teacher following its completion. Not only this, but it now seemed that these scientific terms and the detailed information were to be examined in an end-of-topic test. That is, it was expected that the terms and information should be known by the pupils. This was not a novel event: flicking through the pages of his KS2 science books I could see time and time again material that I would have considered appropriate for KS3. When my son was in Y5, he announced he was ‘bored’ with particle theory or states of matter as he knew it. I began to question how a 9 year old child could be bored of subject material that I knew nothing about until I reached senior school (KS3). I reflected on my own experience as a child growing up in the 70s and 80s. At primary and junior school we did not learn about science as my children learn today. We learnt about nature and things we could see around us. The nature table was a big part of our lives, as were the school pond and garden. Our teacher allowed us to bring in snails and make homes for them out of shoe boxes. We kept them on our desks during lessons and dutifully picked foliage for them to eat. My formal science education began at senior school where everything I was taught was new, interesting and enjoyable. My interest in science began to grow from this point and I have continued to have an interest in it to this day.

My future aspirations as a parent and teacher include the desire for my children and their counterparts to experience a science curriculum that is new and not repetitive, one that fosters a genuine desire to discover more about areas they are personally interested in.

It is from these experiences and aspirations that questions were raised in my mind: why do pupils feel this way? Is the curriculum repetitive? Are pupils gaining progression in science? I began with these questions as a starting point in the development of my research questions. How I arrived at my final research questions is outlined in the next section.

1.3 Research Questions

It was from my experiences outlined in the previous section that I identified progression in the curriculum as the key area for investigation. Progression in an educational setting could be expressed in a number of documents including the NC PoS and the SoW developed by the QCA and schools' own SoWs and teachers' lesson plans. It therefore seemed appropriate to include these documents in the study. However, on further consideration it was felt that obtaining lesson plans from teachers would prove too difficult so an alternative source was sought. I felt that if I could analyse pupils' exercise books I could get an indication of the work covered during lessons and I could assess progression. In addition to these documentary sources I felt that direct consultation with pupils and teachers would enable me to uncover the experiences of pupils within this window of their science education and, further, to understand pupils' and teachers' viewpoints in this area. Including all these documents and sources led to a multifaceted approach to the research project.

Initially, I had a large-scale study in mind, including two secondary schools and four primary schools. This was completely unrealistic and potentially too ambitious for a three-year Doctor of Philosophy (PhD) study, so I scaled down the study to one secondary school and one primary school. As my concerns were curriculum wide, I wanted to look at progression in a number of topics within science, and it therefore seemed sensible to consider a topic from each of the three main disciplines of biology, chemistry and physics. I decided it would be most useful to find topics that were taught across all the key stages as evidence for progression would probably be more apparent in such a context. Topics taught across all the key stages tend to include key concepts or fundamental ideas. I created a shortlist of suitable topics from the NC PoS, which included: 'food and healthy eating', 'plants and photosynthesis', 'forces', 'electricity', 'materials' and 'particles'. These topics could provide an opportunity to explore progression in the curriculum and an appropriate context in which to explore pupils' views and teachers' perceptions of science education. I felt that it would also be wise to have a novel topic for each year, that is, a topic completely new in that academic year. Though fewer in number, examples of this type of topic existed for each academic year.

For example, ‘microorganisms’ was a completely new topic for pupils in Y6 and ‘cells’ was a completely new topic for Y7. The views of the pupils could be monitored for the novel topic and potentially be compared with those elicited for those topics revisited on a number of occasions from KS1 to KS4. My desire was to investigate progression and pupils’ views on each of these topics year on year to investigate if and how they changed with time. After much deliberation including the review of other similar studies (Papatheodorou, 2002; Postlethwaite and Haggarty, 2002; Braund and Driver, 2005a and b) it became apparent that this would be unrealistic within my time frame and research would have to be refined. There were three possibilities: 1) abandon the multifaceted approach and concentrate on only one method; 2) reduce the number of topics considered whilst retaining all the methods and academic years; or 3) focus on fewer academic years. I had to prioritise what factors I thought were most important. My priorities were clear: firstly, that a range of methods must be employed to gather information and allow for triangulation. Secondly, that pupils’ views must be elicited over a number of academic years because the trend under investigation was a change in attitudes over time, and therefore to include a number of academic years was crucial. I therefore decided that it would only be feasible, for a PhD study, to monitor a single topic and over two key stages. I was left with the choice between the ‘particles’ topic and the ‘food and healthy eating’ topic; both were regarded as ideal for the study as they covered fundamental concepts. I chose the food and healthy eating (F&HE) topic because I had already completed some preliminary analysis on this for my proposal and, as a Biology specialist, it seemed sensible to focus on a Biology topic.

The study explored whether curricula structure and content were factors contributing to pupil disengagement with science. In doing so, it was necessary to consider how curricula were structured, how teachers used and built on pupil knowledge, and whether pupils and teachers were able to recognise the progression provided through curriculum design. In order to fulfil these considerations three main research questions were developed:

> RQ1) Do pupils experience progression in the Science National Curriculum when learning about food and healthy eating?

In order to contextualise this research question it was necessary to divide it into three sub-questions as follows:

> 1a) Is progression illustrated in the National Curriculum programme of study?
>
> 1b) Is progression in content and teaching and learning activities illustrated in the Schemes of Work?
>
> 1c) Is progression in content and teaching and learning activities reflected in pupil exercise books?

> RQ2) What are pupils' views on the content, teaching and learning activities, and progression in the food and healthy eating topic?

> RQ3) What are teachers' perceptions of the content, teaching and learning activities and progression in the food and healthy eating topic?

1.4 The Importance of the Research

Throughout the study it has been my desire that this study would be a sufficiently interesting piece of qualitative research that may offer a starting point for a much larger scale study of the population. With this in mind, the findings of the research could have a widespread impact on a number of beneficiaries. Assuming that any potential problems identified by this research and any additional research could be remedied, the potential beneficiaries could include, the pupils themselves, their teachers, universities, industry, society as a whole, and curriculum developers.

If the factors that influence pupils' views and attitudes could be addressed so that their experience of the curriculum sustained their interest in science then this must be beneficial for the pupils. The factors could be addressed in a number of ways, for example by altering the curriculum itself, or by providing teachers with additional guidance on how best to interpret the current NC PoS and SoW. This would therefore benefit the teachers by aiding their planning and preparation. Following this, if the pupils were to find science more interesting and enjoyable then they might focus their studies at A-level and university on Science, Technology, Engineering and Mathematics (STEM) subjects which would benefit industry as a whole. It is also important for people in society to have a good understanding of science and in particular, F&HE for their own scientific literacy, health and wellbeing. There are on-going concerns about childhood and adulthood obesity and how this impacts on key services such as the National Health Service. A good understanding of the subject could help reduce the number of people requiring these services due to an unhealthy lifestyle. The World Health Organisation (WHO, n.d., [online]) stated on its website that:

> Obesity is one of the greatest public health challenges of the 21st century.

Furthermore, and in contrast, anorexia cases requiring hospital treatment have risen 80% in the last 10 years (The Telegraph, 2009).

Curriculum designers may also benefit from additional guidance on how to structure a curriculum to sustain interest by ensuring that progression is built into the structure of the curriculum.

In this chapter I have outlined the impetus for the research, the research questions and the importance of the research. In the next chapter, literature review, I outline what is already known in the study area. Following the literature review the research methodology was developed, and this is outlined in Chapter 3.

CHAPTER 2

LITERATURE REVIEW AND MODEL DEVELOPMENT

2.1 Introduction

This chapter reviews the literature connected to the research questions, primarily to inform the research, but also to identify potential gaps to be addressed in the course of this study. As all three research questions are centred on progression, Section 2.2 focuses on literature in this area. Since progression is highly influenced by the ways in which children learn and by curriculum structure and implementation, Section 2.3 and 2.4 focus on the literature relevant to these areas respectively. Section 2.5 concerns pupils' views and teachers' perceptions corresponding to literature linked to RQ2 and RQ3.

The major part of the literature review was undertaken between February and September 2007, but literature of key significance to the study published after this period has also been reviewed. The literature reviewed included books, journals, newspaper articles, web pages, radio interviews and direct contact with primary sources.

The four stands of progression, how children learn, curriculum design and views, attitudes and perception, were identified at the beginning of the study, but during the fieldwork some additional areas of literature were identified that, if apparent at the beginning of the study, could have been included. These were: the process of curriculum design; preferred learning styles, such as auditory or visual; and the effect of learning styles and teaching and learning methods on long-term memory. Though these were felt to be important they were beyond the scope of this study due to time and word limitations. Although these sources of additional literature were discounted, some additional sources of data have been included in the analysis chapters because these were issued by the UK government and represented major changes to the curriculum for pupils. These documents are discussed in Section 4.5.

2.2 Progression

As described in Chapter 1, initial reading of some elements of the relevant literature indicated progression as a possible area of concern in the science curriculum. Progression is the central concept explored in my work, featuring in all three main research questions. In this Section, I discuss what is meant by the term progression and seek to define it as applied to this study (Section 2.2.1), then review concerns about progression raised in the literature and discuss how these have influenced and refined my research questions (Section 2.2.2).

2.2.1 How progression is described in the literature

While undertaking the literature review, it became apparent that ‘progression’ was frequently linked to ‘continuity’, and it was therefore necessary to consider both terms.

Progression and continuity have been cited as primary objectives of the NC and were noted as desirable to aid transfer and transition through the key stages (Nicholls and Gardner, 1998; Galton, 2002). Braund and Driver (2005b, p.77) stated that the NC sought to achieve progression and continuity by designing a curriculum to:

> …provide such a landscape, with its spiral structure of age related programmes of study.

Though considered as important in the literature, the terms ‘progression’ and ‘continuity’ were rarely defined and on occasions they appeared closely linked as ‘progression and continuity’ or ‘continuity and progression’ (Wood and Bennett, 1999; Galton, 2002). Though they are indeed linked, from my perspective these terms describe two connected but different concepts.

This study is concerned with the NC as laid down by the UK government so I therefore looked to governmental bodies to define the words accurately.

Acknowledging the interlinked nature of progression and continuity the Rumbold Committee sought to provide a detailed definition as stated by the Department Of Education and Science[1] (DES) (1990, p.13):

> Continuity and progression are interlinked concepts relating to the nature and quality of children’s experiences over time. Progression is essentially the sequence built into children’s learning through curriculum policies and schemes of work so that later learning builds on knowledge, skills, understanding and attitudes learned previously. Continuity refers to the nature of the curriculum experienced by children as they transfer from one setting to another. Continuity occurs when there is an acceptable match of curriculum and approach, allowing appropriate progression in children’s learning.

Fourteen years later the Department for Education and Skills[2] (DfES) (2004, p21) sought to define continuity when it stated on its website that continuity referred to:

> -knowing which topics have already been covered;
> -knowing what skills and understandings have been well established;
> -knowing the pace and style of previous lessons in the subject.

The QCA (1998a and b) included information on ‘features of progression’ in its KS1 and KS2 SoWs and on ‘progression’ in its KS3 SoW as guidance for teachers. The UK

1. A government department
2. A government department

government-appointed guidance website National Curriculum in Action (ncaction) [1] later combined and updated this in order to clarify guidance on progression across the science curriculum (ncaction, 2007). I have deconstructed the prose from the webpage and arranged it in Table 2.1 to exemplify how progression was illustrated. This was achieved by taking each bullet point for KS1 and KS2 from the original document and placing it in a row. I then did the same for KS3, placing statements equivalent to KS1 and KS2 statements in corresponding rows.

The second column in Table 2.1 describes progression from KS1 to KS2. For example, in row 2, pupils move from ‘describing events and phenomena’, presumably in KS1, to ‘explaining events and phenomena’, presumably in KS2. In row 4 pupils move from ‘unstructured exploration’ to more ‘systematic investigation’ of a question.

Elements of confusion in the understanding of progression may arise when the third column in Table 2.1 describing the content at KS3 is considered. It might be expected that the starting point in KS3 (the ‘from’ in the description) would be something equivalent to the end point in KS2 (the ‘to’ in the description). This was not always the case. For example, in row 2, the third column describes KS3 and includes in the text the word ‘simple’; as the KS1 and KS2 description did not include the word ‘simple’ it would appear to be a reduction in ability, suggesting poor progression. If the word ‘simple’ had been included in the KS1 and KS2 description, the text would make more sense. Despite this, more direction can be found in the accompanying words; in that the

1. Since the period of the literature review ncaction has been disbanded.

Row	**'To ensure pupils progress in science through key stages 1 and 2, teaching should provide opportunities for pupils to progress:'**	**'At key stage 3, teaching should provide opportunities for pupils to move:'**
1	From personal scientific knowledge in a **few areas** to understanding in a **wider range of areas** and of links between these areas	From understanding scientific knowledge in a **few areas**, to understanding in a **wide range of areas**, including links between areas
2	From **describing events and phenomena to explaining events and phenomena** From explaining phenomena in terms of their own ideas to explaining phenomena in terms of accepted ideas or models	From describing and explaining **simple** phenomena using their **own observations** and ideas, to **explaining** more complex phenomena using scientific concepts, ideas or models From accepting models and theories uncritically to recognising how new evidence may require modifications to be made
3	From participating in practical scientific activities to building increasingly abstract models of real situations	From seeing science as a school activity, to understanding the nature and impact of scientific and technological activity beyond the classroom
4	From **unstructured exploration** to more **systematic investigation** of a question	From enquiries involving simple scientific ideas to those involving more complex ideas in which strategies need to be planned and data evaluated for its strengths and limitations
5	From using everyday language to **increasingly precise use of technical and scientific vocabulary**, notation and symbols. From using simple drawings, diagrams and charts to represent and communicate scientific information to using more conventional diagrams and graphs.	From using **simple scientific language**, drawings, diagrams and charts when representing scientific information, to using and **extended technical vocabulary**, standard notations and symbols, graphs and calculations when presenting quantitative scientific information.

Adapted from ncaction, 2007, [online]

Table 2.1 Deconstructed text from ncaction progression webpage

pupils in KS3 are working from their own observations in order to explain the phenomena.

Row 5 is also potentially confusing as it describes KS2 pupils applying ‘increasingly precise use of technical and scientific vocabulary’ and KS3 pupils using ‘simple scientific language’, again ‘simple’ is included in the description for KS3. The description is later clarified by additional text noting the inclusion of ‘extended technical vocabulary’.

In row 1, the progression through KS1 to KS2 is demonstrated by moving from personal scientific knowledge in a ‘few areas’ to understanding in a ‘wider range of areas’ and of links between those areas. The progression is illustrated by KS2 pupils understanding the links. In KS3, the pupils seem to have fallen back to understanding in a ‘few areas’ before understanding in a ‘wide area’ and, again, links between areas are mentioned. This might be interpreted as moving from the child’s own view of the world that they hold in the early stages to a taught interpretation. Further, in KS3 more areas would have been covered and understood than in KS2.

The ncaction webpage, although intended as guidance, leaves the reader with a number of questions such as: what is ‘simple’ when referring to scientific language, drawings diagrams and charts? What is ‘extended’ technical vocabulary? What are ‘simple’ and ‘complex’ phenomena? Here, the definition of ‘simple’ and ‘complex’ seems to be left to the reader’s own interpretation. Additionally, the document lacks examples or assessment criteria and it would therefore be difficult to know how to interpret the guidance in a school situation. More helpful definitions could have been included, especially in the areas of vocabulary and phenomena. For example, a ‘simple’ phenomenon might be the description of night and day, whilst a more ‘complex’ phenomenon could be seasonal changes.

In general the literature seems to suggest that progression could be exemplified in several ways: by a move from the simple form of a something to a more complex form of something; from an ability to describe to the ability to explain; and from the knowledge of phenomena to an understanding of phenomena (that is, it includes elements of comprehension as described by Bloom, (1956)). Regardless of how progression is exemplified, teachers need to understand how these might be achieved in the teaching class.

The QCA also addressed progression and continuity in the curriculum on its website (QCA, 2007a). The authors described how this was achieved during KS2 and KS3 (KS1 and KS4 were not discussed). The text was deconstructed and transferred to the tabular form by taking the two paragraphs of prose relating to KS2, separating them into sentences, and placing these sentences into the rows of a table. The same process was repeated for KS3, placing sentences similar in meaning to the KS2 sentences in the same row. Table 2.2 is an excerpt of this and shows progression from KS2 to KS3 (full table in Appendix 2.1).

Row	Key Stage 2	Key Stage 3
3	They **begin to think** about the positive and negative effects of scientific and technological developments on the environment and in other contexts.	They **think** about the positive and negative effects of scientific and technological developments on the environment and in other contexts. They take account of others' views and understand why opinions may differ.
4	They **carry out systematic** investigations, working on their own and with others.	They do **more quantitative work**, carrying out investigations on their own and with others. They **evaluate** their work, in particular the strength of the evidence they and others have collected.
5	They use **a range of reference** sources in their work.	They **select and use a wide range** of reference sources.
10	They are **able to offer predictions** and make a fair test.	They are able to **carry out preliminary work to help inform predictions** and **consider the key variables** that need to be taken into account.

Adapted from QCA, 2007a, [online]

Table 2.2 Excerpt of deconstructed text from QCA continuity across curriculum document

The similar context of the sentences illustrates continuity whilst the slight alterations in the level of challenge illustrate progression. When considering investigative work (row 10) progression between the key stages was easy to understand. For example, pupils in KS2 should be able to make predictions and those in KS3 should be able to carry out preliminary work on which to base those predictions. Further, in row 4, pupils progress from carrying out systematic investigations work in KS2 to completing more quantitative work and evaluating results in KS3.

Other areas of progression described within the document are more difficult to understand. For example, in row 3, pupils in KS2 ‘begin to think’ about positive and negative effects, and those in KS3 ‘think’ about the effects. This demonstrates a loose use of terminology. If you have begun to ‘think’ of something then you are ‘thinking’ about it, and again no examples are given to aid the reader in understanding the intended meaning of the text. Other statements do illustrate progression but could still be better defined.

For example, in row 5, ‘a range’ of reference sources is used in KS2 and ‘a wide range’ of reference sources is used in KS3. Here, the authors are assuming that progression is signified by interacting with a greater number of variables. However, without knowing how the child is interacting with those variables, progression may not be found. For example, a child may interact with a few reference sources, but do it with exceptional skills of understanding and evaluation, whilst a second child may interact poorly with a greater number of reference sources. Progression is shown, however, in these statements because pupils in KS2 are simply using the sources whereas those in KS3 have selected them themselves.

As with the DES (1990) and DfES (2004) documents analysed earlier, the QCA seems to exemplify progression by a move from the simple form (concept, idea or process) to a more complex form (concept, idea or process) or from a fewer number of variables to a greater number of variables. The clarity of the document could be improved by inclusion of academic year, appropriate examples and teacher engagement.

Based upon the literature on progression discussed so far, I now propose a definition of progression to be used in my study as follows:

the increase in the demand on pupil learning of the science curriculum.

This definition can be exemplified by a move from a simple form (concept, idea or process) to a complex form (concept, idea or process). This might be observed in several ways, for example, by moving from: concrete to abstract ideas; personal or everyday language to scientific language; narrow to broad or shallow to greater depth coverage of concepts; general non-scientific ideas to specific scientific ideas; few to many variables/resources; or by an increase in academic challenge as identified through the taxonomy of educational objectives (Bloom, 1956) to be discussed in Section 2.4.2.

As continuity is not featured in my research questions, I will not attempt a formal definition, although it is necessary to remember, as discussed earlier, that continuity is closely linked to progression. The literature discussed above indicated that continuity is where children experience similarities in teaching methods or content of the curriculum when they transfer through the key stages. For example, continuity may be experiencing similar teaching techniques such as completing investigative work throughout the key stages, or it may be learning about similar teaching topics such as ‘energy’ in KS2 and

KS3. Continuity is also the acknowledgement by a secondary school of the material covered by pupils in the earlier key stage.

2.2.2 Concerns in the area of progression

In the previous subsection, I described how closely linked progression and continuity are. This is particularly evident when reviewing literature describing concerns with science education. In this subsection I will address the two main areas of concern identified in the literature: post transfer regression and repetition in teaching concepts. After introducing these issues I will examine literature aimed at improving progression and continuity.

Braund and Driver (2005b) expressed concerns, highlighting that they believed pupils' learning journeys are often disjointed or discontinuous. Davies and McMahon (2004, p.1009) also expressed the concern that:

> The lack of continuity and progression between primary and secondary education in the United Kingdom has been an issue for several decades.

A key feature attributed to the lack of progression and continuity is the failure of KS3 teachers to use, or to refer to, pupils' previous learning experiences or attainment from KS2 (Nicholls and Gardner, 1998; Braund and Hames, 2005). A reason for this failure was suggested by one secondary Head of Science in Nicholls and Gardner (1998, p.27):

> …they haven't all done the same thing so basically we start at level 3 in a certain topic.

This is a somewhat disheartening policy as 87% of children achieved a level 4 or above in the KS2 Standard Attainment Tests (SATs) in 2006 (National Statistics, 2006). It may therefore follow that the majority of pupils, in the school where this Head of Science worked, were asked to complete work or were taught at below their actual attainment level, although they may then have been taught to a higher level later. The fact that pupils were completing work below their attainment level was given as an example of poor progression by Galton, Morrison and Pell (2000), who reviewed a number of research projects in the area of progression and continuity and concluded this was poor progression because the pupils' knowledge was not built upon. Although the schools described by Galton *et al* (2000) and Nicholls and Gardner (1998) appeared not to be providing **good** progression and continuity, they at least appeared to be providing some continuity because pupils were returning to the same topic area**.**

Lack of progression in the curriculum has been linked, amongst other things (Braund and Hames, 2005), to post transfer regression, that is, a dip in attainment after the transfer from KS2 to KS3 (primary to secondary school). The lack of progression in the curriculum is illustrated (*Ibid*., p.782) by the fact that:

> Pupils may repeat work done at primary school often without sufficient increase in challenge, sometimes in the same context and using identical procedures.

Braund and Driver (2005b) highlight post transfer regression as being worse in science compared to English or Mathematics, based on the findings of Galton, Gray and Ruddock (1999).

The Biosciences Federation (2005, p.2) highlighted concerns with the curriculum and stated that:

> The science curriculum is intended to ensure progression but too often there is unnecessary repetition of content between successive stages.

They also suggested this was due to a ‘delivery problem’ (*Ibid.,* p.10). They recommended that the curriculum ‘must ensure appropriate learning progression’ (*Ibid.*, p.10).

The repetition of work has also been highlighted as problematic by Nicholls and Gardner (1998, p.47):

> On entering year 7 and meeting with repetition of work they have done in key stage 2, pupils’ are apt to think or even say: ‘I’ve done that. Why am I doing it again?’ Their motivation can be dented and they can even ‘switch off’ if the teacher does not take care to exploit their prior knowledge and to build upon it.

The definition of repetition is problematic in this situation. I would suggest that a true repetition would involve covering the same material again, for example pupils being instructed on the names of the main food groups (fats, carbohydrates, proteins, etc.) when they have already experienced these terms in their prior education. If, however, they have been taught a food group as ‘starches and sugars’ and then they are taught ‘carbohydrates’ in the later years this is **not** repetition but is progression in line with my working definition because there is development of the scientific vocabulary. However, this does not guarantee that the children will perceive this as progression because they might not recognise the change. Repetition of activities may also occur. Children may be asked to collect food labels at junior school so they can look at whether or not a food contains sugar for example, then in secondary school, they may be asked to collect labels again, and the teacher may use them to consider the mathematical percentages of fats, sugars or carbohydrate. Although the complexity of the activity may be different, and hence show progression, the children may remember they have collected food labels before and may perceive this as repetition. True repeat of activities may also occur for example, by completing identical practical experiments, such as filtering in the same context as before.

Some pupils will recognise progression and continuity in their education post transfer. For example, in Galton, (2002, p.257) a pupil stated, ‘We did the same work we did in primary school, only a bit harder’. The ‘same work’ reflected the continuity and the ‘bit harder’ illustrated the progression.

The repetition of work or the failure to take into account pupils’ prior knowledge could be the effect of several factors. It could be that secondary school teachers are effectively dismissing primary school teachers’ ability to teach science as suggested by Jarman (1997), in relation to Northern Irish teachers. It could also be a failure of secondary school teachers to adequately assess the new intake and/or be caused by teachers strictly adhering to the PoS and the SoW as set out by governmental bodies.

The previous paragraphs described a situation where a lack of continuity around the time of transition and transfer can lead to poor progression. Noting this link, I also reviewed literature that sought to improve progression and continuity. For example, Evans (2004-5, [online]) reviewed the continuity practices during transition in Neath, Port Talbot. Within the report Evans quoted Ofsted which highlighted such weaknesses during transfer:

> …secondary schools are not making enough use of primary schools’ information about pupil progress…and they had not set targets for improving attainment during year 7.

Evans concluded that (*Ibid.,* [online]):

> …radical approaches are needed in order to:
> - resolve discontinuities in teaching;
> - look at the gap between pupils' expectations of the next phase of schooling and the reality of these expectations.

In order to achieve better continuity, the report recommended the use of bridging units and cognitive ability tests (CAT tests).

The use of bridging projects between secondary and feeder primary schools was also suggested to overcome the post transfer regression (Braund and Driver, 2005b; Braund and Hames, 2005). However, bridging projects can be difficult to implement (Braund and Hames, 2005; Galton, 2002) due to the sheer numbers of feeder schools. For example, a secondary school in certain inner city areas might have as many as 60 feeder schools (Galton, 2002).

Galton (2002) explored progression in an attempt to explain the dip in attitude towards school Science following the KS2 to KS3 transfer and stated that the solution may lie with pedagogy and not the changes to curriculum; in other words, a solution might be found in the way teachers are implementing the curriculum.

A DfES document, dedicated to continuity, produced some 'failsafe methods' to improve the KS2 to KS3 transfer (DfES, 2004). These included: meetings with primary and secondary coordinators to audit what had been covered in primary school; the sharing of the SoW; observing or team teaching a lesson; the reviewing of a year 7 (Y7) checklist by a Y6 teacher to alert any potential overlaps; consultation with the pupils as to which topics they have already covered; and the review of a complete set of pupil exercise books from each primary school.

Reviewing these methods, I identified some potential problems with implementation, mainly due to time costs for those involved and logistics in cases where there are large numbers of feeder schools. One would also question if the sharing of SoW should be necessary if they are state schools and therefore legally obliged to follow the NC. If so, then what is covered at KS2 should be already be known as the SoWs should reflect the statutory content of the NC PoS. For example, if the KS2 PoS statutory content includes ‘adequate and varied diet’ and the KS3 PoS statutory content includes ‘balanced diet’, a KS3 teacher should be able to assume children entering KS3 have not covered balanced diet but have covered ‘adequate and varied diet’. Consultations involving the pupils themselves would rely on the pupils’ understanding of the meaning of the word ‘topic’. As many of the topic titles from the NC KS2 are similar to those in KS3, it is difficult to see how a simple list of topics could be useful. It is even conceivable that a particular child might omit/include topics depending on whether he/she would like to study them. The final method suggested by the DfES, of reviewing a complete set of exercise books would depend very much on the school/pupil and whether the pupil would have kept such material. This final suggestion, however, has influenced my methodology as I included exercise books in my document analysis (Section 3.2).

In a later document, the DfES (2006) refined and developed these recommendations in further attempts to tackle the problems with continuity. The refined recommendations included a SoW being developed for pupils in Y6 to Y8. This might be thought of as a much longer and more in-depth version of the bridging unit. This would presumably involve planning between schools and might also cause the logistical problems described above for secondary schools that have high numbers of feeder schools.

Other recommendations from the DfES not already detailed in previous documents, include the use of transition booklets, which are partly completed in Y6 and finished off in Y7, and visits of Y6 pupils to new schools to experience teaching methods.

Consideration of these documents leaves one overarching question: what is the purpose of the NC if it is not allowing teachers at KS3 to know what is covered at KS2? Investigating this question, I have consulted the QCA (QCA, 2007b, [online]) website to try to identify the intended purposes of the NC. Its aims are summarised as:

> The curriculum should enable all young people to become:
>
> - Successful learners who enjoy learning, make progress and achieve.
> - Confident individuals who are able to live safe, healthy and fulfilling lives.
> - Responsible citizens who make a positive contribution to society.

The purpose of the NC, stated on the QCA website, directly relevant to this study is (*Ibid.*, [online]):

> ...**to promote continuity** and **coherence**. The national curriculum contributes to a coherent national framework that promotes curriculum continuity and is sufficiently flexible to ensure progression in pupils' learning. It facilitates the transition of pupils between schools and phases of education and provides a foundation for lifelong learning…[to] ensure entitlement for all learners to a

> broad, balanced and relevant curriculum that offers continuity and coherence and secures high standards.

With this statement in mind it is necessary to ask whether the NC is actually fit for purpose in this regard. If the DfES had to issue guidance in the form of the 2004/2006 documents on continuity, with the aim of improving continuity, then this would suggest the NC might not be. It should also be noted that the 2004/2006 documents are for guidance and are not mandatory. They are not therefore, strictly speaking, part of the NC itself**.**

This part of the literature review helped me to refine my research questions, in particular RQ1 and RQ3. These aim to illuminate further two key areas highlighted in the literature. RQ1 looks directly at the curriculum and will explore progression in the NC PoS, SoWs and pupils' exercise books. RQ3 considers the teachers' viewpoint and will attempt to uncover, amongst other things, if teachers take into account pupils' prior experience.
It is also interesting to note that concerns regarding progression similar to those detailed above have also been described in other school subjects, including History in the United Kingdom (Bage, 1993) and Technology in New Zealand (Compton and Harwood, 2005), strongly suggesting that my study could have wider implications outside the area of Science.

In this section I have described problems with the use and meaning of the terms progression and continuity. I have attempted to clarify these and have given my working definition in Section 2.2.1. Issues highlighted in the literature include concerns over lack of progression and continuity in schools which lead to a dip in attainment following the transfer from KS2 to KS3.

2.3 How Children Learn

The progression built into curricula reflects that children develop their ability to learn as they get older. It is therefore necessary to understand how children learn in order to design curricula with progression in mind. The area of child educational psychology is both wide and varied. It is difficult to say definitively how children learn, although it is probably safer to say that ways of learning and speed of learning differ across ages, gender and genetic make-up, and are further dependent on sociological factors, individual experiences and environment. In this section I give an overview of the main theories approaches to how children learn: cognitive, constructivism, behaviourist, and neuroscience and brain-based learning.

Bransford, Brown and Cocking (2007) indicated that during a child's early years there is a certain amount of bias in the child's learning towards areas known as privileged domains. These include areas of physical and biological concepts, causality, number and language. It is no coincidence that these areas are fundamental to survival. At this early stage, much of the learning depends on the environment and culture in which the child is born and occurs in areas that they are therefore predisposed to. As the child grows, it enters a world where learning occurs in areas that they are not necessarily predisposed to, for example the world's oceans or the planets of the solar system. To consider how children learn in areas that they are not predisposed to, we must consider strategies of metacognition, in short, how children learn. It is vital to understand strategies of metacognition in order to fully understand the importance of the structure of curricula.

Many people have developed theories of metacognition which can be roughly divided into three groups: cognitive, behaviourist and humanist. Cognitive group key theorists include Piaget, Vygotsky, Bruner, Feuerstein and Ausubel. In the humanist group the key theorist is Rogers. In the behaviourist group, theorists include Watson, Pavlov and Skinner. In Section 2.3.1 I will briefly discuss these main theories and theorists. Section 2.3.2 discusses how these theories influence curriculum design.

2.3.1 Main theories and theorists

Cognition literally means 'thinking'. Cognitive theories are concerned with the processes which happen in our brains when we learn, that is, how information is processed and stored. The main theories and theorists are discussed below.

<u>Lev Vygotsky 1896-1934</u>

Vygotsky described elementary mental functions in his book *Thought and Language*, published in 1934 (Vygotsky, 1934; reprinted 1986). These functions are unlearned (innate) capacities that we are born with, such as attending or sensing. Later in a child's life, when language develops, the child develops higher mental functions. The theory of 'the zone of proximal development' (ZPD) was developed by Vygotsky (Vygotsky, 1978). The ZPD is the difference between the child's actual developmental level and their potential developmental level that could be achieved with guidance. Vygotsky highlighted that the development of learning is dependent on having adults to facilitate learning, illustrating the importance of teachers to assist in learning. The ZPD is dependent on the child and the child's intelligence is given as its ability to learn. The guidance that a teacher may provide was given the term 'scaffolding' by Wood, Bruner and Ross (1976). Scaffolding may be given in schools by the teacher, teaching assistant or peers. As an example of how scaffolding might work, consider a pupil who has begun her academic career with some knowledge of the 'fruit' concept. She may think that tomatoes are grouped (or classed) as vegetables, like onions and carrots. The teacher, on assessing her knowledge, may identify this misunderstanding and could then help the pupil develop a mechanism that would enable her to correctly classify a tomato as a fruit. The teacher might give her a set of fruits and vegetables to examine and sort into groups using different criteria. Through this interactive process the teacher could guide the pupil to recognise that fruits have seeds or pips, allowing the pupil to classify a tomato as a fruit. In this way the scaffolding, provided by the guidance of the teacher, could enable the pupil to develop her understanding and independent use of the 'fruit' concept.

Although, in this study I largely relate ZPD to child development it is also probable that mature adults have a ZPD that can be developed. For example, trainee computer programmers may hold some knowledge or understanding that they have developed themselves before starting a course. The trainers could be tasked to find out the knowledge that trainees hold, whether that knowledge is correct or not and then provide scaffolding to aid their progression from this point. The ZPD may therefore be thought of as a working space within which an individual may develop with guidance before reaching independence. The ZPD is not fixed and may change over periods of development (growth and age) and further move so that it is always slightly beyond where the learner is. Potentially, this may mean that there is no upper limit to how much can be learnt.

Vygotsky believed that cognitive development can be speeded up. Later supporters of the theory included Shayer and Adey who developed the Cognitive Acceleration through Science Education (CASE) programme (Shayer and Adey, 1981). This programme and curricula links are further discussed in Section 2.3.2.

Jean Piaget 1896-1980

Piaget believed (Piaget and Inhelder, 1969) that children go through four distinct stages or levels of development which are linked to the child's age. They are:

1. The sensori-motor level (birth to 2 years). This level or stage contains the development of object permanence and general symbolic function. Object permanence is the ability to know that objects or people exist even if we cannot see them. General symbolic function is the beginning of language and is influenced by surroundings and contains the ability to copy others (imitation).

2. The pre-operational level (2 to 7 years). This level or stage contains the development of the ability to use symbols and pictures to represent things that are not actually there, intuitive thought, serialisation, and classification. The child also holds the lack of perception of conservation of mass and also exhibits egocentrism. An example of a concept that might be addressed in this stage is

types of living things (organisms) such as tree, dog, fish, daisy which may be learnt using pictures. These concepts may be addressed in the pre-operational level because pictures can be used to introduce organisms that are not actually there such as lion, whale, etc. Towards the end of the stage, the learner may then move on to classifying organisms as plants or animals. This example is developed from the NC PoS (1999) for KS1 and is therefore appropriate for children aged 5-7.

3. The concrete operational level (7 to 11 years). This level or stage develops the ability to decenter, which is the ability to take into account multiple aspects of a problem. The child will also comprehend reversibility and conservation. The child will eliminate egocentrism. An example of a concept that might be addressed in this stage is that plants need light, water and air to grow and if plants do not have any one of these things they will not grow and will eventually die. This concept may be addressed in the concrete operational level because it requires the pupils be able to take into account multiple aspects of a problem; in that plants need *all* of these factors to survive. This example is developed from the NC PoS (1999) for KS2 and is therefore appropriate for children aged 7-11 years.

4. The formal operational level (11 years+). This level or stage develops the ability to think abstractly, problem solve and draw conclusions from information provided. Examples of concepts that might be addressed in this stage are that electric current is the flow of charge around a circuit and that the moving charges are a flow of electrons. These concepts may be addressed in the formal operational level because they require pupils to think abstractly about electrons

which cannot be seen by the naked eye. Further, pupils will be able to draw conclusions from experimentation about the effect on current of adding different numbers of batteries and bulbs to a circuit. This example is developed from the NC PoS for KS3 and is therefore appropriate for pupils aged 11-14 years.

Piaget (*Ibid.*) believed that all children pass through all of these stages, although some children will pass through them sooner than others. He also believed that stages could not be skipped and the way individuals construct their ideas, and therefore learn, is dependent on which stage they have reached. Further, a child must have reached a particular stage to be able to master particular concepts: certain concepts are too difficult to master in the early stages. Piaget developed the notion of a schema as a unit of thought which helps an individual make sense of the world. New experiences will either be assimilated into an existing schema or will be accommodated into a completely new schema. Thus, new items may be linked to old ones or will be set into a new schema. Piaget further highlighted the importance of the learner interacting with the environment to develop old and to create new schemas. He highlighted the need for teachers to provide suitable environments for discovery, similar to providing scaffolding in ZPD. This is now known as Piaget's discovery learning (Long, 2000).

Piaget provided an excellent way of looking at development but the theory has limitations. For example, some subsequent researchers have questioned the age ranges given. Meadows (1993) showed that children can acquire and use concepts at a younger age than previously thought, although Piaget did not define the ages as fixed; they were suggested as a generality. The 'type' of concept also matters; superordinate concepts are those that require understanding of many simpler concepts together and how they inter-relate to a more encompassing concept. For example, balanced diet is a superordinate concept that includes the simpler concepts that carbohydrates are needed for energy and protein for growth. A pupil needs to develop an understanding that the energy and protein needs of individuals vary, based on size, gender, age, activity, etc. Superordinate categorisations are thought to be more difficult for children to understand than the basic-level categories. Mandler (1983) and Rosch, Mervis, Gray, Johnson and Boyes-Bream (1976) pointed out that the understanding of superordinate categories might take a great many years to accomplish. This may mean that the understanding of some superordinate concepts may span developmental stages.

Jerome Bruner 1915-present

Bruner is in disagreement, in part, with Piaget as he believed that any subject can be taught to a child of any age as long as the information is structured properly (Bruner, 1960). Bruner's vision of the importance of structure is described in Section 2.4.1. However, Bruner is in agreement with much of the work of Piaget and Vygotsky and has expanded on their theories (Bruner, 1996). He has been particularly interested in the role of language (like Vygotsky) and has expanded on Vygotsky's scaffolding theory (Wood, Bruner and Ross, 1976).

Bruner, like Piaget, had his own ideas on discovery learning. Bruner highlighted the importance of building on existing schema, and it was this reasoning that led him to develop his notion of a spiral curriculum (Bruner, 1960) (Section 2.4.1). Within this, key concepts are revisited within the curriculum and allowed to grow in detail gradually, thus building on pre-existing schema.

Reuven Feuerstein 1921- present

Another cognitive psychologist, Feuerstein, studied under Piaget and had Vygotsky amongst his peers. His early work (Feuerstein, Rand and Hoffman, 1979) centred on low performers such as holocaust survivors, immigrants, and those with low grades of achievement.

Feuerstein, Rand, Hoffman, Miller (1980, p.7) described how:

> …the IQ [intelligence quotient] test may provide an indication of what has been learned in the past; but how the learning took place and whether an individual has the potential to improve his learning ability are not questions that can be answered by studying the IQ score.

Feuerstein developed the theory of structural cognitive modifiability (*Ibid.*). This is the belief that intelligence is not fixed but can be modified (improved) by teaching children how to learn. He also developed Feuerstein Instrumental Enrichment (*Ibid.*) and the theory of Mediated Learning Experience (Feuerstein, Rand and Rynders, 1988).

As aspects of his work centre on those originally from poor or difficult backgrounds, such as holocaust survivors, I have a particular concern with the concept of modifiability. It may be that modifiability is most appropriate for those who present a low IQ and/or are from very difficult backgrounds. It is obvious that such people would in all probability not be reaching their true potential, but their IQs could almost certainly be increased with targeted help. I query whether this theory can be shown to hold true for all students.

Would those who are currently high achievers exhibit IQ modifiability if exposed to Feuerstein's techniques? His theory has similarities with Vygotsky's ZPD, that is, the difference between the child's actual developmental level and their potential developmental level. Feuerstein also believed that learning is life long and that there is always hope for improvement.

David Ausubel 1918-2008

Ausubel (1968, vi) pointedly suggested that:

> The most important single factor influencing learning is what the learner already knows. Ascertain this and teach accordingly.

This is similar to Bruner's (1960) belief that knowledge should build on from where ever the learner is at the time. Ausubel (1968) developed the theory of advanced organisers. Advanced organisers reflect the impact of prior learning and aid the assimilation of new knowledge into a framework. The assimilation process is dependent on the hypothesis that (*Ibid.*, p.90):

> …even after the new meaning emerges it continues to remain in linked relationship to the slightly modified form of the established idea in cognitive structure.

The advanced organisers can therefore be thought of as frameworks used to organise knowledge. This concept resonates with Piaget's schema development (Piaget and Inhelder, 1969) as both take into account the impact of prior knowledge on the learning of new concepts and if prior learning has occurred then the new knowledge will be assimilated with the existing. Thus, assimilation has importance for meaningful learning, memory or retention, the linkage of ideas and the systematic retrieval of ideas.

Ausubel (1968) attempted to bring together both cognitive and behaviourist perspectives whilst discussing reception versus discovery learning. He (*Ibid.*, p.83) described reception learning as where content is 'presented to the learner in more or less final form' with the requirement of the learner to comprehend and 'incorporate it into his cognitive structure'. Such learning may be exemplified by rote based techniques. He described how many believed such techniques may not lead to meaningful learning in that meaningful generalisations would not be made by the learner. Further, if such techniques are used and the learning is praised, then rote learning is promoted (or reinforced), not necessarily encouraging the development of discovery learning and associated skills. He did, however, believe that reception learning could be meaningful. For example, whilst acknowledging that learners in the concrete operational stage (7 to 11 years) (*Ibid.*, p.86):

> …cannot comprehend, or meaningfully manipulate in problem solving, verbally or symbolically expressed abstract propositions without the aid of concrete-empirical props, and even then their understanding tends to be intuitive and somewhat particularistic rather than precise, explicit, and truly abstract.

He (*Ibid.*) suggested that this was why 'meaningful verbal reception learning - without any problem-solving or discovery experience' is the commonest learning experience for pupils at this age (primary aged pupils). For example, primary aged pupils may learn the order of the planets from the sun using as mnemonic such as, 'My Very Easy Method Just Speeds Up Naming Planets'. This is traditionally learned by rote as it is possibly the most practical solution in this instance.

Further, Ausubel suggested that in the later stages of development, verbal reception learning can still be meaningful and it is not necessary to favour time consuming, discovery techniques. That is, if the learning fits into a network of what is already known, and in some way enhances or extends it, it becomes meaningful. He (*Ibid.*, p.87) believed that some proponents may have been over zealous in the adoption of, what he calls, ‘progressive education’. That is, there is a place for a number of approaches and therefore the development of different behaviours to promote learning. This seems to be a sensible holistic approach to education, considering multifaceted techniques that reflect the needs of the learner and those of the educator. To illustrate his approach, consider the classification of different foods into nutritional groups (food groups). This might be achieved by discovery learning or by rote. Discovery learning could involve a teacher providing tools such as the equipment, safety guidance and an experimental method. The pupils could then perform experiments on food samples to explore the presence of proteins or carbohydrates. The ‘discovery’ for the pupils would be in finding that meat contained protein but no carbohydrate and could lead to the pupils identifying the food groups into which food items fall. To fully cover this concept using discovery learning it could require a great deal of experimentation with many examples of food. Though it is desirable that the pupils should develop the skills of experimentation and discover themes in the grouping of food, it is simply not practical for the pupils to classify all foods through experimentation to truly ‘discover’ all aspects of the concept. Therefore, after discovery learning the teacher may want to fill in the gaps of the pupils’ knowledge with meaningful reception learning. In the pupils’ minds a network of what was already understood exists and this new learning should enhance or extend the network and become assimilated. So pupils may have discovered that products made with wheat and barley were good sources of carbohydrates, thereby identifying the beginning of a trend.

The teacher could ask the pupils if they can see a trend (guided discovery) and then meaningfully extend this knowledge by confirming for the pupils that other cereal grains such as millet, rye and spelt also contain carbohydrates.

The cognitive approach has led to the development of constructivism. Within this approach the learner actively constructs their knowledge by interacting with external stimuli. The constructivist approach has much influence on curriculum delivery (Brooks and Brooks, 1999), where it is important for pupils to be given opportunities to explore theories for themselves and to create new patterns of thinking. Lines of open ended questions, concept mapping (Kinchin, 1998) and student/teacher and student/student discussions are also employed within the classroom. One of the great proponents of constructivism within science education in the UK was Rosalind Driver (Driver and Easley, 1978; Driver and Bell, 1986).

The behaviourist approach to learning centres on theories of conditioning and positive and negative reinforcement (Long, 2000) and also focuses on observed behaviour. Protagonists include John Watson (Watson, 1924, reprinted 2009), Ivan Pavlov (Pavlov, 1957) and Burrhus Skinner (Skinner, 1988). Within this approach the teacher holds the ability to facilitate learning based on positive and negative reinforcement. Classroom management techniques employed by behaviourists are based on operant conditioning. This enables teachers to change the pupil's voluntary behaviour after using a range of consequences: reinforcement, given as a positive response; punishment as a negative response; and extinction as a lack of response when the behaviour is inconsequential. The behaviourist approach to learning has more influence on teacher-pupil interaction than on the development of the curriculum, although the curriculum may be designed to influence behaviour and to promote specific habits.

The humanist approach to learning theory highlighted by Carl Rogers (Rogers, 1961, reprinted 1995) is in effect the opposite stand to the behaviourist viewpoint. Within this approach, learning is internalised and not obvious. Rogers (1961, reprinted 1995, p.280) stated that 'significant learning is facilitated in psychotherapy'. Significant learning in this case means beyond the learning of mere facts and involves the engagement of the whole person. A humanist curriculum would be student-led, with the teacher merely facilitating learning and not controlling it. The problem with this approach is that it would be very difficult to set out in a curriculum what needs to be learnt (as opposed to taught), although a humanist approach could be used with other teaching techniques.

Other areas which influence learning beyond the realm of psychology include those connected to neuroscience and brain-based learning (Caine and Caine, 1991; Hall, 2005). Neuroscience is concerned with processes at a cellular and molecular level and their effect on learning. It also considers the functional organisation of the brain. Currently the impact of neuroscience and its understanding help in areas where children are affected by special educational needs (SEN). It has enabled psychologists and teachers to understand the differences that occur in the brain of a child with dyslexia as compared with an unaffected child. It has also shown how areas of the brain in dyslexic children have been activated by remediation techniques which have led to improvements in reading skills.

Although, the potential for neuroscience to improve curricula design and delivery has been highlighted by Goswami (2004), she fails to develop the suggestion informatively within this work. Bruer (1997) and Geake and Cooper (2003) have voiced caution over the use of neuroscience as a basis for education reform. As the current curricula implications are limited, further consideration of neuroscience is considered beyond the scope of this study.

2.3.2 How theories of learning influence curriculum design

Having reviewed theories of learning, I shall now consider how they have potentially influenced curricula design today. As Piaget believed that cognitive development progressed through distinct stages, it follows that material should only be introduced when a child has reached a suitable stage or level of development to assimilate that material. A curriculum based on Piaget's work would consist of topics being introduced at appropriate times and in such a way that allows a child to be a proactive learner and be able to make discoveries for itself. Some topics may be not deemed age appropriate. Piaget's work can be seen influencing the NC structure, as the major 'key stages' reflect the developmental stages given by Piaget in Piaget and Inhelder, 1969. More (2000, p.11) outlined how:

> The UK National Curriculum also mirrors Piaget's theory of staged development, both through its emphasis on definable levels of achievement and through its identification of 'key stages' which themselves parallel current arrangements for institutional transfer at age seven and eleven.

The pre-operational stage/level, 2 to7 years, roughly corresponds to the preschool/early years and KS1. The concrete operational stage/level, 7 to 11 years, roughly coincides with KS2. Finally the formal operational stage, 11+ years, links to KS3, 4 and beyond. In

Section 2.3.1, whilst discussing Piaget's stages of the development, examples of appropriate concepts that might be addressed during each developmental stage were given, these were developed from the corresponding key stage of NC PoS. The ability to do this supports More's (*Ibid.*) suggestion and may also show how the content of the NC PoS was devised to be accessible to pupils in the corresponding stage of development. I will return to this in Section 7.5 to identify whether evidence of such a link can be demonstrated in the data collected during this study.

Transfer between institutions is likely to bring about changes in teaching and learning methods used by teachers so that they are more suitable for pupils in that stage of development. Piaget and Inhelder (1969) acknowledged that children pass through the stages of development at different ages so it would be up to the teachers to make a judgement on the teaching styles appropriate for individual pupils. How a teacher should assess whether pupils have truly moved from the pre-operational to the concrete operational level would possibly have to include screening a number of attributes of ability to learn and problem solve, decenter, etc. I would question whether SATs grades or attainment levels can answer this question. For example, if a child attained a level 2A or 3 in the KS1 assessments it may not necessarily follow that they had definitively passed through to the concrete operational level. As it stands, as pupils pass through the key stages, techniques and styles develop. For example, from play and picture-based activities to more verbal learning. These may or may not be the best approaches to take for individual pupils, but they serve as the most achievable approach for teachers. In other words, it is most achievable for the teachers to teach to the assumed majority.

The implications of Vygotsky's work were claimed by More (2000) to be two-fold in the delivery of curricula; in the methods and activities used by teachers. The success of the curriculum therefore depends on each individual teacher's ability to utilise Vygotsky's theory. If teachers followed the ZPD theory it would be important for them to pitch work just slightly beyond the learner's developmental level, thus gently extending the pupils. They would also need to complete regular routine assessment of an individual's attainment level to enable them to know at what level to pitch work in order to personalise the curriculum.

Scaffolding may be observed in the provision of the curriculum. Teachers would offer specific and directed help to learners to enable them to construct their knowledge. It may also be that Vygotsky has influenced the design of curricula seeking to provide progression by building on prior knowledge.

A curriculum based on Bruner's work would hold a great diversity of topics from an early age which are revisited repeatedly and which grow in depth as the curriculum develops as outlined in his book (Bruner, 1960) describing the spiral curriculum (Section 2.4.1). This is directly linked to the structure of the NC used by schools during the period of this study.

Feuerstein's influence on the current education system may be identified in the provision of his 'mediated learning experience'. Although, the mediated learning experience is not the usual approach in UK schools, individual teachers may well adopt this approach and provision may also occur outside of state schools.

Cognitive psychology has been the basis for the development of the CASE programme by Michael Shayer and Philip Adey, with Piaget, Vygotsky and Feuerstein among their influences (CASE-Network online, 2007). During the 1980s Shayer and Adey (1981) worked to develop a course that would aid students' cognitive development through science. CASE, known as 'thinking science' in schools, is described by the CASE Network as follows (CASE-Network, 2007, [online]):

> CASE (cognitive acceleration through science education) is an intervention strategy which is a combination of curriculum tasks and teaching methodology. The curriculum tasks are designed to challenge children's present concepts of science and present them with problems that they are unable to solve using their current mental strategies.

Research by Shayer and Adey has shown (*Ibid.*) that the students who followed the strategy performed better in SATs and at GCSE. They also showed that pupils' increases in success were not limited to Science but in other subjects such as English and Mathematics. Many schools across different Local Educational Authorities (LEAs) followed the 'Thinking Science' (CASE-based) course (Adey, Shayer and Yates, 2001).

As well as influencing implementation, constructivism also has implications in the structure of curricula. It is necessary to develop curricula in such a way that topics are introduced in a suitable sequence to allow optimum construction of knowledge. This includes an appropriate arrangement of topics to reflect pupils' development.

This section summarised the main theories of learning and described how they have influenced curricula design. In the next section I describe two distinct curricula structures the spiral, influenced by Bruner (1960) and the mastery, influenced by Bloom (1981).

2.4 Curriculum Design

The 'curriculum' is the term used to describe a particular course of study offered by an educational institution. In England the current curriculum for school-aged children in state schools is called the 'National Curriculum' (NC). The UK government defines the NC as follows (DIRECTGOV, 2007, [online]):

> The National Curriculum sets out the stages and core subjects your child will be taught during their time at school…
> It sets out:
> - the subjects taught
> - the knowledge, skills and understanding required in each subject
> - standards or attainment targets in each subject - teachers can use these to measure your child's progress and plan the next steps in their learning
> - how your child's progress is assessed and reported.

The NC is detailed in the PoS. There is a PoS for each statutory subject covered by the curriculum. The PoS outlines the concepts to be taught and the skills to be gained, and also identifies in which key stage specific material should be covered. The PoS further sets out a scale of attainment for the subject. A SoW will include details of the topic to be taught, objectives, T&LAs, and outcomes suggested for the implementation of the curriculum. Possible pathways for implementing the NC PoS and developing SoW are discussed in Section 4.1.

Within this section I will look closely at two curricula designs, the spiral and the mastery. The NC is structured using a spiral design. The mastery design is suggested as an alternative (Raptis and Baxter, 2006) to the spiral design, and is employed by some high-achieving countries such as Singapore and Finland (Hechinger Report, 2010). Spiral models are based on the work of Jerome Bruner. Mastery models are generally based on the theories of mastery teaching and learning largely proposed by Benjamin Bloom and James Block. It must be noted however, that curricula can vary greatly within these two models and the implementation of the curricula could employ many different T&LAs.

In the following sections literature related to the two curricula models will be reviewed (Section 2.4.1 and 2.4.2).

2.4.1 The spiral curriculum

The use of spiral curricula is widespread in the field of education, including: the NC and other curricula used in schools and colleges (Ruddock, 1998; Schmidkunz and Büttner, 1998; Osborne and Collins, 2001; Manguso and Mullahoo, n.d.); University courses such as English (Wetherbee Phelps, 2007), Medicine (Harden and Stamper, 1999; Davis and Harden, 2003), Chemical Engineering (Clark, Dibiasio and Dixon, 1998) and Dentistry (Coyle, Saunderson and Freeman, 2004); and Hypnosis Training (Wark and Kohen, 2002).

Spiral curricula are based on the 1960s work of the American psychologist Jerome Bruner. His (Bruner, 1960) seminal text *The Process of Education* was written following a ten day conference in 1959, which had been called by the National Academy of Sciences with the intention of considering and improving the dissemination of scientific knowledge in the US. The delegates addressed five areas within the education system: 1) The importance of structure, 2) Readiness for learning, 3) Intuitive and analytical thinking, 4) Motives for learning, and 5) Aids to teaching. All five areas influenced the development of his notion of a spiral curriculum.

Bruner (*Ibid.*, p.18) began his discussion in Chapter 2 by considering 'The importance of structure' and outlined the problem of curriculum structure as follows:

> …how to construct curricula that can be taught by ordinary teachers to ordinary students and that at the same time reflect clearly the basic or underlying principles of various fields of inquiry.

He (*Ibid.,* p.19) suggested this might be achieved by 'enlisting the aid of eminent men in their various fields'. I would exemplify this by suggesting that Stephen Hawking might be approached to help structure the primary school Science curriculum. This would raise a question of whether such eminent people, with potentially limited knowledge of the current school education system or indeed educational techniques, are best placed for this. Perhaps this proposal might have been biased by the fact that the delegates to the 1959 conference were all eminent men in their fields and only 3 of the 34 were from the field of education. Bruner believed that curricula structured by such 'eminent men', with the best possible understanding of an area, would demonstrate the 'fundamentals' of a subject more comprehensibly. He (*Ibid.,* p.20) further suggested it would be prudent to:

> …present the fundamental structure of a discipline in such a way as to preserve some of the exciting sequences that lead a student to discover himself.

This notion clearly has links with discovery theory (Section 2.3.1). According to Bruner, another benefit of well-structured curricula based on fundamental principles, was that the memory of taught material would be improved. Bruner also believed that the deep understanding of fundamental principles in one area could aid the understanding of principles in other areas; he (*Ibid.,* p.25) called this ‘transfer of training’.

Bruner’s (*Ibid.,* p.26) final justification for the emphasis on structure and principles in teaching is:

> …that by constantly re-examining material taught in elementary and secondary schools for its fundamental character, one is able to narrow the gap between ‘advanced’ and ‘elementary’ knowledge. Part of the difficulty now found in the progression from primary school through high school to college is that material learned earlier is either out of date or misleading by virtue of its lagging too far behind developments in a field.

It is evident that this suggestion would require a continual updating of curricula, but he did not suggest how frequently this should be examined or by whom.

Bruner continued to develop his ideas in Chapter 3 ‘Readiness for learning’. He (*Ibid.,* p.33) opened this chapter with the statement:

> We begin with the hypothesis that any subject can be taught effectively in some intellectually honest form to any child at any stage of development.

Bruner believed that if you structure material correctly, then you can teach any topic to any age of child (Section 2.3.1). Bruner continued to outline theories of learning within this chapter. As I previously discussed these in Section 2.3.1 they will not be readdressed here.

Bruner (*Ibid.,* p.13) surmised in *The Process of Education* that:

> A curriculum as it develops should revisit the basic ideas repeatedly, building upon them until the student has grasped the full formal apparatus that goes with them.

In essence he is suggesting that students will gain greater understanding of subjects if they are revisited frequently and are allowed to gradually build in detail. It follows that the spiral curriculum model is based on a large number of topics being introduced early in the curriculum. These topics are then revisited repeatedly, gradually increasing in complexity, until the topic has been taught to completion as defined by the curriculum (Bruner, 1960; General Teaching Council for England[1] (GTC), 2006; Smith, 2002). Bruner did not define the phrase ‘revisit the basic ideas repeatedly’ and I suggest that this is potentially a source for many differences between different curricula all claiming to be of a spiral nature. I shall define the term revisit as ‘to return to an area of the curriculum previously taught’, an act that evokes continuity for pupils. This may take the form of direct revision where a subject is effectively re-taught or could just be the return to a general area of the curriculum where the majority of the work is new. I shall further define the word repeatedly as meaning ‘on more than one occasion’. The building of the curriculum in complexity means to move from simple material to more complex material within the same topic. This could be achieved, for example, by firstly learning about photosynthesis in simple terms, such as that ‘plants gain energy from the sun’. Secondly, by progressing to learning the word equation for photosynthesis, and finally, by learning the chemical equation for photosynthesis. This would mean revisiting the area three times, gradually building in complexity and thus allowing for progression to be experienced by the learners.

1. A professional body for teaching in England

I wish to highlight three areas of concern regarding Bruner's book. In his preface (*Ibid.,* ix) Bruner comments on knowledge/education in the spiral curriculum:

> One starts somewhere – where the learner is. And one starts whenever the student arrives to begin his career as a learner.

I would interpret this as meaning that the teacher of a topic should first assess where the learner is, then build on this knowledge and not repeat work already understood. If work already covered is not understood, then my interpretation would be that this work should be taught again.

Secondly, from my understanding of this text it was Bruner's belief that the teaching of a particular topic should continue 'until' the student has grasped the concept (as cited above). This would be difficult to achieve practically in most educational situations. Currently, the NC appears to be 'best fit' for teaching the average members of class. Herein lies the problem: certain pupils will grasp a concept sooner than others. Therefore some pupils will experience unnecessary repetition, whereas other pupils will find repetition necessary to grasp that concept. Teaching would have to be very flexible indeed to cater for all.

In an attempt to clarify the points I have raised in the last two paragraphs, I made direct email contact with Jerome Bruner via the New York University website (Appendix 2.2). Though brief, his response highlights two key points: Firstly, he states 'a spiral curriculum shouldn't be a repetitive circling round and round' i.e. work should not be repeated or revisited unnecessarily. This outcome is not what the NC was intended to provide as it was designed with the aim to promote continuity and coherence and ensure progression (QCA, 2007b). However, repetition and unnecessary revisiting in the curriculum has been reported in the literature discussed in Section 2.2 (Nicholls and Gardner, 1998; Murphy and Beggs, 2003; Biosciences Federation, 2005; Lord and Jones, 2006). Secondly, Bruner refers to the spiral curriculum as ‘interesting ideas’. This brings me to my third point: it is my understanding from *The Process of Education* that Bruner did not suggest his work as a *fait accompli.* On the contrary, he suggests on a number of occasions where further research could be carried out to help to refine his ideas (pp.10, 12, 20, 28, 29, 32, 48, 54, 55, 59, 61, 66, 68, 73, 80 and 89). This is a potential explanation as to why Bruner himself did not attempt to clarify his work within the book through definitions or by developing a model.

Literature discussing spiral curricula falls into three categories: 1) Biographies of Bruner or simple explanations of curricula structure quoting Bruner (Wetherbee Phelps, GTC, 2006; Smith, 2002; Manguso and Mullahoo, n.d.). 2) Those who develop Bruner’s theory further (Clark *et al*, 1998, Harden and Stamper, 1999; De Montfort University Education Department, n.d.; Pak, Rho, Chang and Kim, 2005). 3) Those seeking to discredit the validity of using such a system (Valverde and Schmidt, 1998; Engelmann, 1999; Schweingruber, 2001; Raptis and Baxter, 2006). Those sources seeking to develop the idea further are discussed in the following section on models, and those expressing a point of view on Bruner’s work are discussed in the Section 2.4.3.

There is evidence in the literature that suggests that some may have misunderstood the key aspects of the spiral curriculum. For example, Cruey (2006, [online]) stated:

> …a spiral curriculum begins with the assumption that children are not always ready to learn something.

This appears to be in conflict with Burner's (Bruner, 1960, p.33) statement on readiness of learning:

> We begin with the hypothesis that any subject can be taught effectively in some intellectually honest form to any child at any stage of development.

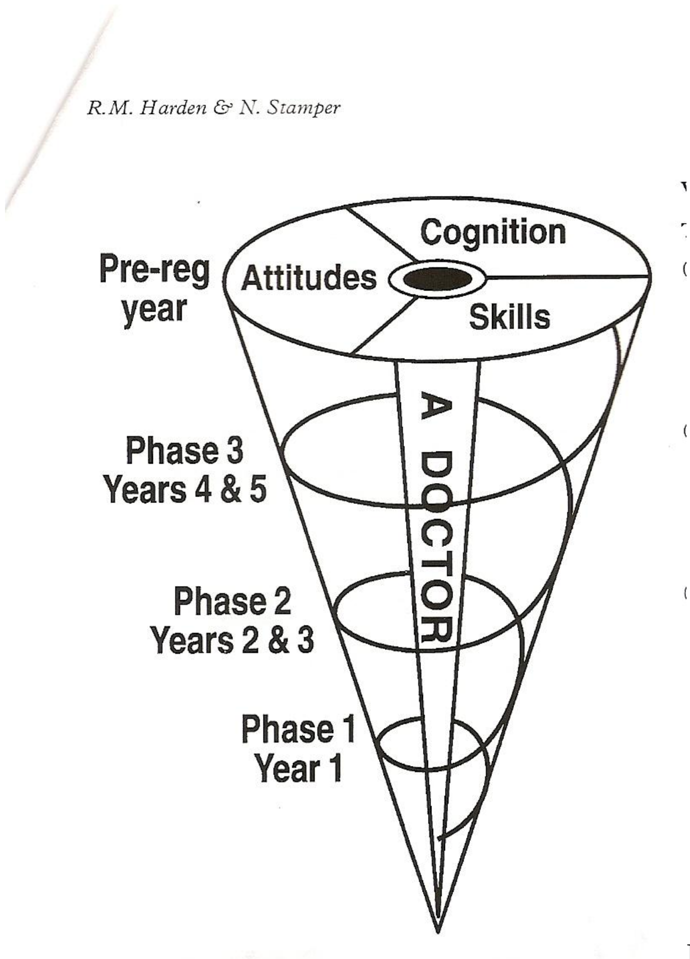
Bruner's statement seems to suggest a 'readiness' in some form on the part of pupils in any stage of development, whereas Cruey acknowledges that pupils are not always ready to learn something. Cruey also described how teachers should teach a topic and then leave and move on to the next topic, even potentially knowing that no pupil has understood, and further, that teachers should feel confident that on their return more pupils will understand. What he appeared not to have considered was the impact on student confidence if, time after time, a teacher moves on to a new subject without the pupils understanding the work, although this may be seen as overcritical and may be due to his current role and responsibilities. Cruey works in the area of SEN and he seems to have focused on benefits of the spiral curriculum for pupils in this area: work is revisited or repeated, and although pupils might not have understood it the first time, they might pick it up on subsequent revisits. He did, however, highlight the strong belief, held by some teachers, that the spiral curriculum has a very positive effect on some pupils, in this case those with SEN.

Models which illustrate the principles of the spiral curriculum are uncommon in the literature. Interestingly, Bruner himself did not develop a model in *The Process of Education*, so each model identified in the literature was, in all probability, developed by the authors from their individual interpretations of Bruner's work. There appear to be three models of spiral curricula developed within the literature, each of which is now discussed.

The Harden and Stamper model (1999) (Figure 2.1) illustrates the four phases of teaching in Medicine. The 'spiral' appears as an inverted cone or conic helix. Mathematically speaking, this model is not actually a spiral, but the term spiral has long been used colloquially in similar contexts, for example in a spiral staircase or spiral binding. If one was able to look down on a conic helix from the horizontal plane then a true Archimedean spiral would be observed.

The model can be described by the vertex illustrating the beginning of the course and the directrix illustrating the 'pre-reg' year. The altitude (or height) illustrates the underlying purpose of the course: to become a doctor. The base (at the top of cone as it has been inverted), illustrates the three fields of teaching - attitudes, skills and cognition. Each turn of the spiral illustrates a phase of teaching which does not necessarily correspond to a year. The model was explained by Harden and Stamper (1999, pp.141-142) as follows:

> …[Students study] normal structure, function and behaviour in phase 1 of the curriculum through a system-based approach…They revisit the same system in phase 2 when they look at abnormal structure, function and behaviour, building on what they have learned about the normal in phase 1. Students revisit the systems for a third time in phase 3, when they relate their studies to clinical practice, applying what they have learned in phases 1 and 2. The spirals broaden as the students pass from phase 1 to phase 3 in the curriculum. In a fourth spiral students, as pre-registration house officers, put the theory into practice.



Harden and Stamper, 1999, p.142

Figure 2.1 The Harden and Stamper Model

More generally, this model illustrates the fundamental principle of the spiral curriculum in revisiting topics and allowing students to deepen and expand their understanding of the topic.

On detailed consideration, this model has limitations due to aspects not fully explained by the text. For example, the full relevance of the broadening of the spiral was not explained. I would surmise from studying the model and its accompanying description that this broadening was intended to illustrate the expanding understanding of the three fundamentals (attitudes, skills and cognition). Further, the model does not illustrate what the term 'revisit' was intended to mean, and in addition it is not clear if any material is revised or taught again, or if the material taught in the next phase is intended to be completely new.

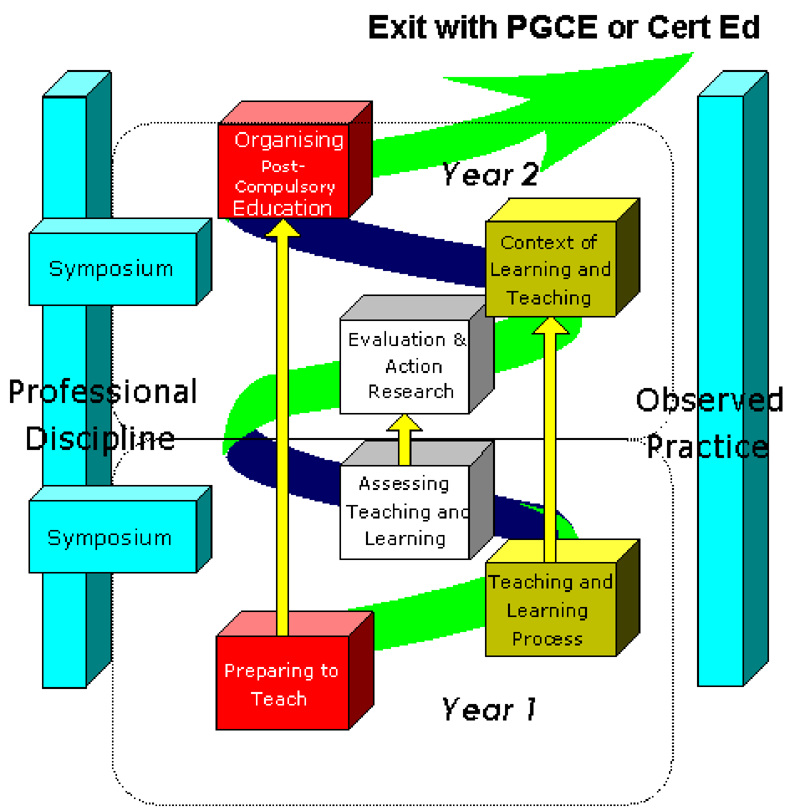
The value of the spiral curriculum is discussed further on in the text. The first value identified is that of 'reinforcement' by continued exposure to a teaching area. I would query if reinforcement can be gained if particular concepts are not revised. One might therefore assume that at least some material was revised.

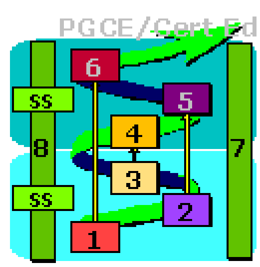
The second value identified is that work moves from simple to more complex (thus illustrating progression) and therefore the student is not overwhelmed. I am not convinced by the assumption that all topics can be so conveniently arranged in this way. Using their example of organ systems, the normal structure, function and behaviour appears to be the simple concept as it was taught earlier in the curriculum and the abnormal, taught later, appears to be more complex. I would suggest that some abnormal behaviour of organ systems may be very easily understood, and that it does not necessarily follow that abnormal aspects are more difficult to understand. Indeed, by this reasoning, the most complex aspects of organ function are related to clinical practice. I am sure this may be the case for some of the work covered in the curriculum, but doubt that it would be the case for all. I suggest that the real reason the work was arranged in this order was because it formed a logical flow for learning. Clearly, it would not be logical to learn about abnormal structure and function before to learning about what was normal. Further, to learn about clinical practice before having any understanding of structure and function would be nonsensical. Harden and Stamper themselves subsequently continue their discussion on the values of the spiral curriculum with the suggestion that a logical sequence could be adopted. Spiral curricula can indeed be arranged with a ‘logical sequence’. It does not follow, however, that a logical subject flow is automatically a flow from the simple to the complex. The sequence described by Harden and Stamper would still demonstrate progression by an increasing depth of knowledge and potentially in other ways, such as a move from describing structure and function to evaluating evidence on the causes of the abnormal.

A second model identified was the De Montfort University (n.d.) model (Figure 2.2) developed by academics at De Montfort to illustrate the curriculum in courses leading to teaching qualifications.

The way De Montfort University describe the course appears to be in agreement with Bruner’s key principle for a spiral curriculum. De Montfort University (*Ibid.*, [online]) state that:

> We offer you an overview of everything, and then we dig down into the detail when you know how it all fits together. In the jargon, this is called a ‘spiral’ curriculum. You go over material several times, each time in greater depth, and with the benefit of some familiarity with all the other issues which affect it.





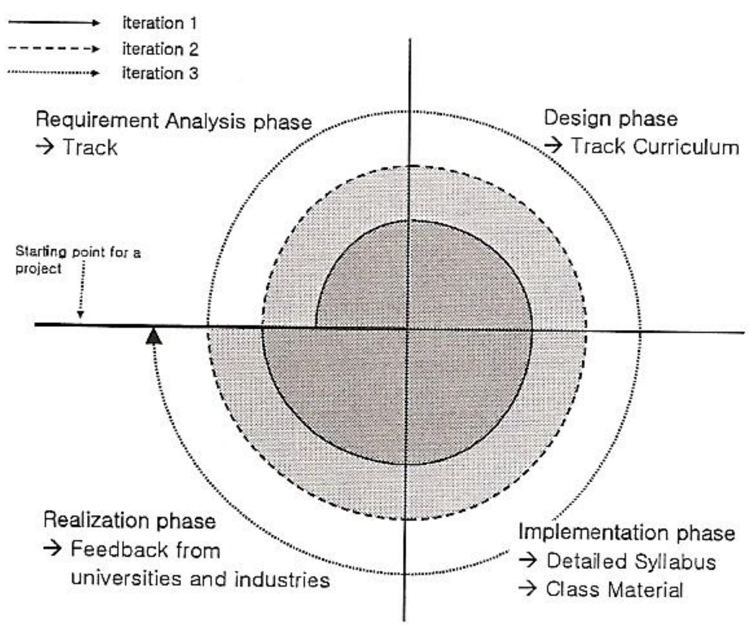
De Montfort University, n.d, [online]

Figure 2.2 The De Montfort University Model

Again, this model does not represent a true spiral but is a conventional helix. In this model each turn of the helix represents an academic year. The course illustrated is modular with modules numbered 1-8. Module 1 is related to Module 6 and the two are joined by a line. Other similarly related modules are also joined by lines. Module 7 and Module 8 are taught throughout the two years and appear on either side of the helix as continuous blocks.

Although related modules exist, the modules do not appear on the same point of the turn and appear to be taught at different points of the academic year. The position of the modules on points of the turns seems to determine the chronological sequence of teaching. The helix is illustrated with a constant width throughout the two years. The model does not account for how much work is revisited or revised or how much is completely novel.

The third model is the Korean government model developed by Pak *et al* (2005) (Figure 2.3). It was developed as a model for curriculum development and not curriculum implementation, but it is interesting to consider nonetheless.



Pak *et al*, 2005, p.16

Figure 2.3 The Korean Government Model

This was the only model found in the literature based on a true Archimedean spiral. Each complete clockwise turn of the spiral is known as ‘an iteration’. These are numbered 1-3. Each iteration is divided into four phases of curriculum development. An iteration illustrates the **repeating** of a process of curriculum development. The prime function of this form of curricula development model was to allow universities to keep up to date with innovations and new technologies. It demonstrated a refining and improving procedure. By repeating procedures and gaining feedback, discrepancies can be readily identified. This model highlights one of the benefits of structure outlined by Bruner (1960, p.26) because the re-examining enables curricula to keep up with scientific discoveries.

In summary, the three published models have been shown to possess limitations regarding the amount of information they convey. Further, none are specifically directed to school curricula. For this study, therefore, I have developed a new model intended to convey more information than the above, including specific features relevant to the demands of this study. This Ryland spiral curriculum model is shown in Figure 2.4.

I have based the Ryland model on a conic helix, similar to that used in the Harden and Stamper model. I have used this in preference to a true Archimedean spiral, as a conic helix is 3-dimensional and can therefore convey more information than a 2-dimensional spiral. A conic helix also has an advantage over a conventional helix as the variable of width can be used to convey more information. This will now be illustrated and discussed.

The Ryland Model can illustrate the whole curriculum or the teaching of a particular topic or strand. The time span is shown by line ‘F’. Each turn of the spiral, ‘A’, illustrates a year of teaching. Line ‘E’ illustrates the amount of work revisited, or confirmed as prior knowledge and line ‘D’ illustrates the amount of work completely new to the pupil. Line ‘B’ illustrates the increase in the level of understanding required to complete the work and ‘C’ illustrates the overall breadth of coverage. The spiral may not necessarily increase in width (‘C’) each year of teaching. If a year of pure revision is included then the ‘D’ line may be omitted altogether. Within this model the turns of the spiral will vary depending on the number of times a topic is revisited. It may be noted that potentially ‘C’ could expand in a spiral curriculum, as with each ‘revisit’ the core could be bigger because of prior experiences (‘C’ and ‘E’ subsumed). However, I have included the additional measure of ‘E’ so that the effect of the curriculum could be illustrated.

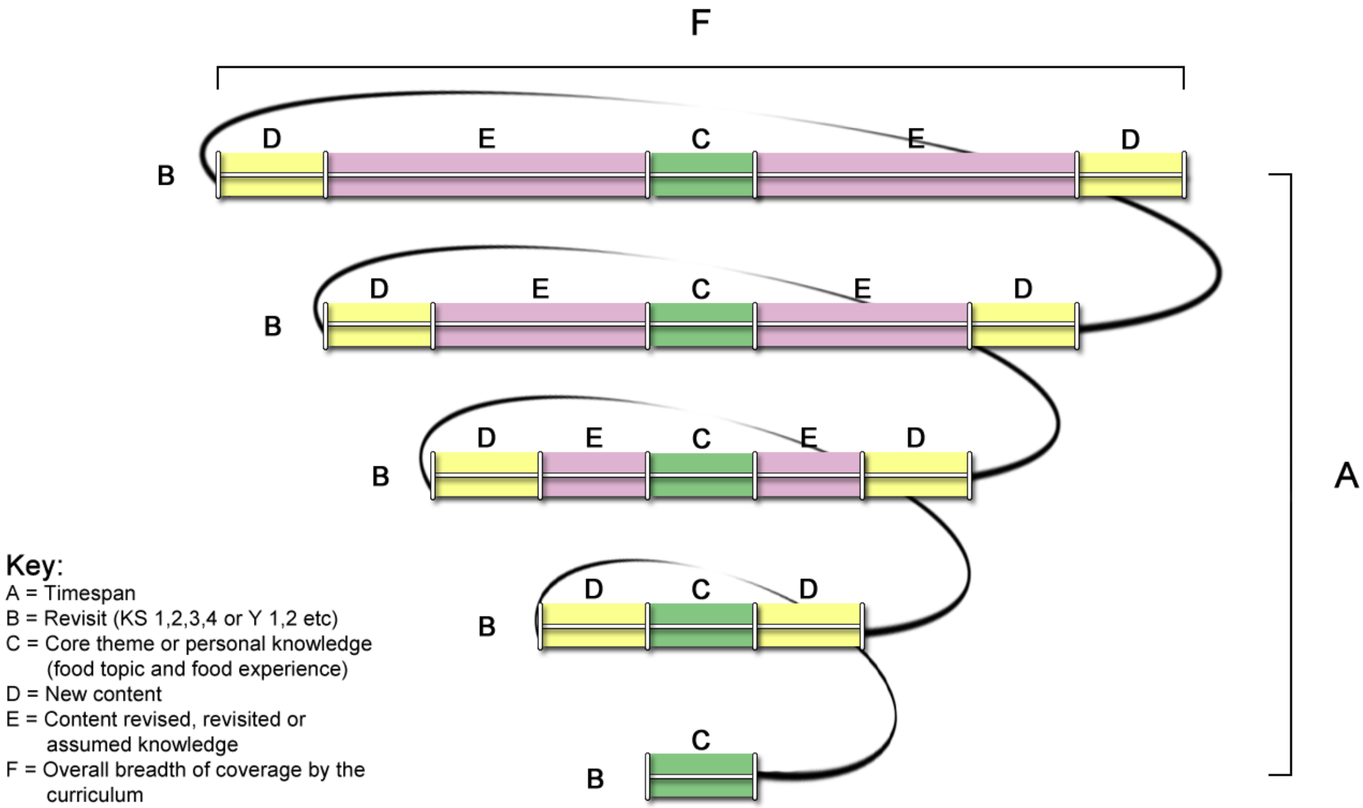


Figure 2.4 The Ryland Spiral Curriculum Model

Two alternative ways of implementing a spiral curriculum are shown in Figures 2.5 and 2.6. Figure 2.5, example a, illustrates the teaching of a topic over most years within the time span. The topic is revisited six times and gradually grows in breadth and or complexity. This could illustrate the F&HE theme of the NC PoS. This topic is currently revisited (QCA, 1998b) in years 1, 2, 3, 5, 8 and 9 (excluding KS4). By contrast, Figure 2.6, example b, illustrates a topic being introduced earlier in the time span at a simplistic level and revisited towards the end of the time span at a much greater breadth and or complexity. This could illustrate the microorganisms topic which is introduced in Y6 as a short topic and is revisited again in Y8 in much greater depth (QCA, 1998b).

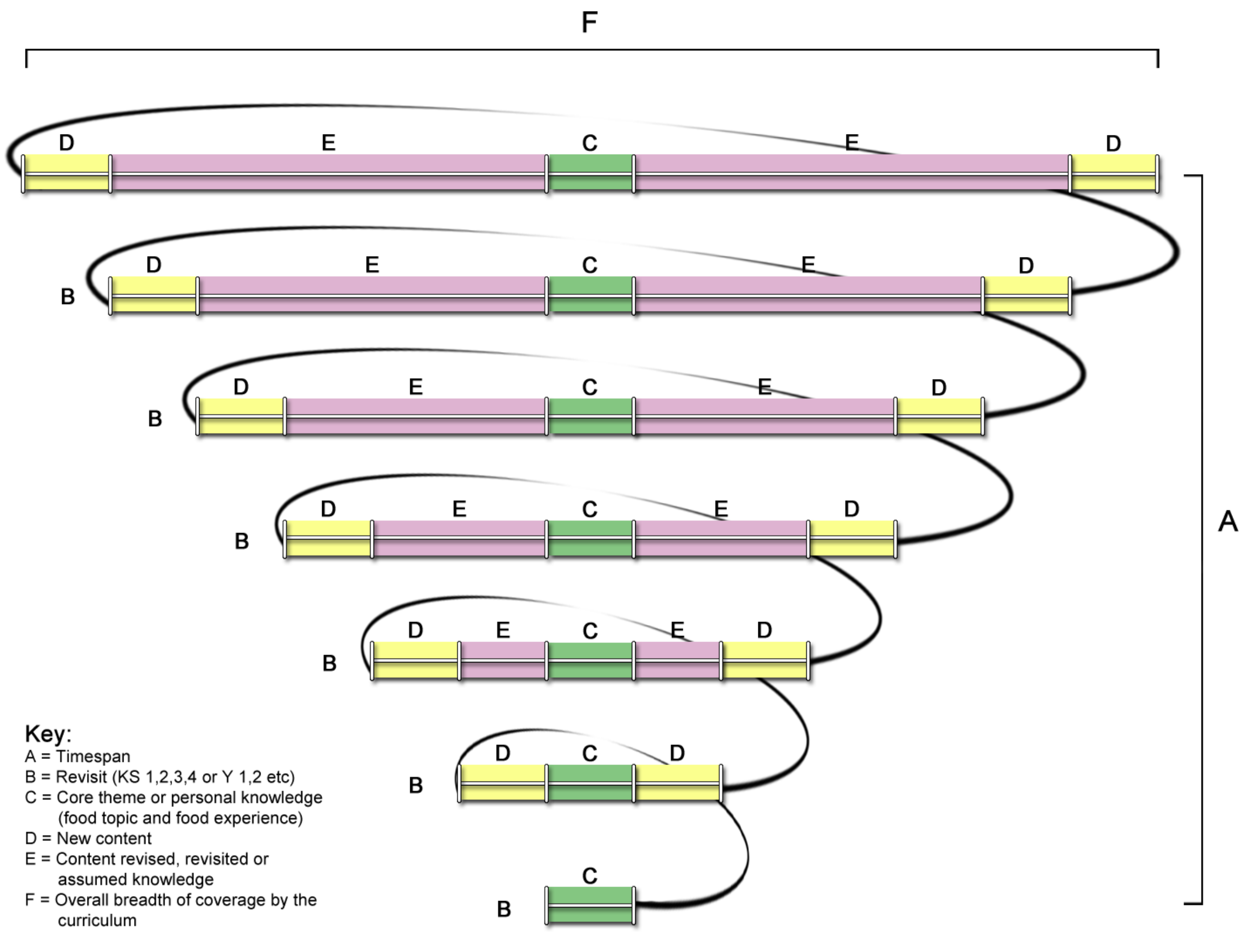


Figure 2.5 Example a

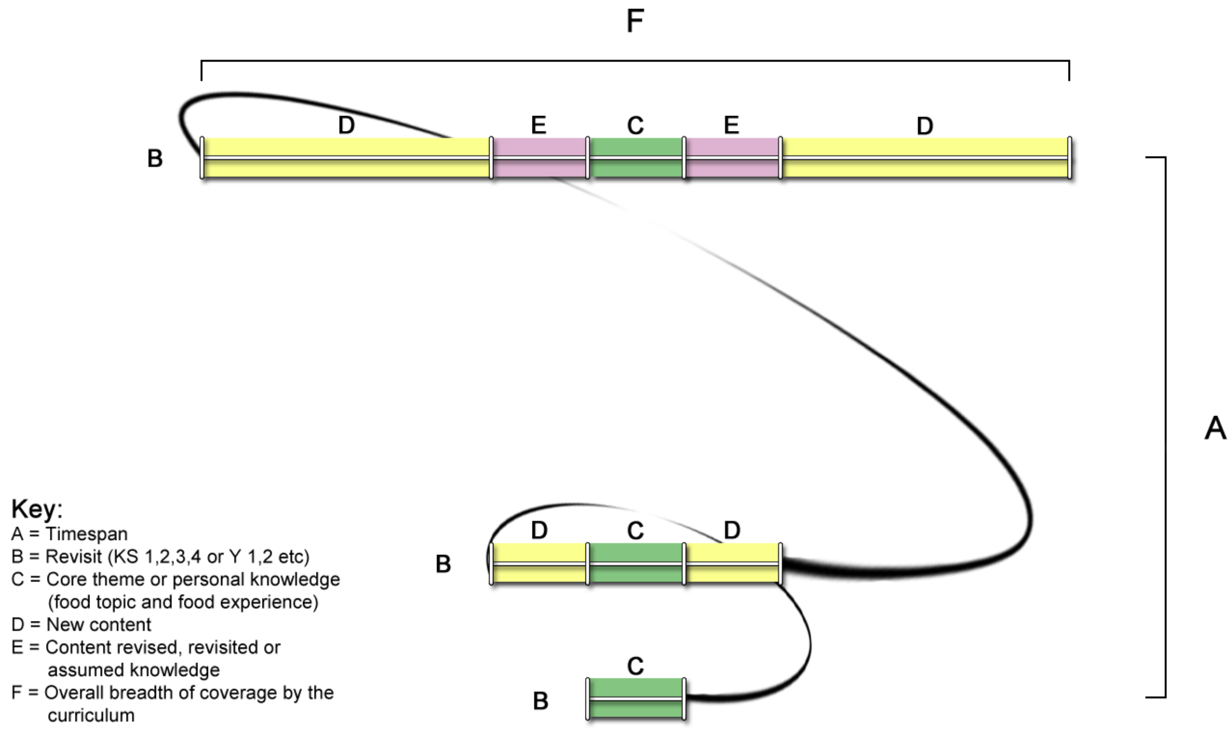


Figure 2.6 Example b

The Ryland Model conveys three factors that are not apparent in the other available models:

- it illustrates the frequency with which a pupil may be exposed to similar or identical material
- it illustrates how much new material a pupil can expect to be exposed to for each revisit of teaching of a topic.
- it illustrates the intended increase in breadth of knowledge of a pupil.

In the next section I discuss the mastery model of curricula design.

2.4.2 The mastery curriculum

The mastery curriculum is based on the principles of teaching to mastery and is suggested as an alternative to a spiral curriculum. Within these principles a student is taught in order to reach a particular objective and will only progress beyond that objective when they have reached complete understanding. Benjamin Bloom is largely credited (Eisner, 2000; Anderson, 2002) with the theory of mastery learning. He believed (Eisner, 2000) in arranging educational objectives according to their cognitive complexity. This culminated in his development of *The Taxonomy of Educational Objectives: Handbook 1, the Cognitive Domain* (Bloom, 1956). Within the cognitive domain, skills are arranged into six levels moving from those easiest to master to the most difficult. The levels include 'knowledge', 'comprehension', 'application', 'analysis', 'synthesis' and 'evaluation'. Evaluation is, according to Bloom, the most difficult skill to master. There is debate in the more modern literature as to the validity of this assumption (Coates, 2003), some believing that analysis and synthesis require greater cognitive maturity.

Bloom believed strongly in the effect of environment on performance and this, coupled with his belief in the systemic arrangement of learning, led him to develop his theory of mastery learning. In developing this theory, he was influenced by his mentor Ralph Tyler (Bloom, 1981). He was also building on John Carroll's 1963 model for school learning (Anderson, 2002). Carroll believed that the amount of teaching time should be flexible and that some students would require longer than others to master a concept. Bloom strongly agreed with this, seeing students as individuals. He also believed in students helping each other (in agreement with Vygotsky, Section 2.3.1) and that assessment, immediate feedback and correction are imperative. Bloom outlined the important features of mastery learning as follows, as summarised by Anderson (2002, pp.378-379):

- Specification of objectives and content of instruction (precondition).
- Translation of specifications into evaluation procedures (precondition).
- Setting of standards of mastery and excellence apart from interstudent competition (i.e., absolute mastery standards) (precondition).
- Breaking course of subjects into smaller units of learning (operating procedure).
- Use of alternative instructional material or processes intended to help students correct their learning difficulties (as indicated by their performance on the diagnostic-progress tests) (operating procedure).

The theory of mastery learning was further developed by Bloom, Carroll, Airasian and Block (Block, 1971a). It is interesting to note that Bloom intended that remedial work (final bullet point above) should be alternative in nature to the original work completed by the student, thus cutting out any repeat of processes that might occur. He also highlighted that if a student does not understand a particular procedure or objective the first time he is likely not to understand it a second time if taught in the same way. Block (1971b, p.71) also suggested a number of 'learning correctives' that could be used if a student has not reached mastery. These included: small group problem sessions where students help each other; individual tutoring for all ages; alternative learning materials and textbooks; workbooks and programmed instruction; audio-visual methods; academic games and puzzle; and finally, Block suggests re-teaching if the subject has only been superficially taught on the first occasion. However, if re-teaching is necessary then the teaching should be (Block and Anderson, 1975, p.34) 'as different as possible'.

Underlying mastery learning is the belief that most students could learn well (Block and Anderson, 1975). Within a mastery format, students would be introduced to a topic at an appropriate age, based on cognitive development, and then the topic would be taught to complete 'mastery' of it. That is, to complete understanding. The arrangement of topics is therefore based on intellectual operations (based on Bloom, 1956) required to master each (Block and Anderson, 1975). It follows that relatively few topics will be taught each year (Schweingruber, 2001). Topics can be introduced over a number of lessons, with new material kept to a minimum (Engelmann, 1999). There is revisiting of the material during the teaching period as a number of lessons will be devoted to a concept, thus allowing for 'over learning'. Children are assessed at the end of a topic (Postlethwaite and Haggarty, 1998), and those not reaching the required level of mastery are given additional remedial work. This may mean that an individual pupil may be held back until they have mastered it. This is also known as achievement-based grouping. The material once mastered would not be revisited in the long term.

Since the Bloom and Block era other proponents have emerged. Siegfried Engelmann, for example, developed his own program based on the theory of mastery learning. Engelmann (1999, p22) described his mastery program as follows:

> The program design must be like a stairway, distributing new learning in small amounts and providing for mastery of each step before moving on to a new step. After being introduced, new learning is firmed for several days, then systematically reviewed across time. Students learn that once something is learned, it must be remembered...

Engelmann has developed his ideas, calling this form of methodology 'direct instruction'. This has been turned into a trademarked program distributed by the publishing group SRA/McGraw-Hill (McGraw-Hill Education, n.d.). Initially the program was called DISTAR, although it is now known by the terms 'direct instruction' or 'reading mastery'.

It has grown in favour in the US and Canada and has several associations endorsing it notably ‘Association for Direct Instruction’ and ‘National Institute for Direct Instruction’. The recommended materials are purchased from the publishing group and include fully scripted lesson plans.

Diagrammatic representations illustrating the mastery style curriculum could not be identified in the literature. The curriculum may be only shown as a list of modules. Engelmann described his program as a stairway (staircase) but has not illustrated his programme. In the absence of suitable models, I have developed a mastery model for the purpose of this study. It has similarities to Engelmann’s description as it appears to form a staircase but was constructed before reading Engelmann’s work.

The Ryland mastery curriculum model is shown in Figure 2.7 and illustrates topics covered in the whole curriculum by placing them in chronological order for teaching. The *x* axis, represents the time span ‘A’, and is graduated in years. However, students may progress through a mastery curriculum at different speeds so the illustration should be thought of as describing an average child’s progress. The *y* axis indicates the increasing complexity of subject matter ‘B’ and is linked to the need to demonstrate increasingly difficult intellectual operations. The ‘C’ points are plotted to illustrate the topics taught in school. There may be a single strand with very few topics taught in a school year or several strands and few topics. The relative size of the ‘C’ points, indicate the amount of work covered. The ‘C’ points are colour coded to reflect the scientific field/strand of the topic. Within this model, links maybe apparent between topics taught in different years;

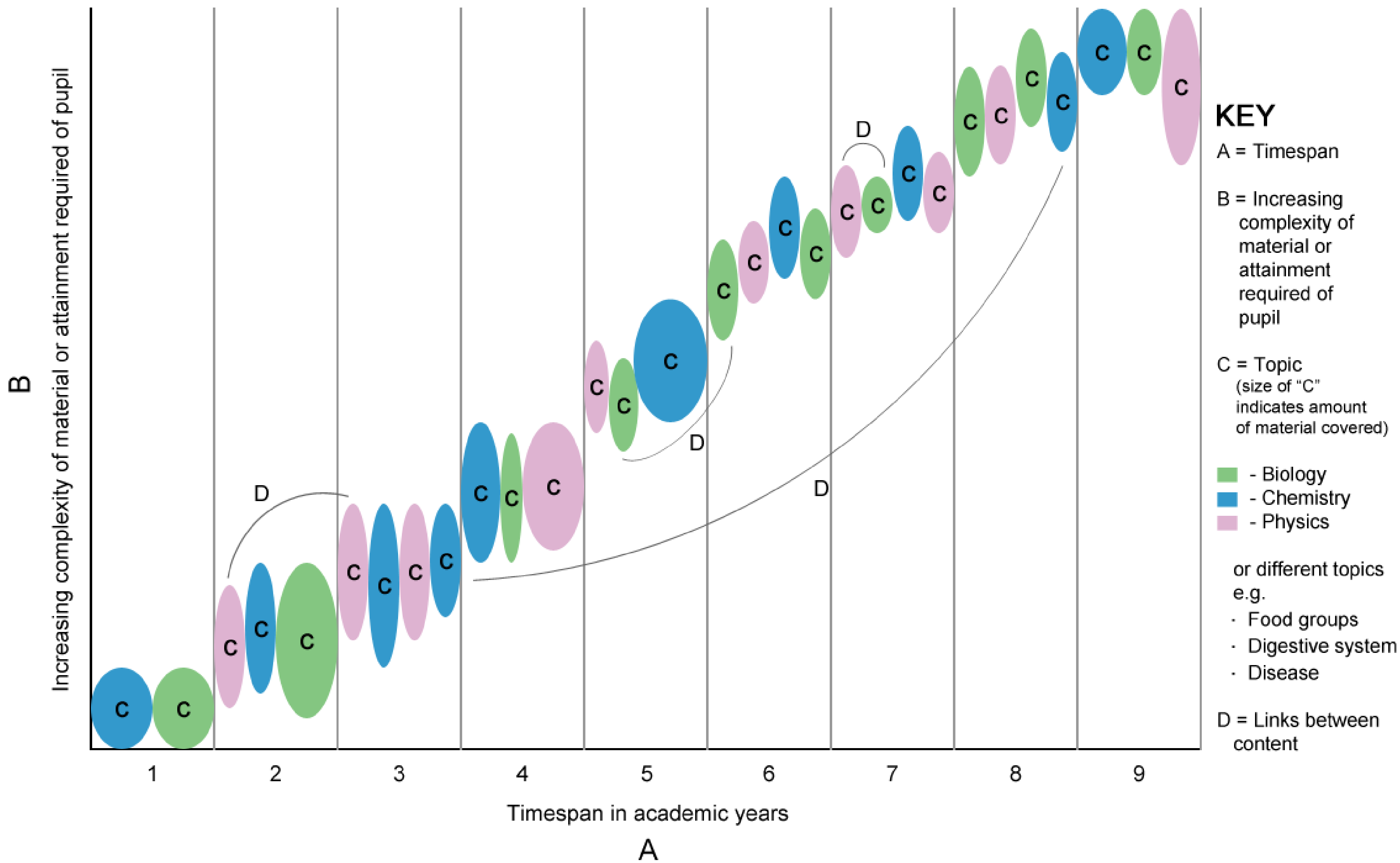


Figure 2.7 The Ryland Mastery Curriculum Model

for example, habitats may be taught in Y4 and adaptation in Y7. The links would be identified and discussed with the children but habitats as a topic would not be taught for a second time as the children who had progressed this far would already have mastery of it.

The value of this model is that the progression of topics is shown. A teacher or student reviewing the model would easily be able to identify topics already covered and those they are yet to cover. They would also be aware of the increasing complexity of the subjects. Satisfaction could be gained from climbing the mastery staircase (progressing through topics).

2.4.3 Pros and cons of differing curriculum styles

Pupils' views on the 'spiral nature' of the curriculum have been highlighted by Osborne and Collins (2001) as a reason behind pupil disengagement from Science (Section 2.5.1) in that the spiral nature of the curriculum may lead to repetition in the curriculum. However, other studies (Chapman, 2001, p.3) have stated that in the field of Geography, pupils who repeated work in KS3 that they had done in KS2, commented 'how repetition of work fills them with confidence'. The study also highlighted the opposing view by outlining the concerns of Ofsted and the local education authority involved that the repetition of work could lead to lack of challenge. The effect of the spiral curriculum on pupils' views will be addressed in the study using RQ2.

Teachers' perceptions of the use of a spiral curriculum or other approaches vary greatly and may be dependent on the form of curriculum currently used by each teacher (Bennett, Gråsel, Parchmann and Waddington, 2005). Some teachers believe the spiral curriculum to be advantageous (Cruey, 2006) whilst others believe the opposite (Bennett *et al*, 2005). In this study RQ3 addresses teachers' perceptions in this area.

It is possible within both the spiral and mastery designs to arrange educational objectives according to their cognitive complexity in a manner mindful of the theories of learning described in Section 2.3.1, such as Piaget's (Piaget and Inhelder, 1969) levels of development. However, it is also apparent that there are pros and cons to both the spiral and mastery designs. In Table 2.3 and Table 2.4 I have summarised these as raised in the literature. In addition I have included some I developed during the course of this study (cited as 'Ryland' for the purpose of the table). In reviewing these tables, it should also be borne in mind that some proponents may benefit financially by the uptake of particular programmes and therefore their opinions may be biased, especially if supportive evidence is not offered.

Area	Pros	Cons
Early Belief	-Deals with misconceptions at an early age (Ryland)	-Misconceptions may continue after teaching as targeted remedial work is not given after assessment (by curriculum design, however good teachers will address this in their teaching). (Ryland)
Experience	-Many children find covering familiar work reassuring and it gives them confidence (Clark *et al*, 1998; Chapman, 2001)	-Children may experience very similar practical work or activities on a number of occasions especially across key stages 2-3 as a change of school usually occurs (Chapman, 2001). -Repetitive (Schweingruber, 2001; Raptis and Baxter, 2006) -Constant repetition of the same topics leaves students and teachers uninspired and lacking in enthusiasm toward science (Biosciences Federation, 2006). Or repetition causing disengagement (Osborne and Collins, 2001) -Disjointed as jumping between topics (Bennett *et al*, 2005).
Age linked curriculum	-The design aids simple curriculum planning and all students of a particular age will be doing the same work (Ryland)	
Fast Tracking		-Bright students are effectively held back by repeating work they have already mastered (Ryland)
Depth of knowledge	-Children get a second chance at understanding as they will revisit a concept a second, third or fourth time i.e. progressing at own developmental pace (Cruey 2006; Manguso and Mullahoo, n.d.)	-Pupils not necessarily taught to mastery before they continue. (Engelmann, 1999; Snider, 2004; Raptis and Baxter, 2006) -Many topics are taught to a minimum depth of understanding or to a lack of depth (Valverde and Schmidt, 1998; Schweingruber, 2001; Raptis and Baxter, 2006)
Challenge		-covering familiar work gives lack of challenge (Chapman, 2001)
Manageability	-Easy to structure, helps teacher by being predictable in planning terms. Comfortable or rewarding for program designers, teachers and students (Engelmann, 1999; Bennett *et al*, 2005)	-Time wasteful. Time revisiting material may be wasted if student has already gained a deep understanding (Ryland)

Table 2.3 Pros and cons of spiral style curricula

Area	Pros	Cons
Early Belief		-Allows misconceptions to develop in early stages as topics are introduced much later (Ryland)
Experience	-As prior knowledge is minimal there is a high amount of discovery when a topic is taught (Ryland) -No repeating of practical work or activities (Ryland) -Instils confidence as students learn they are capable of learning whatever new skills or material the teacher introduces (Block, 1971a; Engelmann, 1999)	-Children will progress at different speeds and those who receive remedial action may have a dip in confidence (Ryland) -Children taught as individuals (Engelmann, 1999)
Age predictability		-Not age predictable as some students will be fast tracked. (Postlethwaite and Haggarty, 1998).
Fast Tracking	-Bright students can progress quickly, less bright students are given targeted help to aid their progression (Postlethwaite and Haggarty, 1998)	
Depth of knowledge	-As a topic is taught to mastery before they progress, a deep understanding of a subject is gained by pupils (Engelmann, 1999; Schweingruber, 2001) -Achieve at higher levels (Anderson, 2002) -Improved ability to learn new material (Block, 1971a; Engelmann, 1999)	
Challenge	-High, as pupils can be fast tracked (Ryland)	
Manageability	-Teaching easier in higher grades as pupils have deep understanding (Engelmann, 1999) -Students learn more in a specified period of time and in an effective use of instructional time (Engelmann, 1999)	-Requires high level teacher input to assess progress and mastery and in general coordination (Block and Anderson, 1975; Engelmann, 1999).

Table 2.4 Pros and cons of mastery style curricula

2.4.4 A worldwide perspective

Worldwide, countries vary as to which curricula models they employ. It was not easy to directly attribute curricula models to individual countries as literature could not located that adequately described the foundations they had used. However, international agencies do give some indication (Ruddock, 1998), strongly suggesting that many countries employ spiral style curricula. The countries may differ in the frequency of revisiting of a topic. One country may revisit a topic two or three times in a child's education and this would be thought of as a spiral curriculum. In contrast, another may revisit such a topic on many more occasions (Ruddock, 1998). This variety within the boundaries of a spiral curriculum was discussed earlier and illustrated in Figure 2.5 and Figure 2.6. The gradation of the spiral may differ which would then vary the relative complexity of the topic. Larger leaps appear in some countries than in others. The breadth of coverage may also differ greatly. Further, the quality of the revisits may also vary depending on how the curriculum was implemented (Section 2.4.5). That is, it would be dependent on the ways in which learners expand their skills, understanding and experience.

Some countries have education systems where there is no centralised curriculum. In the US, for example, each state sets its own curriculum. The same is true in Australia. The differentiation and frequency of return to a topic varies with some countries having flexibility. Ruddock (1998, p.11), noted that:

> How often topics are revisited is a matter left to the discretion of the teacher in some systems, such as Sweden.

Discussion on the use of the spiral curriculum has occurred in other countries, for example, in the US (Sheppard, Swickard and Trehan, 2000) and Canada (Raptis and Baxter, 2006). Research undertaken by Raptis and Baxter (2006) on the attainment of Mathematics students across Canada between the years 1988-2000 found that students in Quebec outperformed students from other areas of Canada. They outlined how the Ministry of British Columbia undertook research into the curriculum to see if the structure could be an explanation for the difference in attainment. They reported that although British Columbia and Quebec covered similar topics, their curricula structure varied greatly (British Columbia followed a spiral style, Quebec did not). This variation of structure was therefore considered to be a potential factor.

The lower attainment of US students compared to those in Japan has in part been linked to differences in curriculum structure (Gamoran, 2001). Japanese students experience more new topics, and less work was revisited. Differences in amount of homework and a longer school year was also linked to the disparity. On reviewing US and Japanese textbooks, Schmidt, Raizen, Britton, Biachi, and Wolfe (1997) noted great differences in curriculum structure, with the Japanese books having a smaller number of topics studied but in great detail for longer periods of time. By contrast, the US books have many more topics and a certain amount of 'jumping' between topics. As described in Section 2.4 a spiral style curriculum would have a greater number of topics revisited frequently, whereas a mastery style curriculum would include relatively fewer topics that would be covered in depth. The US uses spiral-based curricula (Sheppard *et al*, 2000) and the style of the textbook seems to suggest that the Japanese curriculum is based on the mastery model. This discussion of curricula structure as a factor influencing attainment assumes an environment-proof, people-proof curriculum and omits cultural aspects such as attitudes towards learning which will also be factors. Some of these factors are discussed below.

Differences across countries were further indicated from TIMSS data in the US (National Science Board Report, 2006). This highlighted that although the curricula across countries are similar in content they differ in modes of delivery or implementation (Section 2.4.5) and breadth of coverage.

The Hechinger Report (2010) discusses three countries that regularly perform at the top of world rankings for educational performance: Singapore, South Korea and Finland. The report highlights how in Asian countries failure is not considered acceptable and details how the Mathematics curriculum in Singapore focuses on mastery of concepts. In other words, students are taught a topic and expected to learn it before moving on. It further details how teachers in Singapore are recruited from the highest achievers in high school; benefit from a light work load during the first year of teaching; and financial incentives, and continue to receive large amounts of professional development each year. It must be noted that children in Singapore and many other Asian countries start school at age 7 or 8, much later than pupils in the UK who start at age 4 or 5. This may also influence pupils' educational performance. It is interesting to compare this description of Singapore with that of Finland where children also perform highly in world educational league tables. Landers (2009) details how in Finland teachers have high expectations of results from all students (to master all concepts), and additional tuition is supplied if students do not reach them. Students can also repeat years if they fail to reach the required standard. Additionally the teaching profession is competitive and well-respected: only one in ten who apply for teaching at university receives an offer, and all teachers need a Master's degree. The other similarity with Singapore is that children in Finland do not start school until they are age 7 (Coughlan, 2008). In summary, although differences in curriculum structure may influence attainment, it is also possible that a number of cultural factors could be at least as important.

2.4.5 Implementation and enactment of curricula

The theory, design and structure of curricula discussed earlier this chapter (Sections 2.3.2 and 2.4) are of key importance to the content covered and frequency of revisiting of concepts within the curriculum experienced by pupils. In addition to this, how curricula are implemented or enacted by teachers (McDonald and Butler Songer, 2008) is also a key factor in the learning and experience of pupils. In this sub-section I will identify key factors that influence curriculum implementation and the enactment of educational policy.

Teachers or classroom practitioners and those who draft SoW have the responsibility of translating (McDonald and Butler Songer, 2008) the prescribed curriculum and putting it into practice. This implementation or enactment is influenced by teachers' confidence, competence, curricular expertise (Sharpe, Hopkin and Lewthwaite, 2011) as well as experience, beliefs and knowledge (Ryder and Banner, 2012). The personal preferences of the teachers will also influence the way they chose to implement the curriculum.

Within the discipline of Science, secondary school teachers tend to have a specialism such as Biology, Chemistry or Physics and may be required to teach outside that specialism. Some may be confident doing this and others may not. In contrast, those working in primary schools, as generalist teachers, may not have a background in Science and may have limited subject knowledge in specific areas of Science. This may impact on confidence (Watt and Simon, 1999), and further, how they implement the curriculum (Sharpe, Hopkin and Lewthwaite, 2011).

How teachers implement the curriculum is also dependent on the pupils or learners within individual classes. That is, implementation will also be influenced by pupils' prior learning experiences and skill set, ability, home life and behaviour in the classroom setting. Ryder and Banner (2013, p.493) suggested how pupils' potential future science education 'needs' were also reflected in teachers' provision of the curriculum. Ryder and Banner's paper described how a teacher interviewee was influenced as to which course of study a pupil should take if they were likely to become a professional scientist or not. The teacher explained how the current range of courses meant that (*Ibid.*, p.500) 'appropriate courses' could be provided for the pupils and this was key for them to do well. Thus, curricula implementation will also vary between classes even if they are taught by the same teacher.

Another key factor is the teaching environment, for example, the facilities at the school, available resources, teaching aids and published materials (Watt and Simon, 1999; Givens and Barlex, 2001), teaching support such as science technicians and learning support assistants. The school culture, such as whether there are prescribed SoW or whether teachers are given a free rein, also influences curriculum implementation. Further, the level of in-service education and training available to Science teachers is said by some to affect curriculum implementation (Stronkhorst and van den Akker, 2006). At KS4, the particular GCSE course, for example whether an applied or pure Science is followed, will directly influence the implementation of the curriculum (Bell and Donnelly, 2006). The ways in which pupils and teachers are assessed can also affect curriculum implementation, for example, whether pupils are assessed on their concept knowledge or their skills of scientific inquiry. The curriculum may therefore be implemented with this assessment in mind; potentially favouring one skill over another.

Sharp, Hopkin and Lewthwaite (2011, p.2426) described factors affecting teachers' implementation of the Science NC in primary schools as 'personal or 'intrinsic' and environmental or 'extrinsic'. They (*Ibid.*) further developed a hierarchical list of least inhibiting to most inhibiting:

- school ethos (least inhibiting);
- professional attitude and interest;
- professional adequacy;
- professional knowledge;
- professional support: and
- time (most inhibiting).

Factors influencing the implementation of the curriculum for teachers involved in this study will be explored using RQ3 and will be reported in Chapters 6 and 7.

As with the implementation and enactment of curricula, a myriad of policies may also affect the curriculum experienced by pupils in schools. Educational policies that may affect pupils' educational experience include, for example, learning to learn, assessment for learning, personal learning and thinking skills, every child matters, peer mentors, marking policy and personalised learning (Braun, Maguire and Ball, 2010). Braun, Ball, Maguire and Hoskin's 2008-2011 study looked at policy enactment in secondary schools and was based on ninety interviews (Braun, Ball and Maguire, 2011). They reported their findings in a series of papers (Ball, Maguire, Braun and Hoskins, 2011a and b; Braun, Ball, Maguire and Hoskins, 2011; Maguire, Hoskins, Ball and Braun, 2011). In Braun, Ball, Maguire and Hoskins, 2011 they identified factors such as school intake, history, staffing, school ethos and culture as well as other environmental factors such as buildings, resources, budgets, local authority relations and national bodies such as school inspectors in policy enactment. Teachers' perceptions of Science education are further explored in this literature review in Section 2.5.2.

How teachers implement the curriculum in relation to the F&HE topic will be explored during the study and reported on in the analysis chapters (Chapters 4, 5 and 6). The implications of this implementation will be discussed in Chapters 7 and 8. This study will not look further at the enactment of policies because it is outside the scope of the research questions.

2.5 Views, Attitudes and Perceptions

This section considers literature based on ‘direct consultation’ type research with pupils and teachers. Researching the views of pupils has become popular since the United Nations Convention on the Rights of the Child in 1989. Those researchers working with, or in the interest of children can often present information that is valuable and might not have been realised if the pupils had not been consulted. Pupils benefit from the empowerment that being consulted gives them, and in addition it allows them to become actively involved with their education (MacBeath, Demetriou, Rudduck and Myers, 2003). Recent research relying solely on the views of teachers is less common. Such research allows teachers to express their views on changes in education provision or policy (Hallam and Ireson, 2005; Gillard and Whitby, 2007; Collins, Reiss and Stobart, 2010) or on in-service programmes (Jarvis and Pell, 2004). Research on people’s views can be collected using a variety of research methods that will be reviewed in Chapter 3. I will now discuss the meanings of terms used in connection with direct consultation.

The data elicited using direct consultation usually fall into three categories - ‘views’, ‘attitudes’ or ‘perceptions’. I will first consider ‘views’ and ‘attitudes’ as these terms are most commonly used with pupil consultation, while ‘perceptions’ is outlined in Section 2.5.2 dealing with teacher consultation.

Braund and Driver (2005a) highlight both ‘attitudes’ and ‘views’ within their research but do not define either. To try and gain an insight into the potential meaning they might have for each word I have analysed the preceding and subsequent words used in connection with them. With ‘attitudes’ words they use include (*Ibid.,* p.14 and p.21) ‘positive’ and (*Ibid.*, p.23) ‘unexpected’. With ‘views’ the words they use include (*Ibid.,* p.23) ‘general’, (*Ibid.,* p.21) ‘restricted’, (*Ibid.,* p.21) ‘probe’, (*Ibid.,* p.22) ‘aspirations’, (*Ibid.,* p.24) ‘explore’ and (*Ibid.,* p.24) ‘generally positive’. Halkia and Mantzouridis (2005) entitle their paper ‘Students’ views and attitudes’, but they do not define the terms and then do not refer to students’ views at all in the main body of the text. They do (*Ibid.,* p.1393), however, use the term ‘attitude’ and link it to the word ‘positive’. Gibson and Chase (2002, p.694), repeatedly link attitudes to the words ‘negative’ and ‘positive’. From these observations I would suggest that these researchers believe attitudes could be positive or negative and expected or unexpected. Osborne, Simon and Collins (2003) describe how attitudes are frequently measured on Likert scales, and this is confirmed in the literature (Pell and Jarvis, 2001 and 2003; Coates, 2003; Chen, 2006; Kaya, Yager, and Dogan, 2009). These scales are frequently odd numbered, for example, using 5 points. I therefore suggest that an attitude could be positive, negative or hold a neutral stance as indicated by the central value. However, views may hold some deeper emotional meaning that needs exploring and may be the reasons behind people’s attitudes.

A useful definition of attitudes is found in Kind, Jones, and Barmby (2007, p.873):

> …the feelings that a person has about an object, based on their beliefs about that object.

As this definition is limited to attitudes towards an ‘object’, and a useful definition of views in the literature could not be found, for the purpose of this study I have developed my definitions based on the literature discussed previously and dictionary sources (The Free Dictionary, n.d.a and n.d.c):

Views are an individual's perception, judgment, interpretation or opinion on a particular issue or factor. Views can take into account many or few contributing factors and are a reflection or expression of ones sentiment, beliefs or feelings.

Attitudes are an expression of an individual's state of mind, feeling or disposition, and are influenced by one's views. Attitudes can be expressed on a scale from negative to positive as a reflection of one's feelings about a subject.

As an example, to illustrate these definitions one might ask: What is your <u>attitude</u> towards dogs? Potential answers might be: I like/love dogs, expressing a positive attitude;
I am not bothered either way/no opinion, expressing a neutral attitude; or,
I hate/loathe dogs, expressing a negative attitude.

Alternatively one might be asked, what are you views on dogs? Potential answers might be: I like dogs **because** they are good company and give me an incentive to exercise; or, I don't really like dogs **because** they are smelly, dirty and need exercising. So, when expressing one's views you may still express a positive or negative attitude but you are also likely to include some qualifying information about the factors that might influence them.

Researching pupils' views has more recently become known as 'pupils' voice' (Demetriou, Goalen and Rudduck, 2000; McIntyre, Pedder and Rudduck, 2005; Flutter, 2007; Ruddock, 2007; Whitty and Wisby, 2007). Pupils' voice is a catch-all term and would therefore include research concerned with both attitudes and views.

As highlighted in Chapter 1, the UNCRC recommendations provide a strong justification for a research proposal in the area of pupil voice. An additional justification for this type of research may be giving individual schools a means for improvement based on pupil feedback (McIntyre *et al*, 2005; Whitty and Wisby, 2007). The desired effect is that any potential improvements would be school-specific and pupils taking part may be given a motivational boost by being consulted. This has been seen as a move towards democratic schooling (Flutter, 2007, p.345) or active citizenship (Whitty and Wisby, 2007). A final justification for this type of research is personalisation, also highlighted by Whitty and Wisby (2007, p.310), where they emphasise 'the engagement of consumers in choice with a view to improving quality'.

The word 'consumers' refers to the pupils and the 'improving quality' refers to the experience of education. The idea of the pupils as consumers is mirrored in other literature, including Maxwell (2006).

Flutter (2007) raised concerns with the practice of listening to pupils' views. Firstly, that the views of more articulate pupils would be 'heard' more clearly than those expressed by less articulate pupils. Secondly, Flutter also expressed a concern that the study of pupil views has the potential to undermine teacher authority. I believe this could be carefully managed so the research does not upset the dynamic and the teachers consulted during these studies seem to feel positive about pupils' views research and welcome procedures likely to increase pupil engagement in the classroom (McIntyre *et al*, 2005; Flutter, 2007). Fielding (2001, p.124), on the other hand, supports a more transformative approach

> …in which the voices of students, teachers and significant others involved in the process of education construct ways of working that are emancipatory in both process and outcome.

He seeks to achieve this by developing 'students as researchers' style projects. Much of the work into pupil voice centres on developments that could be made at the school level to improve classroom practice (McIntyre *et al*, 2005; Flutter, 2007).

The remaining sections report on literature directly linked to the research questions of this study. Section 2.5.1 considers pupils' views on the curriculum, school Science in general, and the T&LAs employed by teachers. Section 2.5.2 considers teachers' perceptions on teaching school Science.

2.5.1 Pupils' views

Pupils' views on the school curriculum outlined in the literature are varied; some feel that the pace of the curriculum is too fast whilst others believe it to be too slow (GTC, 2005). Harris and Haydn performed a large study (Harris and Haydn, 2006) involving 12 secondary schools and 1740 pupils, that suggested that the curriculum may be a reason for pupil disengagement with History.

Lord and Jones (2006) compiled a comprehensive summary report of research into pupils' experiences and perspectives of the NC and assessment on behalf of the QCA, based on around 300 research papers, and considering research from 1989 to 2005. The reviewed research frequently included studies that focused on pupils from Y2, Y6, Y9 and Y11, perhaps targeting groups at the end of each key stage. The research also included a variety of methods that gave both quantitative and qualitative outcomes. Science was the area of greatest research, although research was also included in the review from a number of subject areas such as English, Mathematics; Personal Social and Health Education (PSHE).

In general, according to the summary report (*Ibid.*), pupils see the curriculum as relevant to passing exams and for their future careers. Further, pupils' enthusiasm decreases as they get older. This was also true of enjoyment and motivation, although there was a rise in enjoyment at KS4 observed in connection to their 'optional' GCSE subjects. Pupils also expressed the view that repetition occurs after the KS2 to KS3 transfer, and that this was particularly apparent in Science.

The relative enjoyment of a subject was influenced by a number of factors, including ease, accomplishment and challenge. Lord and Jones (2006) suggest that future research into coherence, progression and continuity of learners' experiences would be opportune. This is a reassuring suggestion as it is describes aspects of my own study since I am targeting progression in the transfer KS2 to KS3. Their suggestion has influenced RQ1 and RQ2, leading to the consideration of progression in the curriculum and pupils' experience and pupils' views on these so that I may address the gaps in the literature.

When considering research into school Science in particular, the literature indicates that enthusiasm decreases with age towards the end of primary school (Murphy and Beggs, 2003) and during the secondary school years (Bennett and Hogarth, 2005; Braund and Reiss, 2006; Lord and Jones, 2006). What is less clear are the reasons behind the decline. Murphy and Beggs (2003) suggest that the decline during the primary years was due to a lack of experimental work, repetitive topic revision and inappropriate curriculum content.

Research, undertaken by Francis and Greer (1999) in Northern Ireland, assessed views of 1549 pupils in a number of grammar schools from both Protestant and Catholic communities. They (*Ibid.*, p.67) found that:

> The data demonstrate that although the importance attributed to science is unrelated to sex, age or denominational group, girls, fifth formers and pupils in Catholic schools hold less positive attitudes toward science in the school curriculum and to science as a career than is the case among boys, third formers and pupils in Protestant schools.

The summary report by Lord and Jones (2006, p.31) revealed some interesting findings with regard to Science. Firstly that:

> …[while] primary pupils' perceptions of ease increased over the years, their enthusiasm for science declined.

They are suggesting that pupils become progressively less challenged over the years by the Science curriculum and that this occurs at the same time as a drop in enthusiasm. It is easy to jump to the conclusion that the lack of challenge has caused this lack of enthusiasm, but it could be coincidence or be influenced by a number of variables, including puberty and the influence of hormones, teacher-pupil relations, home life, etc. To investigate this further it would be necessary to identify other subjects that were providing adequate challenge to the pupils and monitor this for corresponding amounts of enthusiasm. Keeping these issues in mind it still has implications for my research, as it seems to suggest there is not adequate challenge, and it may be that this is caused by inadequate progression in the curriculum.

Lord and Jones (2006) go on to suggest that the apparent newness of a topic raises enthusiasm, and that pupils respond positively to the active and practical approach to teaching but respond negatively to writing activities. Further, that Science is also a subject that pupils held strong opinions about, frequently appearing as both most and least favourite subject at school. Pupils also find that following the KS2 to KS3 transfer they experience discontinuity in teaching styles and lesson content. Pupils have also suggested that a slimmer curriculum with an in-depth approach would be desirable.

Lord and Jones (2006) end their report by highlighting some important implications for Science in schools including:

- The need to enhance continuity
- The need to capitalise on KS2 enthusiasm
- The need to contextualise the curriculum
- The need to reduce repetition to enhance enjoyment and challenge

These implications, based on the large amount of research, identify continuity as an issue, and as previously discussed in Section 2.2 this in turn affects progression.

Murray and Reiss (2005) report on research carried out by students. Though the research is not directly relevant to this work, as it was completed by post-16 students, it does offer an interesting insight because the students' opinions would have been founded on their prior experience of education. The student researchers made ten recommendations for the improvement of school Science. One of these is connected to this research project, stating (*Ibid.*, [online]):

> Slimming the curriculum. The science curriculum should cover fewer topics to allow for more in-depth treatment and more detailed explanations.

This suggestion would mean that students would spend more time developing their knowledge of key areas and there would be less jumping from topic to topic.

Galton's (2002) research is particularly relevant as he explored pupils' views in connection with progression and continuity in science teaching. He uncovered some interesting points, highlighting the fact that the most able pupils are more likely to suffer with a dip in attitude towards science than less able children. This is very interesting as it mirrors the change in take-up figures of high- and low-achieving pupils of Science subjects at A' level over recent years (Vidal Rodeiro, 2006): high achievers during the period up to 2006 were becoming less likely to take up Science at A' level. This notion of the effect of ability was not mirrored by Bennett and Hogarth (2005, p.9) who stated: 'There were no significant findings in relation to students' academic ability'.

However, they also stated that their sample group consisted of mainly middle or upper ability students. It is, therefore, an unusual statement for them to make as it seems they could not make a comparison within their sample with low-ability pupils. It may have been more accurate to say that no significant finding could be drawn regarding ability between the middle to upper-ability pupils taking part in the study. Their statement implies that ability is not a factor in influencing the polarity of the view when, in fact, it may well be the case. If the intention was to test the influence of ability on their findings then the full spectrum of abilities should be evident in the sample. On closer inspection it becomes apparent that small numbers of low-ability pupils were included in the study sample. Out of the 280 pupils taking part in the study 13 were defined as being of low-, 131 middle- and 136 high-ability. For the statistical comparison, the authors grouped the middle- and low-ability pupils together. The validity of this approach is not apparent. Bennett and Hogarth (2005) also suggested that boys showed the greatest change in their enjoyment of the subject and this led to the greatest amount of dissatisfaction.

Pell and Jarvis (2001), who looked at pupils' enthusiasm for Science in Y1 to Y6, found that boys and girls both felt Science got easier though the years and that their enthusiasm also declined over the years. This supports the notion that the perceived lack of progression in curriculum content may be affecting enthusiasm. In contrast, pupils' enthusiasm for undertaking practical work increased. General enthusiasm, enjoyment and motivation for school and the curriculum diminished with age (Lord and Jones, 2006). Galton *et al* (1999, p.6), whose work was particularly concerned with issues of transition and transfer, detail how a dip in progress is often linked with a 'loss of enjoyment of school and a fall in motivation'. Galton *et al* also highlighted English, Maths and Science as vulnerable subjects when considering these pupils' enjoyment. They linked the dip in enjoyment of Science in Y7 to the pupils performing tasks below their achieved attainment level, thus implying a lack of progression in the curriculum at this time.

Murphy and Beggs (2003) discuss the influence of gender on aspects connected to school science. They found that primary-aged girls held more positive views than primary-aged boys. Murphy, Ambusaidi and Beggs (2006) and Jenkins and Nelson (2005) highlight research that indicated boys and girls have alternative topic preferences.

Bennett and Hogarth (2005) stated their most significant finding was evidence of a Y9 (age 14) dip in positive attitudes and that attitudes were most significantly in decline between the ages of 12 and 14. They also stated that there was an improvement in attitudes in KS4; this is mirrored by other studies (Lord and Jones, 2006), which also suggested that this was due to the positive influence of options at GCSE. Pupils, in other words, held a renewed enthusiasm for school subjects possibly due to the ability of selecting subjects or because of the influence of exams. They found that, overall, positive attitudes to science declined with age and girls held more negative views. Within Bennett and Hogarth's conclusions and recommendations are some suggested areas for re-examination including science courses for students aged 11-14. It was based on this and the other literature reviewed above that I developed RQ2. The aim of this RQ was therefore to elucidate areas of concerns highlighted in the secondary literature.

Parkinson, Hendley, Tanner and Stables (1998, p.156) highlighted how in their study with secondary school pupils:

> The involvement of practical work in lessons was seen as the most significant factor in promoting positive attitudes.

The Biosciences Federation (2005, p.2) compiled a report on ‘enthusing the next generation’, and they outlined how bioscience education was ‘outdated’ and ‘fails to enthuse students’. They recommended that practical work, including fieldwork, should be given greater prominence in the curriculum and that genuine concerns of teachers about health and safety and respect for living organisms must not result in a poorer learning experience for the pupils.

Regarding other T&LAs employed during science lessons, general studies such as Pell, Galton, Steward, Page, and Hargreaves (2007) suggest a positive influence on pupil attitudes at secondary school when performing group work. Research discussed by Flutter (2007), which was carried out in Exmouth Community College with Y11 pupils, revealed that boys and girls preferred different ways of working in science; girls preferring to work in collaborative groups, while boys preferred to work in on their own or in pairs. When asked what they enjoyed about science there was a difference between the responses of high-attaining and low-attaining groups. The former preferred to do hands-on practical work, the latter literature-based work. This may be particularly relevant to my work and influenced the development of RQ2.

Lord and Jones (2006) suggested that pupils respond positively to an active and practical approach to teaching and respond negatively to writing. Ornstein (2006, p.285), working with 6^{th} to 12^{th} (age 10/11 to 17/18) grade students in the US, showed how that students held more positive attitudes in hands-on classrooms (more practical) and

> …more challenging, open-ended experimentation and inquiry experiences produced more positive student attitudes.

Braund and Driver (2005a, p.20) stated that pupils in Y6 and Y7:

> …saw practical work as a natural and enjoyable consequence of scientific endeavour and of use to society.

Positive views expressed by pupils towards practical work were also highlighted by the GTC (GTC, 2005, p.3), who also suggested activities that pupils responded negatively towards such as: written work; needing help, but not getting it; and

> …repetitious, 'easy' and mundane activities, such as completing worksheets and working from textbooks and activities that involved little physical movement.

There were a number of gaps in the literature regarding pupils' views connected to the F&HE topic; these will be outlined in Section 2.6.

2.5.2 Teachers' perceptions

When reviewing the literature regarding the views and attitudes of teachers it was found that some researchers used the term 'teacher perceptions' (Penuel, Fisherman, Gallagher, Korbak and Lopez-Prado, 2009). 'Perceptions' appears to be a flexible term as it not only enables researchers to ask teachers about their views and attitudes but also their perceptions of pupils' views and attitudes. I therefore included 'perceptions' within RQ3 as opposed to 'views' or 'attitudes'.

Teachers' professional perceptions undoubtedly influence how they implement curricula (Section 2.4.5). Literature dealing with teachers' perceptions of school Science was less abundant than literature dealing with pupils' views and mostly considered the perceptions of primary school or pre-service/trainee teachers. As teachers' perceptions of curricula structure were discussed in Section 2.4.3 they will not be readdressed here. The following paragraphs outline teachers' perceptions of the views and needs of science teachers; classroom management; the QCA SoW; time and resources; assessment; and extending able pupils.

Dillon, Osborne, Fairbrother, and Kurina (2000) published a study on the views and needs of science teachers in primary and secondary schools. The consultation was performed in the summer of 1999, just prior to the introduction of the 1999 PoS. One outcome was that 57% of primary teachers said they had a lot of confidence teaching Science as opposed to 66% in English and 63% in Mathematics. Further, when dealing with practical aspects of Sc1 (Scientific enquiry or experimental and investigative science) the figure fell to 44%. As one might expect secondary teachers possessed more confidence and, in practical aspects, the figure was 89% confidence. Pell and Jarvis (2003) also described how primary school teachers were slightly less confident in teaching Science than English and Mathematics. Further, they outlined how teachers were more confident teaching life processes (Biology) than the other Science disciplines. Harlen and Holroyd (1997) suggested subject knowledge as a very significant feature influencing primary teachers' confidence. Lunn and Solomon (2000) investigated primary teachers' views of the NC for Science in March 1999. During that study seven teachers made unsolicited comments on what they would like to teach about Science that was not included in the curriculum. This suggests that these teachers in this study had some confidence with teaching about Science in other areas outside of the curriculum.

MacBeath and Galton (2004), investigating the deterioration in pupil behaviour at secondary school, found that less experienced teachers (less than 5 years' experience) attributed poor behaviour to a general decline in respect for others, whereas more experienced teachers attributed it to the demands of the NC and statutory testing limiting their ability to include pupil participation activities. This meant their lessons tended to be focused on whole-class direct instruction. Pell *et al* (2007) suggested that teachers tended not to use group work, despite it being a popular T&LA, because there was the perception that they might experience a 'loss of control over the learning environment'. Further that mixed abilities or pupils with behavioural problems might obstruct learning.

Gillard and Whitby (2007), who studied the primary curriculum in schools, reported that the QCA SoW were widely used. Further, primary teachers' views on the QCA SoW were positive due to progression built into the scheme and that the SoW illustrated what children should be achieving each year. One school Science leader stated (*Ibid., p.219*):

> …it sets out for the teacher what to do. It is hands-on and has an investigative approach. Before there were teachers here who just used to make children copy out of a book, children thought science was boring.

Also commenting on the QCA SoW another school Science leader said that (*Ibid.*, p.220):

> …it has good progression so that teachers can be sure of what the children have already covered.

This subject leader has, perhaps incorrectly, assumed that teachers would rigorously adhere to the scheme, but as it is not statutory it is difficult to see how this could be the case. Perhaps, in this particular school, the teachers were expected to strictly adhere to the scheme and their comment reflects this. Pell and Jarvis (2003, p.1291) suggested that the primary school teachers' lack of confidence to plan a course of lessons according to the required NC criteria could explain 'the enthusiasm and perhaps an uncritical adoption of the government optional science scheme of work [QCA SoW]'.

Gillard and Whitby (2007) raised concerns that schools would need a lot of resources to implement the QCA SoW especially in the area of ICT and data logging. This implied that schools may not hold such resources already. Collins *et al* (2010) identified that teachers reported a lack of time for teaching science and a lack of resources.

Collins *et al* (2010) produced a study into teachers' perceptions of the abolition of compulsory testing using more than 600 respondents. The respondents included Y6 teachers, primary science coordinators and head teachers. The study followed the abolition of the KS2 and KS3 SATs tests in Wales (in 2004) and the KS3 SATs tests in England (in 2009). One common belief shared by many teachers was that national testing at age 11 narrowed the curriculum and encouraged the inclusion of only those aspects thought likely to be in the test, and further that investigatory aspects of science were reduced for Y6 pupils.

Collins *et al* (2010, p.277) also stated that:

> …there was a perception by focus group participants in England that the spiral curriculum, while supporting progression in pupils' learning in English and Mathematics at KS2, was less effective in Science where discrete topics failed to build on pupils' previous knowledge and understanding.

They further detailed that 27% of telephone respondents thought it necessary to revise the entire KS2 curriculum in the last two terms of Y6. If this was the case then it could be an explanation of why pupils felt the curriculum was repetitive (as described in Section 2.5.1). The paper also included a comment from a Y6 teacher and which is particularly relevant to this study as they are commenting on components of the F&HE topic (*Ibid.*, p.277):

> …they won't have done anything on teeth since Y3, so by Y6 they have completely forgotten the important bits.

This seems to be a justification for revising the curriculum prior to testing. Finally, Collins *et al* (*Ibid.*,p.278) stated that the revision described by a quarter of the teachers/coordinators was not simply 'repetition of work from previous years' but also included further development of 'pupils' knowledge and understanding of key concepts'.

Coates (2003) investigated the views of teachers regarding how highly able 6 and 7 year olds were catered for in school. He described how teachers were unclear on the best way to cater for the most able. One option described was that KS1 pupils could be progressed onto KS2 material or practical work, with the potential problem that this may not be recognised by the KS2 teachers. This is an interesting point as if this option was undertaken and the KS2 teacher did not recognise it, then repetition may occur at KS2. This might also be a cause for the belief of pupils that the curriculum is repetitive (Section 2.5.1). A second option described in the paper was the development of ‘sideways investigations’ which do not cover work from the next key stage. The second option would seem a sensible choice, however, as described earlier in this section, primary school teachers lack confidence especially in the area of practical investigations/Sc1. This perhaps makes the first option more likely. Coates (*Ibid.*) also stated that a number of teachers thought there needed to be more guidance in the use of extension activities.

Tranter (2004), a senior advisor for CLEAPSS School Science Service, commented on how biology teachers were becoming boring biologists. He described biology lessons that (*Ibid.*, p.102) ‘leave pupils disaffected, lacking enthusiasm and bored’ because they did not include practical work with living or once-living organisms, field work, or computer simulations rather than doing the ‘real thing’. He also outlined reasons cited by biology teachers for this situation: league tables leading to concentration on success in exams as opposed to quality of biological education; insufficient equipment, funding or technician support; safety issues; and pupil misbehaviour. Many of these explanations he did not wholly accept. For example, he suggested a number of ways living samples could be collected from gardens or the local environment at little cost. He outlined how health and safety or legal issues were (*Ibid.*, p.105):

> …frequently nothing more than a deliberate excuse for biology teachers to claim that they are prevented from tackling the more interesting.

He commented on how these rumours or myths prevented teachers from performing practical work that was not actually banned. He does appear a little harsh on teachers who might genuinely feel a fear of litigation if anything did go wrong.

There were a number of gaps in the literature regarding teachers' perceptions, and these will be discussed in the next section.

2.6 Gaps in the literature to be addressed in this study

In order to ensure that this study provided a new insight into the study area a number of gaps in the literature were identified and incorporated into the research questions.

There were gaps in three key areas. Firstly, although some literature suggested that pupils felt the curriculum was repetitive (Murphy and Beggs, 2003), research had not been undertaken to test this point. It might be that progression was offered but the pupils did not recognise it. To clearly illustrate whether the NC PoS, SoW or classwork experienced by pupils is repetitious this study addresses these areas using RQ1.

Secondly, while there is literature that focuses on pupils' views there is limited topic specific focus. This gap in the in the literature is addressed by this study's focus on learning about F&HE. In England today there is a growing problem of childhood obesity (Campbell, 2010) and eating disorders (The Telegraph, 2009), and therefore it is imperative that the pupils receive good quality education in this area so that they can engage with the various issues. F&HE appears in all three research questions but this gap is more specially addressed using RQ2.

Thirdly, UK teachers' perceptions of the content of and progression in the curriculum for science including a focus on F&HE and a wider focus; T&LA employed in the classroom; how they implement the SoWs; content of and progression in the KS3 QCA SoW; and teachers' practical ability to recognise progression in SoWs, were not addressed in the literature . These areas are explored in the study using RQ3.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Following the development of the research questions the study considered the research paradigm. Because the study is relatively small-scale and relates, in part, to pupils' views and teachers' perceptions, it was felt that a qualitative paradigm would be most appropriate. Nevertheless, and in agreement with Borland (2001), some quantitative aspects have also been included to allow for comparison of pupils' views across the years and in the documentary analysis.

In order to address the research questions I initially considered employing a longitudinal study similar to that undertaken by Gibson and Chase (2002). Their research assessed the impact of a science programme on children aged 9-13 and resembled this study with its focus on a similar age range. A longitudinal study would give a clear picture of the curriculum experienced by the sample group throughout their education. However, it would also potentially pose a number of problems, the main one being the amount of time needed to complete such a study: the data collection phase alone would take several years, and additional time would be required for analysis and writing up. Tracking of individual pupils would prove difficult as, even if they remained in the same class throughout junior school, they would almost certainly be separated at secondary school. There would also be a greater likelihood of pupils moving from the area or just wanting to drop out of the study as time passes. Increased cost would also be a problem, and this would be accentuated by tracking specific pupils. A longitudinal study was therefore not considered to be feasible or appropriate for this PhD study.

A cross-sectional study was therefore felt to be best suited as it would avoid the problems identified above, and indeed other similar studies have adopted this approach: Mason (2003), for example, considered the beliefs of high school pupils on Mathematics across a five year age range, and Bullen and Benton (2004) investigated the effect of age on the knowledge held by children. I believe this approach to be justified as Darling (2005) performed both a cross-sectional study and a longitudinal study within her research and found that both sets of findings were consistent with each other.

I divided the study into three phases linked to the research questions prior to the development of the research tools. All three phases are set in the context of one primary school and one secondary school. The primary school caters for children from the nursery year through to Y6, ages 3 to 11. The early years and KS1 pupils are taught in a separate building to the KS2 children and have different senior management teams. The school has 554 pupils, 305 boys and 249 girls; more than half of the pupils are from minority ethnic backgrounds, and 39 pupils have been identified with a learning disability. The school is situated in an affluent area of Birmingham and the pupils perform above the national average at age 11.

The secondary school is an 11-16 mixed comprehensive school with foundation school status. This means that although state funded it is run by the governing body and therefore has greater freedom than community schools. The school caters for 900 pupils, two thirds of whom are from minority ethnic backgrounds. It is consistently oversubscribed and there is a below average number of pupils identified as having learning disability. The pupils perform slightly above the national average at GCSE.

The first phase, addressing RQ1, consisted of documentary analysis of: the Science NC PoS (DfEE and QCA, 1999; QCA 2007c); the QCA's SoW (QCA 1998b); the schools' SoWs; and pupil exercise books. Both the 1999 and the 2007 National Curriculum PoS were included as this major change was implemented following the start of the study (for Y7 pupils in September 2008). By comparing these sources of data and by consulting the pupils' exercise books, an understanding of the curriculum experienced by pupils was gained. This first phase provided information for the completion of the second and third phases. Information gathered from the National Curriculum PoS was compared to the experiences of teachers and pupils. Information from the QCA SoW and the schools' SoW was used as discussion material for the teacher interviews and was compared with the reported experiences of the pupils. Information regarding T&LAs from the schools' SoWs was used to construct the pupil questionnaires and teacher interview protocol.

Phase 2 and Phase 3 involved a cross-sectional study at a co-educational primary school and a co-educational secondary school. The sample included a class of pupils from each of years 5, 6, 8 and 9 and their science teachers. Pupils in KS2 and KS3 have been included in the study because they are pre and post-transfer from primary school. Phases 2 and 3 addressed RQ2 and RQ3 respectively. These phases provided a snapshot of the views of pupils in each of four academic years and, in addition, the perceptions of their teachers. The data collection was undertaken in the September 2008 to July 2009 academic year. Phase 2 involved pupil questionnaires, pupil focus groups and role plays and Phase 3 involved teacher interviews.

<u>Sampling for Phase 2 and 3</u>

Literature reviewed in Chapter 2 revealed some concerns in the practice of listening to pupils' views, for example that the views of the more articulate pupils would be 'heard' more strongly or more clearly than those expressed by the less articulate pupils (Flutter, 2007). This may or may not have implications on the research, depending on the sample group. If the sample group were to cross a range of abilities then it might be the case that the views of the more articulate are easier to distinguish as they may have a developed use of language that can express their views more clearly. Those with a less developed use of language may hold equally strong views yet be unable to articulate them clearly. However, if the sample group is stratified, for example selecting either high or low achievers, then those selected are likely to have similar abilities to express themselves. I decided to target the mid-high achievers at the secondary school because the literature suggested this group were the most disaffected with their science education (Galton, 2002). Whitty and Wisby (2007) raised concerns that the high achieving and the most disaffected are more likely to be involved in pupil views research with an 'excluded-middle' evident. This is a concern in connection to some research, for example Postlethwaite and Haggarty (2002) who only target over- and underachievers. However, the majority of work reviewed in Chapter 2 made no mention of targeting high-ability pupils or those who seem most disaffected, and simply take what is felt to be a representative sample from the years they are researching. Some research exists with targeted sample groups, for example children on the special educational needs register (Maxwell, 2006), middle-ability to high-ability pupils (Francis and Greer, 1999; Bennett and Hogarth, 2005), those identified as disaffected and disadvantaged (Riley and Docking, 2004), and pupils from marginalized communities such as those with disabilities and from refugee or ethnic minority families (Rose and Shevlin, 2004).

The sample for Phase 2 was non-probability based (Robson, 2002), due to its small-scale nature, and was in the region of 100 pupils, 40 from primary school and 60 from the secondary school. Initially, I had hoped also to include a Y3 class in the study but this was not permitted by the primary school. The Y5 and Y6 pupils in the Phase 2 sample groups were chosen by the head of department (HoD) largely based on convenience. The sample from the primary school for Phase 3 consisted of the teachers of the classes involved in Phase 2. I requested that a different teacher be chosen for Y5 and Y6 so that I retained two teachers for interview from this school. The classes at the primary school were of mixed gender and ability. Initially, I had hoped to restrict the study sample to mid- to high-ability pupils, but at an early stage this was discounted because they would be spread over a number of different classes in these mixed ability sets. This would have made targeting mid- to high-ability pupils difficult, and furthermore such an approach would not only have been time-costly for the researcher, but may also have proved to be a deterrent to the school's participation if it had involved more classes.

In the secondary school the pupils were set in Science based on their ability as measured by their performance in the KS2 SATs. To find a mixed ability sample to match the primary pupils would therefore involve the same problems as outlined for finding mid- to high-ability pupils in the primary school. For these reasons I used purposive sampling (Wellington, 2000) at the secondary school. I targeted mid- to high-ability sets (set 1 and 2) in Y8 and Y9, as these are the pupils who appear to become most disengaged with Science during their later years (Galton, 2002). By targeting these groups there was a possibility of investigating if the dip in pupil attitudes was occurring where the literature had described (Section 2.5), and, if the study confirmed such a phenomenon, of investigating why it was happening. The sample from the secondary school for Phase 3 consisted of the teachers of the two classes involved in Phase 2.

To increase the validity (Whittemore, Chase and Mandle, 2001) of my research I introduced aspects of methodological triangulation into each phase (Scott, 2007) and employed more than one method to gain the answers to similar questions. For example, triangulation for the perceptions and understanding of the teachers was achieved by asking questions in the interview on progression then completing an activity with the teachers designed to judge their determination of how progression was illustrated in QCA teaching objectives.

I have taken guidance for the consideration of ethical issues involved with my study from the BERA (2004) guidelines and Farrell (2005). In particular, I have considered the ethics involved with the study including: recruitment of participants, informed consent, options for withdrawal, confidentiality, detrimental effects, storage and handling of data, harmful or illegal behaviour, subterfuge, and dissemination of findings and debriefing. When recruiting participants, a meeting was undertaken with each of the teachers during which I explained how the study would progress and the ethical aspects connected with the study. Following these meetings letters were provided for the pupils and guardians of each participating class explaining the study (Appendix 3.1), guaranteeing anonymity and seeking permission to audio tape. The voluntary nature of the study was emphasised and the purpose of the audio recordings explained. No guardian refused the participation of their child and neither did any pupil refuse to take part in the study.

In Sections 3.2, 3.3 and 3.4 I address each phase in turn by, firstly, discussing methods that could be employed, outlining each research tool's potential efficacy in the context of my particular study. I then detail the tools chosen and give an overview of the stages of development of each through piloting before it was progressed to trial. Further, I outline the trials and discuss how the tools were modified prior to the main study. Each section ends with a description of the tool as used in the main study and discusses any problems encountered. Section 3.5 summarises the research in relation to the research questions.

3.2 Phase 1: Documentary Analysis

To assess if pupils experience progression in the teaching and learning of the F&HE topic lesson observations (King, Shumow and Lietz, 2001; Zohar and Schwartzer, 2005) and/or videoing of lessons could be employed (Boardman, 2004; Lundin, 2008; Andrews, 2009). Though these approaches may have provided some excellent data, I felt that this would have only been able to be completed at a considerable time cost for a small-scale study. Further, the videoing of pupils, especially at a young age, might have been seen as inappropriate and therefore not agreed to by teachers and guardians. I felt that if the NC PoS and the QCA's and schools' own SoW could be analysed and compared with pupil exercise books then this would give a clear indication of pupils' experience of the F&HE topic.

For the main study all document sources of evidence were analysed using documentary analysis (Papatheodorou, 2002; Cohen, Manion and Morrison, 2007). This provided an unobtrusive measure and was non-reactive (Robson, 2002). The documents were of course not affected by the fact that I analysed them, but lesson observations might have been reactive in that the teachers and pupils could have altered their behaviour because I was observing them.

Though literature in the area of document analysis exists (Bélanger, 2001; Stylianidou, 2002; Zembylas, 2002) none provided a suitable framework for the analysis of the kinds of documents used in this study. It was therefore necessary to develop a framework that was capable of analysing three types of documents all written by different authors for different purposes. The purpose of the NC PoS is to standardise content by outlining the statutory requirements that all schools must meet. On the other hand, SoWs in general outline the content to be covered, and provide T&LA ideas and lesson objectives.

Pupil exercise books may be completed for a number of purposes, for example as a means of assessment of the understanding of taught material or to provide notes that may be used for revision. None of the documents included in the analysis were written for the purpose of research and a certain amount of researcher judgement was therefore used during analysis to allow comparison of the documents.

The method used during the documentary analysis is similar to content analysis as outlined by Robson (2002, p.352) which he described as 'codified common sense'. The process began with the development of the research question and selection of the sample. The sample of documents for the main study is outlined in Table 3.1. The research began with the analysis of the descriptors from the Sc2 section 'life processes and living things', subsection 'humans and other animals' of the NC PoS (DfEE and QCA, 1999). These were analysed for progression in keywords and concepts. The data were then compared with keywords and concepts from all the remaining sources (SoW and the exercise books). In addition, the T&LAs were analysed in the SoWs and pupil exercise books (these being absent in the Sc2 section of the PoS). The QCA and the school's own SoW were then analysed further by considering the lesson objectives, as these seem to relate closely to the NC PoS. A breakdown of the documents analysed for the study addressing RQ1 is included in Table 3.1.

Sub-Research Question	Documents Analysed	Theme of Analysis
1a) Is progression illustrated in the National Curriculum programme of study?	The National Curriculum Programme of study for KS1-3 including: • National Curriculum Programme of study for KS1 and KS2 (DfEE and QCA, 1999) • National Curriculum Programme of study for KS3 1999 (DfEE and QCA, 1999) • National Curriculum Programme of study for KS3 2007 (QCA, 2007c)	• Keywords and concepts analysed for progression.
1b) Is progression in content and teaching and learning activities illustrated in the Schemes of Work?	Schemes of Work including: • Qualifications and Curriculum Authority schemes of work for KS1-3 (QCA 1998a and b) • The primary school's SoW for KS1 and KS2 • The secondary school's SoW for KS3	• Keywords and concepts analysed for progression. • Teaching and learning objectives were analysed for progression. • Teaching and learning activities were analysed for progression.
1c) Is progression in content and teaching and learning activities reflected in pupil exercise books?	Pupil exercise books including: • Years 2, 3, 4, 5 in the Primary school • Years 8 and 9 in the secondary school	• Keywords and concepts analysed for progression. • Teaching and learning activities were analysed for progression.

Table 3.1 Summary of the documentary analysis

All the data in the documentary analysis underwent reduction and rearrangement. This was achieved using a technique where text, similar to that shown in the example below, was analysed by ignoring all the non-significant (non-scientific) words like ‘the’, ‘and’, ‘its’ unless they altered the concept. For example, some verbs were included such as ‘use’ of carbohydrates, whereas, others such as ‘introduce’ were not because they did not alter the concept. Other verbs such as ‘describe’ and ‘explain’ were largely dealt with in the final part of the analysis described below. Following this reduction all that remained were the keywords and concepts. A scientific keyword is a significant or descriptive word with a scientific focus, such as intestines. A concept is a central or unifying theme or idea, for example food groups.

As an example, text from the QCA Y3 SoW states (QCA, 1998b):

> Introduce the concept of groups of foods for particular purposes eg some foods, particularly meat, fish, cheese, lentils, beans, supply what we need for growth.

This was analysed and became the following **scientific keywords and concepts**:

- Food types in groups (human) vegetables, fruit, bread, rice, cheese, meat
- Group of food type linked to use
- Meat, fish, cheese, lentils, beans for growth

The aim of this was to simplify the text to allow comparison of the different sources by entering these keywords and concepts into a table corresponding to the source. The table was then formatted so that similar keywords and concepts were closer together (rearrangement). An excerpt is shown in Table 3.2.

	QCA Y1	QCA Y2	QCA Y3	QCA Y5	QCA Y8	QCA Y9
What we eat and drink	*					
Food eaten by us	*					
Food types in groups (human) vegetables, fruit, bread, rice, cheese, meat		*	*	*		
Food groups					*	
Fats			*	*	*	
Carbohydrates					*	
Proteins					*	
Starch			*			
Why we eat (example not given)	*					
Food for activity and growth			*		*	*
Food for growth repair and movement					*	
Products of digestion give fuel for growth, repair and energy for activity						*
Group of food type linked to use			*			
Meat, fish, cheese, lentils, beans for growth			*	*		
Fats, sugars and starches to be active			*	*		
Fats-Energy					*	
Carbohydrates-Energy					*	
Protein-Growth					*	
Protein-Repair					*	

Table 3.2 Excerpt of document analysis table for the QCA scheme of work

Progression was then assessed, for example in the development of scientific language: from meats and beans to proteins, or by an increase in the depth of understanding from meat for growth, to protein for growth and repair. This process is further discussed in Chapter 4 (Sections 4.2 to 4.5).

The T&LAs were addressed in a separate table, often including more detail than the keywords/concepts. For example, from the QCA Y3 SoW:

> Invite the school nurse or other health professional to give a demonstration about cleaning teeth and its importance in preventing tooth decay and gum disease.

Became:

Teaching and learning activity

- Visit by school nurse or health professional (tooth decay talk)

Keywords/concepts

- Importance of brushing teeth
- Tooth decay and gum disease

The table was later formatted so that similar T&LAs were grouped together. Progression was then assessed by comparing these activities across the years.

The third part of the analysis considered the objectives found in the SoWs. (These were not applicable to the NC PoS or exercise books as they did not appear in these documents). All the objectives were entered into a table and analysed for progression, for example in the development of language and ability moving from describing (knowledge) to evaluating (Bloom, 1956). These were also used as a basis for an activity used during the teacher interviews in Phase 3. An overview of the scale and detail of Phase 1 is shown in Table 3.3.

Focus	Source or method	Detail	Academic Years	Scale
Document Analysis	Programme of Study	1999	1 to 9	3 key stages
		2007	7 to 9	1 key stage
	Schemes of Work	QCA	1 to 9	9
		Primary School	1 to 6	6
		Secondary School	7 to 9	3
	Exercise Books	Primary School	2, 3 and 5	6
		Secondary School	8 and 9	4

Table 3.3 An overview of the scale and detail of Phase 1

Analysis and discussion of the data collected in Phase 1 are reported in Chapter 4.

3.3 Phase 2: Pupil Consultation

Phase 2 involved direct consultation (MacBeath *et al.*, 2003) and could have been completed in many ways including questionnaires (McCallum, Hargreaves and Gipps, 2000; Gibson and Chase, 2002; Jarvis and Pell, 2004; Braund and Driver, 2005a; Jenkins and Nelson, 2005), interviews (Turner, 1997; Parkinson *et al*, 1998*;* Dunphy, 2005; Braund and Driver, 2005b**;** McIntyre *et al.*, 2005; Maxwell, 2006), focus groups (Horner, 2000; Osborne and Collins, 2001; Côté-Arsenault and Morrison-Beedy, 2005; Breen, 2006; Freeman, 2006) or a pupil diary/log (MacBeath *et al.*, 2003; Lewin, 2004). Further, it could be completed using a single method (McIntyre *et al*, 2005) or a combination of several methods (McCallum *et al.*, 2000; Postlethwaite and Haggarty, 2002; Harris and Haydn, 2006).

Pupils' logs or diaries could be completed after individual lessons. Although these would have been a good source of data, it might have been difficult to recruit pupils willing to spend time after each lesson filling in their diary in addition to any homework they might have. They also might not comment directly on the desired area or could give such brief responses that the diary would not have been very informative. If few pupils agreed to complete a diary then consensus views or the full range of views may not be apparent. In order to get the views of as many pupils as possible, questionnaires were felt to be the best option. These could direct questions to the desired areas and be completed in class and therefore not interfere with pupils' free time. In order to triangulate data and investigate key areas further, interviews or focus groups could be employed following the questionnaires. Owing to the number of pupils in the study, interviews would have been too time consuming and therefore impractical. Focus groups provided a more workable format for the pupils in this case. The tools of questionnaires and focus groups were progressed to the pilot stage of the study.

The ultimate aim of the methods used was to find out the attitudes and views of the pupils. Positive or negative attitudes could be gauged on attitude scales and with preference ranking, which generate quantitative data (Pell and Jarvis 2001; Jarvis and Pell 2002a; Jarvis and Pell, 2002b; Gibson and Chase, 2002 ; Crettaz von Roten, 2004; Jenkins and Nelson, 2005; Kind *et al*, 2007). Specific views can be investigated using open questions in questionnaires and during focus groups, and can generate qualitative data. This allows a greater depth of information to be gathered. These methods give the pupils a greater opportunity to express themselves. Such qualitative methods can also be used to some extent in the gauging of views.

The pupil consultation was undertaken in two stages, the questionnaires and the focus groups. These are addressed in Section 3.3.1 and Section 3.3.2, respectively.

3.3.1 Pupil questionnaires

The pupil questionnaires were developed in a multi-staged procedure, resulting in five versions being subjected to piloting prior to the trial. The questions were first piloted with two Postgraduate Certificate in Education (PGCE) Science tutors, then other PhD students, and finally with two 10 year olds. The questionnaire consisted of two parts pre- and post-teaching, respectively, of the F&HE topic. These questionnaires contained open and closed questions, ranking activities, questions based on Likert scales, and the novel use of mood clouds/balloons in which the pupils indicate their feelings by ticking the illustration closest to the own feelings or by writing their own words in an empty cloud/balloon (Appendix 3.2).

The main outcome of the pilots was the realisation that by asking 'what topic do you enjoy/least enjoy learning about in Science?' the pupils were most likely to answer the topic they have just done. This question was altered to a ranking exercise for all the listed topics. The 12 topics were selected after the document analysis and included topics new to the pupil in the previous year and topics frequently revisited throughout the curriculum. Further, a question on the most favoured/least favoured school subject was included in both the pre- and post-teaching questionnaire in different formats where the order of the subjects was reversed so as not to favour a particular subject, although the results from these questions are not reported in subsequent chapters due to thesis size constraints.

Two trials of the questionnaire were undertaken with Y5 and Y8 pupils. Both trials were performed during lesson time and included the pre- and post-teaching questionnaire. The data were collated and entered into tables so that an indication of the types of response could be gained. Pupils were encouraged to ask for guidance if they did not understand a question, and also to give feedback if they had any views on the design of the questionnaire or wording of the questions.

For the main study only minor alterations were made to the questionnaires. Firstly, pupils advised during the trials that the use of mood clouds was preferable to balloons as the latter were felt to be ‘babyish’. Secondly, the names of the topics given in question nine and fourteen (pre- and post-teaching questionnaire, respectively) were altered depending on the academic year to reflect the pupils’ experience during that year, though they remained on the same theme. For example, a topic referred to as ‘materials’ in Y5 became ‘materials and chemical reactions’ in Y8. Further, the format of Q4 (Appendix 3.2) from the post-teaching questionnaire was altered to make it easier for pupils to understand. Thirdly, the names of the school subjects shown in the final question were altered to match the school’s policy, for example, citizenship/PSHE became ‘Lifetracks’ (sic) for the secondary-aged pupils and PSHE for the primary-aged pupils.

The trials indicated that the questionnaires were well structured and the pupils made good use of the space given for the open responses. They also indicated that each questionnaire could be completed in 20 to 30 minutes. Further, the responses to the questions suggested that pupils had understood the question asked and had responded appropriately.

For the main study, the pre-teaching questionnaire was administered during the first lesson of the F&HE topic and the post-teaching questionnaire was administered in the lesson immediately following completion of the F&HE topic. Examples of the questionnaires can be found in Appendix 3.2. The responses were initially entered into summary documents for each individual year and were later combined into tables so that all the years could be compared. These were used as the basis for analysis and are reported in Section 5.2.

A few problems were encountered with the questionnaires during the main study. Firstly, part of the Y8 sample were absent for the post-teaching questionnaire due to a French exchange trip. Secondly, there were some issues with time taken to complete the questionnaire. The trials indicated that they could be completed in 20 to 30 minutes with Y5 pupils. The main study questionnaires were therefore timetabled for a single, 30 minute lesson. However, three pupils involved in the main study struggled to finish it. Although they were asked to come back in the lunch hour (around half an hour later) some forgot, so not all questions were answered by all pupils. The explanation as to why there was so much difference in completion time seems to be because the Y5 questionnaires trials were completed at end of Y5 whereas the main study was completed at the beginning of Y5. Adjustments were made and the Y5 post-teaching questionnaire was timetabled for a double lesson (60 minutes). As the final question of the pre-teaching questionnaire is unreported in the analysis chapter this problem is of little consequence.

MacBeath *et al*. (2003) outlined weaknesses in using questionnaires as a tool. Firstly, they suggest that structured questions can limit responses as there is little space for elaboration**.** This was not a problem for this study as adequate response lines were included in the design post piloting. Secondly, they suggested that the reasons for a particular response are not usually given. This again was not a problem for this study: the questionnaires were designed so that the 'response' and the reasons 'why' were two separate questions, and therefore pupils duly completed them. Thirdly, that words may be open to a variety of meanings was also suggested as a potential problem. This was not identified as a problem during piloting.

3.3.2 Focus groups and role play

Piloting of the focus group was more streamlined than that for the questionnaire, due to time issues caused by the end of the academic year, and it was necessary to progress to trial at an early stage. The trial protocol included some open and closed questions. Literature on the running of focus groups was reviewed (Morgan, Gibbs, Maxwell and Britten, 2002; Freeman, 2006) in which focus group size varied from two to twelve participants. Osborne and Collins (2001), who were working with pupils discussing the curriculum, suggested that the optimal size for a focus group was six to eight pupils. It was therefore decided that focus groups in this study should be of around that size. Had time not been an issue then a number of trials could have been completed to assess this area. The trial was undertaken with a single group of six Y8 mixed gender pupils during their lunch hour who were chosen by their teacher from a group of volunteers. The protocol was a simple list of questions followed by a role play activity. Though the questions were successful there were too few of them and they also lacked prompts and probes. The first outcome of the trial therefore was the inclusion of more questions and, further, the inclusion of prompts and probes. In addition, more pupil-based activities were included to help draw out ideas rather than relying on closed questions on a particular theme.

The focus group included a role play; this is a form of mediated consultation. Though discussion of using role play as a method can be found (MacBeath *et al.*, 2003; Cohen *et al.,* 2007) its use in this context appears to be novel since, based on the literature review, no other reports of this approach were found. Pupils were requested to split into two groups. The groups were asked to role play what Science lessons were like, one in primary school and the other in secondary school. The group split themselves into a male group and a female group. This gender split was not an issue for me as it was essential that the pupils felt comfortable working with the other pupils in their group. The pupils enjoyed the role play part of the focus group and there was no hesitation amongst the pupils to join in. This was initially intended to be an activity with the age groups immediately prior to and post-transfer to secondary school, but it provided such useful data and was so enjoyable for the pupils that it was included in the final focus group protocol for all age groups.

The main study focus group protocol was arranged into sections addressing sub-themes of RQ2. The sections included all the questions and additional prompts and probes. This formed a data recording sheet (Appendix 3.3) to make documentation and analysis easier. Each academic year's protocol differed slightly because of some questions that directly followed up responses given in the questionnaires. Some additional piloting of additional questions developed after the trial was completed, and this identified the protocol as requiring around thirty minutes to be completed.

For the main study a sub-sample of pupil volunteers, from those who had previously completed the questionnaires, was selected by their teachers to take part in the focus groups. The focus groups were conducted within two weeks of the completion of the F&HE topic at a time suggested by the teachers; for the KS2 pupils this was undertaken in the lunch hour. As the Y6 pupils did not undertake the F&HE topic during the academic year, they did not take part in the questionnaires. They did, however, take part in the focus groups; these were undertaken during their post-exam enrichment period (in the summer term). The Y6 protocol (Appendix 3.4) did not contain all questions posed to other groups; instead, more general ones were included, for example 'Do you think you should learn about food in Science lessons?'; 'Do you think learning about food is important?'; 'What sort of activities do you enjoy/not enjoy in class?'; and 'What Science topics do you enjoy the most/least?'. These questions appeared on the questionnaires for the other age groups.

The KS3 focus groups were undertaken during lesson time in a different room to the rest of the class within two weeks of the completion of the F&HE topic.

In the main study two focus groups were undertaken for each year (5, 6, 8 and 9) and these took thirty to forty minutes to complete. During each focus group notes were made about the pupils' general mood and positions (during the role plays). Pupils' responses were recorded on three voice recorders and, in addition, notes of their responses were also made by the researcher. Immediately following each focus group the notes were entered into a data recording sheet and audio recordings were transcribed, in part, and added to the same sheet. The partial transcription (McLellan, MacQueen and Neidig, 2003) included all the direct responses to the questions and did not include pupils' conversations if they drifted from the focus. As the full transcription of the focus groups was not completed, a time marker of each question was added to the sheet so that the relevant section of the recording could be easily reviewed during the data analysis. Following the completion of all eight focus groups, data reduction was undertaken to leave only the key points. The data sets were combined into one spreadsheet showing the data for all four years.

Data were then highlighted in different colours to indicate the link to the content, T&LAs or progression. The data were then reduced further by removing all questions not directly relevant to RQ2. The remaining data were analysed and are discussed in Chapter 5.

No major problems were encountered in the completion of the focus groups, and they proved to be popular with the pupils, who enjoyed the chance to share their views and perform role plays. MacBeath *et al.* (2003), suggest some weaknesses in using talk-based approaches as a tool. For example, pupils may give 'please the teacher' or 'right answers' responses. As their anonymity was guaranteed, I am confident that the pupils undertaking the focus groups gave their honest opinions. The literature also suggested that pupils might feel inhibited in talking about their feelings in front of others. However, all the pupils in this study were willing volunteers and therefore actively wanted to share their feelings, whether positive, negative or neutral, otherwise they would not have volunteered. Potentially the views of very shy pupils may not be evident in the focus groups, but these pupils would still have had a chance to express their views in the questionnaires. Further, it must be conceded that as volunteers the pupils involved in the focus group were already a sub-group and this may have influenced their responses. However, as ethical guidelines had to be followed there was little room movement here. The literature also suggests that one pupil or gender might dominate discussions, but this was easily managed by directing questions to a variety of pupils within the group and not moving on until all had had a chance to speak. However, it must be acknowledged that pupils may still be influenced by each other's responses (peer pressure). The final weakness suggested was that during the transcription of responses it may be difficult to identify individuals. Within this study pupils were told of the importance of taking turns in speaking because I would not be able to disentangle the comments if many of them were talking at once, and indeed pupils were largely well-mannered in this area. On occasion, when particularly excited about a question, some did talk over each other.

When this occurred I asked the question again and gave individual pupils a chance to speak. There was a minor problem with one of the Y8 focus group transcription where I found it impossible to ascribe gender to responses of the participants. As gender was not considered during the analysis, this was not a major problem.

An overview of the scale and detail of Phase 2 is shown in Table 3.4.

Focus	Source or method	Detail	Academic Year	Scale
Pupil consultation	Questionnaire	Primary School	5 pre	20 pupils
			5 post	20 pupils
		Secondary School	8 pre	30 pupils
			8 post	20 pupils
			9 pre	30 pupils
			9 post	30 pupils
	Focus Groups	Primary School	5 (2 groups)	12 Pupils
			6 (2 groups)	12 Pupils
		Secondary School	8 (2 groups)	12 Pupils
			9 (2 groups)	12 Pupils

Table 3.4 An overview of the scale and detail of Phase 2

Analysis and discussion of the data collected in Phase 2 are reported in Chapter 5.

3.4 Phase 3: Teacher Consultation

The teacher interviews also fall into the area known as direct consultation, as has been discussed in the previous section. The teacher consultation differed greatly in sample number from the pupil consultation and it follows that similar methods to those used for the pupil consultation were not appropriate for the teachers. Focus groups, for example, were discounted as a possible tool as they are in general used to generate discussion between people or identify consensus views (Wilson, 1997), and are therefore unlikely to be helpful in this instance as all participants teach different years and were unlikely to hold ‘consensus’ opinions, and RQ2 directly sought to identify the teachers’ **own** perceptions. Although the use of questionnaires was considered, they were discounted because the qualitative nature of the study required a more in-depth consultation than questionnaires could provide. Further, interviews could follow up interesting points immediately, whereas data from the questionnaire could not easily be followed up unless addition research was planned. Interviews were considered best suited as potential instruments and were progressed to pilots and trial. I decided to focus on two forms of interview fully structured (Wellington, 2000) and semi-structured (DiCicco-Bloom and Crabtree, 2006). I discounted an unstructured interview (Wellington, 2000) at an early stage because I wanted to target my predetermined research questions.

<u>Fully structured interview pilot and trial</u>

The fully-structured interview protocol was formed and piloted with two PGCE Science tutors and other PhD students resulting in three versions being developed from the prior version post piloting. The protocol was developed initially from a list of randomly arranged questions relevant to the research, lacking in fullness and clarity. The final protocol consisted of twenty-seven questions arranged in six sections targeting different areas such as background information, year x and the F&HE topic, the F&HE topic and other subject matter, the NC and progression. These contained open and closed questions and the selection of the best statement. The final protocol ended with a sequencing activity based on six teaching objectives taken from a number of years of the QCA SoW. For the fully structured interview trial a participant was recruited who taught the Science NC to KS3, but in a different school to where the main fieldwork was to be completed. The teacher was provided with some background information about the area of research, the purpose of the trial, audio recording, and the transcription of the data. These details were given so that the teacher was fully aware of the area of research and how the study would progress. At this time I explained the ethical aspects of consent, withdrawal, and confidentiality.

The trial took place in the teacher's own home as this proved to be most convenient for them. The interview was recorded on two digital voice recorders and was completed in around forty minutes. The audio recording was partially transcribed into a 3,500 word document. The fully-structured interview worked well for the closed questions but the open questions proved more difficult for the respondent to answer, as indicated by her frequent seeking of approval or pointers. This would have been easier to manage in a semi-structured interview with the use of probes and prompts because points could have been investigated further whilst remaining within the protocol.

Semi-structured interview pilot and trial

The questions to be used in the semi-structured interview were based on the fully structured protocol but also included a range of prompts and probes developed following the fully-structured interview trial. This protocol was piloted with two PGCE Science tutors and other PhD students. The final version contained thirty-four questions that were arranged in sections according to their content. They considered background information, teacher perceptions of the content and delivery of the curriculum, knowledge and understanding of progression, and a sequencing activity**.**

The structure of the sequencing activity was changed during piloting, reducing the emphasis on correct/incorrect, and including a number of probes and prompts. As with the fully-structured interview, the sequencing activity was based on objectives taken from the QCA SoW. The teachers were not given the corresponding academic years and were asked to place them in an order to demonstrate their understanding of progression. The first part of the activity considered objectives from years 1, 2 and 3 and the second part considered objectives from years 5, 8 and 9.

The final adjustment to the protocol was to transfer the entire document into table form. This was to allow me to separate the data from individual questions, prompts and probes. An excerpt is provided in Table 3.3 and the full document is in Appendix 3.5. The data recording sheet was printed horizontally and the table split into three columns. The first column contains any introductionary comments and the question. If the participant was forthcoming with an answer to a question, the answer was documented in the row below the question. If there was no answer then a prompt contained in the second column was given. This information was documented in the bottom row of the 'prompt' column. Depending on the answer given their response could then be investigated further using the third column entitled 'probe'. This column was also used immediately after the question without the use of the prompt if the participant was particularly forthcoming with an answer. By splitting the responses into three columns the influence of any prompting and probing was clearly noted for future consideration.

Question	Prompt	Probe
1. "Ok, let's get started then. Could you give me a few details about yourself;		
1c) What is your subject specialism?	Biology/Chemistry/Physics	Did you do that at university?

Question	Prompt	Probe
2. "In this section I'm going to ask a bit about the planning behind the food topic"		
2b) The school's schemes of work- How were these developed?	Based on QCA/National Curriculum?	Personal involvement? 1 person? Specialist? Team?

Table 3.5 Excerpt from teacher interview data recording sheet

Depending on the question, the answers were coded and entered into the table. The closed questions were simply ticked off on the chart, for example, the question requesting the teacher's speciality was coded into Biology, Chemistry, and Physics or other. The open questions were coded, for example the initial responses were coded as, unsure/does not

know, generally positive, indifferent, and generally negative. Then their qualifying comments were coded, accounting for the range of answers reported in the study.
The semi-structured interview trial was carried out with one teacher who taught the Science National Curriculum to KS2 in the same school as where the main study was later completed; at that time this was not known to be the case as the main study school had not yet been confirmed. The teacher was informed of the background information as described above for the fully-structured interview trial. The interview took place in the teacher's own laboratory and he appeared relaxed in familiar surroundings. The interview was recorded, with permission, on two digital voice recorders, and information and comments were entered onto the data recording sheets.

The interview took one hour five minutes, including establishing rapport and feedback comments from the teacher regarding the trial. The trial proceeded smoothly, with some minor alterations being suggested during the course of the interview. Sampson (2004) incorporated a complete section at the end of the interview where comments were encouraged. She found this to be of little use in refining the schedule as respondents were generally positive. To overcome this I tried to gain opinion if the participant seemed to be having a problem with a question. I also asked him for comments at the end of the interview. First, he commented that one of the questions was not clear on whether it was asking about the F&HE topic or all topics. Secondly, there were some process suggestions, including the making available of a list of the sample year's topics for the teacher, as he had some problems recalling all the topics from Y5 and resorted to trying to retrieve the information elsewhere. Lastly, a suggestion was made that a list of potential T&LAs could be provided and then activities that were completed by the teaching group could be ticked off or added to.

The audio tape was reviewed in its entirety before transcription. This was to get a general feel for the interview before starting the transcription. This allowed me to judge the general flow of the recording and gave me a clear indication of what was needed to be transcribed.

The voice recording of the trial semi-structured interview was transcribed into an 8000 word transcript; this took around seven hours to complete. The recording was of good quality with little background noise, which meant it was easy to pick up the spoken word. The only section of the trial where the recording was not as clear was when the participant stood up and walked around the classroom in order to find information on topics covered and the resources used. Following transcription of the interview I supplied the participant with a full transcript for respondent validation as suggested by Lacey and Luff (2007). The participant did not make any objections or highlight any errors in the transcript.

The purpose of the two trials was to assess the effectiveness of the fully-structured interview and the semi-structured interview in answering the RQ3. The key word in the research question is 'perceptions'. I feel that the emphasis on this aspect makes the choice between tools a relatively easy one. There was a much greater depth of the information produced in the semi-structured interview due to the ability to prompt and probe, and also the ability to follow up interesting comments immediately. In this way, the understanding of the perceptions expressed by the teachers might be enhanced if this tool is employed. The fully-structured interview was much more restricted and caused the participant a certain amount of distress that they were going miss out information that they should have mentioned, although this may have been a reflection of her own personality rather than the type of interview. The main disadvantage of the semi-structured interview was the time-costly nature of the tool, in connection with both collection and transcription/analysis. As the sample was restricted to four teachers in the main study, however, it seemed appropriate to use a semi-structured interview.

Main study semi-structured interview

Based on the trials, the interviews were scheduled for one hour. Following the trial a number of adjustments were made to the semi-structured interview protocol before the start of the main study; these were mainly differences in the process of the interview including, for example, teachers being given a list of activities (derived from the SoW and teacher consultation) to comment upon and, further, a list of content concepts (*aide-mémoire*) (Appendix 6.1) covered being provided prior to interview. Teachers were also informed that there would be some discussion of other topics covered during the academic year. The final change was the expansion of the second part of the sequencing activity; in the trial this was part of an informal discussion and in the main study it was structured in the same way as the first part of the sequencing activity. The final protocol is included in Appendix 3.5. The interviews were all undertaken in the teachers' own laboratory at a time agreed by them. They were recorded on two voice recorders and, in addition, notes were taken.

Considering the amount of time taken to transcribe the interview trials, in the main study I did not transcribe all the answers but focused on some key questions. For example, the prologue and Section 1 of the interview protocol were not transcribed at all. Instead I included only a brief summary of the answer along with the exact timing of the comment on the voice recording. This allowed the analysis to be completed more quickly, yet it also allowed for the easy identification and transcription of excerpts to be included in the analysis chapter (Sections 6.2 to 6.5). Following the final interview, all the data were entered into a single table dealing with all four teachers. Discussion of the data collected in Phase 3 can be found in Chapter 6.

The main problem when undertaking the interviews was participant retention. Midway through the study the Y6 teacher withdrew as he was a newly qualified teacher (NQT) and he did not feel confident enough to be involved in the study (the interview). There was no other Y6 teacher at the school who could be involved. Consequently, I decided to include the data from the trial in the main study as this had been conducted with a Y5/6 teacher at the same school who had left the school during the summer to be replaced by the NQT. The trial interview only varied in the process of the interview, not the content. That is, the questions remained unchanged in the main study. The inclusion of the pilot interview also provided the unplanned benefit of a class teacher (CT) and a Head of Science (HoD) from both schools being involved in the study.

Robson (2002) suggests that problems in undertaking interviews may include the participant wanting to talk for longer than the set time. This was not a problem in this study with all the interviews being completed in the one hour allotted time.

An overview of the scale and detail of Phase 3 is shown in Table 3.6.

Focus	Source or method	Detail	Academic Year	Scale
Teacher Consultation	Interviews	Primary School	Year 5 teacher	1
			Year 6 teacher	1
		Secondary School	Year 8 teacher	1
			Year 9 teacher	1

Table 3.6 An overview of the scale and detail of Phase 3

Analysis and discussion of the data collected in Phase 3 are reported in Chapter 6.

3.5 Summary

Table 3.7 gives a summary of the three phases of research as completed for the main study.

Phase 1 (Chapter 4)	**Phase 2 (Chapter 5)**	**Phase 3 (Chapter 6)**
Documentary Analysis	**Pupil Consultation**	**Teacher Consultation**
-Programme of study KS1, KS2 and KS3 **-Schemes of work:** 1) QCA/KS1-3 2) Primary school KS1 & KS2 3) Secondary school KS3 **-Pupil exercise books** Primary school Y2, Y3 & Y5 Secondary school Y8 & Y9	**-Questionnaires (two parts)** Primary school Y3 & Y5 Secondary School Y8 & Y9 **-Focus groups** Primary school Y3, Y5 & Y6 Secondary school Y8 & Y9	**-Interviews** Primary school Y5 teacher (Head of Science), Y6 teacher (class teacher) Secondary School Y8 teacher (Head of Science), Y9 teacher (class teacher)

Table 3.7 Summary of the three phases of research

Table 3.8 identifies the sources for data collection of each research question and where the data are presented and discussed. The table also indicates how data were triangulated at the inter-method level (where more than one method was used to address a research question). Triangulation at the intra-method level (where different parts of the same method address a common research question) will be discussed alongside the data within the analysis chapters. As the table indicates, triangulation can be demonstrated for each of the three main research questions, and for RQ1 and RQ2 on multiple occasions. For example, RQ2 was investigated using questionnaires and focus groups providing triangulation at the inter-method level. The data collected for RQ2 were also triangulated at the intra-method where more than one question within the questionnaires addressed the same research area. The data collected for RQ3 were triangulated at the intra-method level only (during the interview).

Phase and Focus	Source or methods		RQ 1	RQ 1a	RQ 1b	RQ 1c	RQ 2	RQ 3	Analysis Chapter
Phase 1 Document analysis	Programme of Study	Document Analysis	✓	✓					4.2
	Schemes of Work	Document Analysis	✓		✓				4.3
	Exercise Books	Document Analysis	✓			✓			4.4
Phase 2 Pupil Consultation	Questionnaires Pre	Open and closed questions	✓				✓		5.2
		Mood Clouds	✓				✓		
		Likert scale	✓				✓		
	Questionnaires Post	Open and closed questions	✓				✓		
		Mood Clouds	✓				✓		
		Likert scale	✓				✓		
	Focus Groups	Questions	✓				✓		5.3
		Activity	✓				✓		
		Role play	✓				✓		
Phase 3 Teacher Consultation	Interviews	Questions	✓					✓	6
		Activity	✓					✓	

Table 3.8 Where research questions are addressed in the study

CHAPTER 4

DOCUMENTARY ANALYSIS

4.1 Introduction

The purpose of the documentary analysis was to explore RQ1: Do pupils experience progression in the Science National Curriculum when learning about food and healthy eating? Three documentary sources were analysed in order to address this question through the sub-research questions, shown in Table 4.1, where the focus of each was F&HE. All the documents included in the analyses were those relevant and in use at the outset of the study in February 2007.

Sub-Research Question	Documents Analysed
1a) Is progression illustrated in the National Curriculum programme of study?	The National Curriculum programme of study for KS1-3 including: • National Curriculum programme of study for KS1 and KS2 (DfEE and QCA, 1999) • National Curriculum programme of study for KS3 2007 (QCA, 2007c)
1b) Is progression in content and teaching and learning activities illustrated in the schemes of work?	Schemes of work including: • Qualifications and Curriculum Authority scheme of work for KS1-3 (QCA, 1998b) • The primary school's scheme of work for KS1 and KS2 • The secondary school's scheme of work for KS3
1c) Is progression in content and teaching and learning activities reflected in pupil exercise books?	Pupil exercise books including: • Y2, Y3 and Y5 from the primary school • Y8 and Y9 from the secondary school

Table 4.1 The sub-research questions and the corresponding documents analysed

The NC PoS was included because it sets out the statutory content to be covered across the various key stages in all state schools in England. The PoS does not identify how a subject should be taught (using T&LAs) and can be implemented in a number of ways by teachers. Three possible ways are outlined in Figure 4.1. The QCA SoWs were based on the content in the NC PoS and were an attempt to show how the PoS could be translated into practical teaching plans. The QCA SoWs were not statutory and therefore schools were also free to develop their own SoWs. Schools could either adopt the QCA SoWs in their entirety or adapt them to suit their own particular resources and pupils (QCA, 1998a). Due to this potential flexibility both the QCA SoWs and the schools' own SoWs were included in this research to give an as clear as possible reflection of the curriculum in place in the sample schools. The primary school involved in the study uses the QCA SoWs in its entirety and has not altered the documents, therefore following Route 1 in Figure 4.1. The secondary school involved in the study developed their own SoWs without consulting the QCA SoWs and therefore followed Route 2 in Figure 4.1. Pupil exercise books were included because they provided direct evidence of the classwork completed by pupils and therefore reflected the curriculum they experienced.

Although other topics could have been selected (Section 1.3), the F&HE topic was chosen because the NC PoS showed continuity (Section 2.2) in this area, that is, aspects of the topic were taught at each key stage, making it appropriate for analysing progression. As a Biology specialist I was also best able to reflect on aspects of progression in this area. As discussed in Section 2.2.2 some issues surrounding progression have been raised in relation to the transfer through the key stages so it may

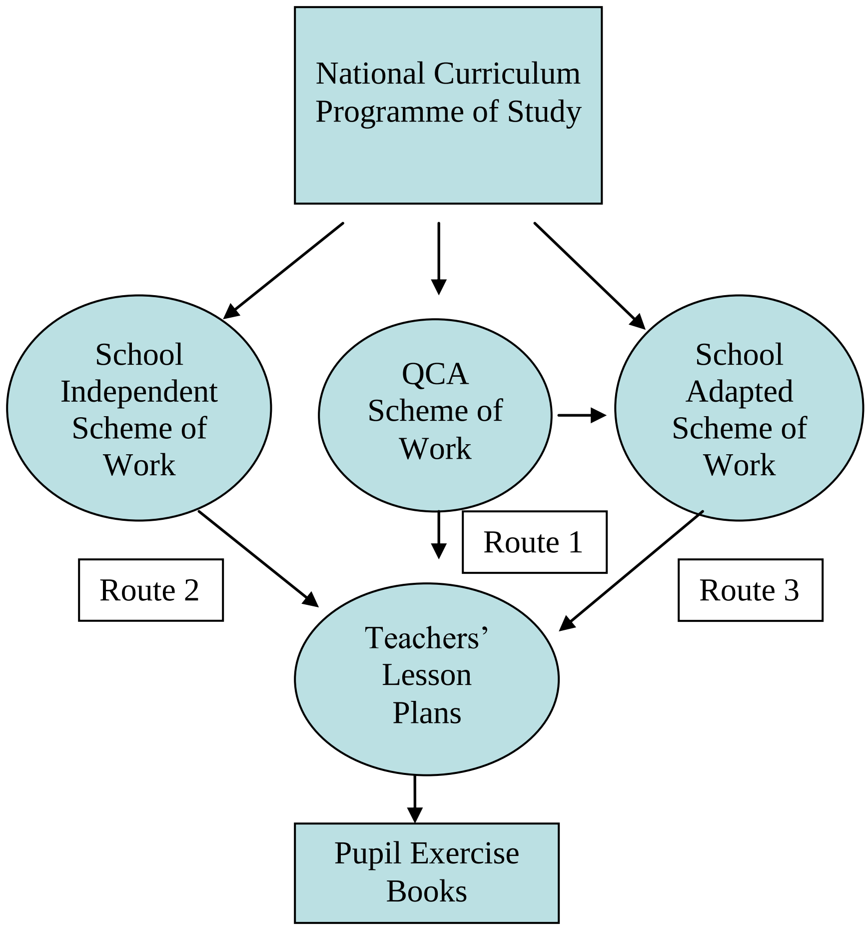


Figure 4.1 Possible pathways to implementing the National Curriculum Programme of Study

have been better to have selected a topic taught in Y6 and Y7 as this is when transfer occurs. In the QCA SoWs two topics met this criterion: 'forces' and 'electricity'. They both fall in the field of Physics and were therefore discounted due to being outside my specialism. However, pupils were given the opportunity to express the views on these topics during the focus groups (Section 5.3). The definition of progression was discussed in detail in Section 2.2.1 and can be summarised by a move from coverage in a simpler form to a more complex one. This might be observed in several ways, for example by moving from: concrete to abstract ideas; personal or everyday language to scientific language; narrow to broad or shallow to greater depth coverage of concepts; general non-scientific ideas to specific scientific ideas; few to many variables/resources/concepts; or by an increase in academic challenge as identified by Bloom in *The Taxonomy of Educational Objectives: Handbook 1 the Cognitive Domain* (Bloom, 1956), discussed in Section 2.4.2.

Each sub-research question is addressed in turn in the following sections: Section 4.2 presents the analysis of the NC PoS; Section 4.3 presents the analysis of the QCA and schools' SoWs; Section 4.4 presents the analysis of the exercise books from Y2, Y3, Y5, Y8 and Y9 and some comparative analysis of the exercise books with the NC PoS and the SoWs; Section 4.5 provides a discussion of key documents, that were only available after the start of the study, demonstrating the complex and fluid nature of literature supporting the NC including: the 2007 NC PoS (QCA, 2007c) and the National Strategies for Science 2008 (Department for Children, Schools and Families[1], 2008a, b and c); finally, Section 4.6 is a summary of the document analyses.

4.2 Progression in the Teaching and Learning of Food and Healthy Eating as covered in the National Curriculum Programme of Study

The NC PoS is split into four age-defined 'key stages', each building on the previous key stage. For the purpose of this research, I analysed the NC PoS for KS1, KS2 and KS3. This analysis centred on statements from the Sc2 section 'life processes and living things', subsection 'humans and other animals', which is linked directly to F&HE. In the

1. A government department

following paragraphs I present my analysis of the key themes in the NC PoS and highlight the areas of progression. Excerpts of the NC PoS 1999 are shown in Table 4.2.

Key Stage	National Curriculum statements (Pupils should be taught:)
1	2b, that humans and other animals need food and water to stay alive
1	2c, that taking exercise and eating the right types and amounts of food help humans to keep healthy
2	2a, about the function and care of teeth
2	2b, about the need for food for activity and growth, and about the importance of an adequate and varied diet for health
3	2a, about the need for a balanced diet containing carbohydrates, proteins, fats, minerals, vitamins, fibre and water, and about foods that are sources of these
3	2b, the principles of digestion, including the role of enzymes in the breaking down large molecules into smaller ones
3	2c, that the products of digestion are absorbed into the bloodstream and transported throughout the body, and that waste is egested
3	2d, that food is used as a fuel during respiration to maintain the body's activity and as a raw material for growth and repair

Table 4.2 Statements from the National Curriculum Programme of Study (1999) focused on food and healthy eating

These statements show a clear progression in the use of language in the area of food types or groups. In KS1, the language is personal and everyday and focuses on types of food, although what is meant by the term 'type' is not clarified. In KS2, the language is still personal and everyday using 'food types', and pupils develop by learning that some types are used for activity and others for growth, showing progression in the depth of knowledge**.** In KS3, the language progresses from the personal and everyday to the scientific by including the scientific terms for the food groups, such as 'proteins' and 'carbohydrates'.

An example of progression from concrete ideas to abstract ideas occurs in the KS2 to KS3 transition in the area of digestion. In KS2 pupils should learn about the beginnings of digestion when they learn about the function of teeth. They can experience chewing for themselves and have an understanding that they chew to make things smaller and easier to swallow. This is a concrete idea because they can experience it happening themselves. Moving on to KS3 where they learn about the function of enzymes, they cannot see the enzymes working in their own bodies so this is an abstract idea to them. A second example of this type of progression is connected to how our bodies use food. In KS1 pupils are taught that we need food to stay alive. In KS2 pupils are taught that we need food for activity and growth. The concepts of ‘alive or dead’ and’ activity’ and ‘growth’ are all concrete ideas. Pupils can experience these concepts themselves or observe them in others. In KS3 pupils are introduced to the concept of food being used as a fuel for respiration. This is an abstract idea because they cannot see it happening since it is operating at the micro/molecular level.

Progression exemplified by an increase in the depth of knowledge is shown by KS1 pupils learning that we need food to stay alive, KS2 pupils learning that the use of food includes activity and growth, and KS3 pupils learning more specific uses, including growth and repair, and that food is used as a fuel for respiration. Progression is also shown by the requirement of pupils to learn about an increasing number of concepts across the key stages of the NC PoS.

The NC PoS does not address T&LAs directly in the section of Sc2 life processes and living things connected to F&HE. It does cover elements of T&LAs in section Sc1 Scientific Enquiry. Scientific enquiry can be experienced through practical, experimental or investigative work, and develops skill in planning experiments, obtaining and presenting evidence and considering and evaluation evidence. The following citation is repeated in the Sc1 section of all four key stages (DfEE and QCA, 1999, p.16):

> Teaching should ensure that scientific enquiry is taught through contexts taken from the sections on life processes and living things [Sc2], materials and their properties [Sc3] and physical processes [Sc4].

This sets the expectation that pupils will complete T&LAs that develop scientific enquiry during the teaching of all the sections of the PoS (Sc2, Sc3 and Sc4). That is, that elements of scientific enquiry will be employed in the curriculum experienced by pupils.

Although not directly detailed with reference to F&HE I briefly analysed the Sc1 section of the PoS to get an indication of pupils' expected progression in the area of scientific enquiry. Progression was illustrated in the PoS, for example, by pupils in KS1 obtaining evidence using the (*Ibid.,* p.16) 'senses of sight, hearing, smell, touch and taste' and pupils in KS2 (*Ibid.,*p.21) 'making systematic observations and measurements, including the use of ICT for data logging'. Thus pupils progress from relying on their own senses to give an indication of the evidence to using equipment to take more accurate measurements. In the area of presenting evidence pupils in KS1 use 'drawings, tables, block graphs and pictograms' and those in KS2 use 'bar charts, line graphs', thus developing their skills and understanding of this area and in this way offering progression.

Overall in the NC PoS the use of T&LAs such as the use of ICT and the production of graphs is consistently presented throughout the key stages. Further, the use of such T&LAs if implemented according to the NC PoS in lessons would facilitate progression.

In addressing RQ1a, my analysis of the NC PoS identified progression in several ways: in the development of language from personal and everyday to scientific; by a move from concrete ideas to abstract ideas; by an increase in the depth of knowledge; and by an increase in the number of concepts covered across the key stages.

4.3 Progression in Teaching and Learning of Food and Healthy Eating as covered in the Schemes of Work

This section is divided into two sub-sections addressing RQ1b: Is progression in content and teaching and learning activities illustrated in the Schemes of Work? Section 4.3.1 addresses the QCA SoWs and Section 4.3.2, addresses the SoWs used by the two schools involved the study.

4.3.1 Progression in the QCA Scheme of Work

In this section I present my analysis identifying progression shown in the content and T&LAs contained in the QCA SoWs when they are viewed **across** KS1, KS2 and KS3 and also **within** KS3. I continue the critique of progression by identifying potential inconsistencies and where content might be open to a variety of interpretations **within** KS1 and KS2.

Please note the QCA SoWs are currently available as an archived webpage. Quotations within this section are therefore without a page number, however the unit number is given which will allow the reader to locate the quotation in the cited text.

Throughout the schemes the QCA gives ‘learning objectives’ as well as possible teaching activities, learning outcomes, vocabulary, expectations, etc. The phrase ‘learning objective’ refers to content that should be covered with the pupils and therefore should reflect the content outlined in the statutory content of the NC PoS. It also refers to statements describing what a pupil is expected to know, understand and/or be able to demonstrate as a result of the learning, for example pupils will be able to ‘state’, ‘explain’ or ‘demonstrate’ a concept or theory (Kennedy, Hyland and Ryan, 2006) . As the learning objectives outline the content of the curriculum I analysed them first. A selection of these learning objectives is shown in Table 4.3. Within the QCA SoWs, the F&HE unit is revisited in Y1, Y2, Y3, Y5, Y8 and Y9, amounting to twice per key stage. This illustrates the broad spiral nature of the curriculum (Section 2.4.1). When the learning objectives from the SoWs are viewed at the key stage level, as expected, they relate directly to the NC PoS statements as summarised in Section 4.2. As the QCA SoWs were designed as an example of how the NC PoS might be translated into a plan for teaching, it is unsurprising that the progression evident in the NC PoS is reflected in the QCA SoWs at the key stage level. For example, when considering progression in content, KS1 pupils learn that we need to eat food to stay alive and in KS3pupils learn that we need protein for growth and repair. This shows progression in two ways, firstly by an increase in the

Key Stage	Year and Unit number	Learning objective (children should learn:)
1	Y1 (1A)	That we need to eat and drink to stay alive
	Y2 (2A)	That humans need water and food to stay alive
	Y2 (2A)	That there are many different foods
2	Y3 (3A)	That all animals, including humans, need to feed
	Y3 (3A)	That an adequate and varied diet is needed to keep healthy
	Y3 (3A)	That humans have teeth- molars for chewing, canines for tearing, incisors for cutting- and that teeth help us eat
	Y5 (5A)	That to stay healthy we need an adequate and varied diet
	Y5(5A)	Identify eg (*sic*) by including them in their display or menu foods eg (*sic*) meat, fish, eggs, cheese needed for growth and those which provide for activity eg (*sic*) sugar, bread, pasta, rice, fats, etc.
3	Y8 (8A)	That foods contain a mix of proteins, carbohydrates, fats, vitamins, minerals, fibre and water
	Y8 (8A)	That protein is important for growth and repair and that carbohydrates and fats more commonly provide energy
	Y8 (8A)	That a healthy diet contains a balance of foodstuffs
	Y8 (8A)	That large molecules are broken down by enzymes in the gut to form smaller molecules, which pass through the wall of the small intestine
	Y9 (9B)	That a balanced diet requires nutrients, including vitamins, in the correct quantities
	Y9 (9B)	That deficiencies in specific nutrients lead to specific diseases
	Y9 (9B)	A person is malnourished if their diet is not balanced, this may lead to the person being too fat or too thin. It may also cause deficiency diseases
	Y9 (9B)	Too much salt in the diet can lead to increased blood pressure

Table 4.3 Excerpt of the QCA schemes of work analysis of learning objectives

depth of knowledge, from food to stay alive, to specific uses of key nutrients, for example, proteins are used for growth, etc. Secondly, pupils move from personal and everyday language to scientific language, from ‘food’ such as ‘meat’ in KS1 and KS2 to ‘proteins’ and ‘carbohydrates’ in KS3. The QCA SoWs also clarify the NC PoS statement

(Section 4.2) regarding ‘food types’ by suggesting that ‘food types’ include meat, rice, pasta, etc.

In KS3 the unit is revisited in Y8 and Y9, with progression evident within the key stage. In Y8 the focus is on the introduction of nutrient types (as the ‘food groups’ carbohydrates, proteins, etc.), their uses and sources, and how the body digests them into an absorbable form using enzymes. The term ‘balance’ is introduced in connection with foodstuffs in relation to a healthy diet. In Y9, this ‘balance’ is directly linked to the concept of correct quantities. Progression is demonstrated by an increase in the depth of knowledge by a move from a general concept of balance to a specific scientific concept with the link to quantities. The area is further extended to include examples of deficiencies, disease and malnourishment, and health effects of excesses of some minerals such as salt. In Y8 there is development of pupils’ scientific vocabulary and pupils’ ability to understand abstract concepts such as how enzymes work. In Y9 there is further development of their scientific language to include words such as malnourished.

I will now identify concerns regarding progression in connection to the content of the SoWs, identifying potential inconsistencies and where there is content that might be open to a variety of interpretations within KS1 and KS2.

An area where progression might be questioned is in relation to the term ‘diet’. In the Y3 Unit 3A (QCA, 1998b) the objective reads: ‘That an adequate and varied diet is needed to keep healthy’ and in Y5 SoW 5A: ‘That to stay healthy we need an adequate and varied diet'. These objectives display a tautology and it is difficult to see any difference in the outcome of these two objectives although this would be dependent on how the material is revisited. It would appear that within the QCA SoWs the progression is not evident between the first and second time the concepts are revisited in KS2. Some might regard this as reinforcement of the material whilst others may feel this is unnecessary repetition.

When reviewing the objectives directly connected to the consumption of food in Y1, Y2 and Y3 we can see that in Y1 the pupils are introduced to the concept that we need to eat and drink stay alive. In Y2 the pupils are taught that the important component of drink is water. In Y3 pupils are acquainted with the term 'feed', and it would also appear that the pupils are introduced (indirectly) to the fact that humans are animals. However, when the QCA SoWs were reviewed in greater depth looking at other objectives not directly connected to food, it is apparent that Y1 pupils are introduced to the concept of humans as animals within Unit 1A with this objective: 'That the term animal includes humans'. In addition, this introduction is prior to the objective 'That we need to eat and drink to stay alive'. In other words Y1 pupils should already have been taught that humans are animals when they reach Y3. So, although it would appear at first sight that progression is evident in these SoWs, if pupils have been taught according to all the objectives this might not be the case.

Progression is also questionable in another area with the use of 'drink' in Y1 and 'water' in Y2. It would appear Y2 pupils are progressed by identifying the important component of drinks as water. However, part of the Y1 SoW, Unit 1A, is to 'discuss…the needs of our pets' and 'ask children about the food and drink taken by different, familiar animals eg (*sic*) cats, dogs'. A teacher might therefore begin: 'Put your hand up if you own a pet. Now can you tell me what you give your pet to drink?'. The majority of pets will naturally be given water. Thus, the linkage of water and drinking will have been made in Y1. This may mean that the objectives show limited progression and may lead solely to the repetition of concepts between and within key stages.

The next stage of the analysis was to consider the greater detail of the QCA SoWs beyond the objectives, including all the text (that appeared in the sections: about the unit, expectations, resources, points to note, possible teaching activities, learning outcomes, vocabulary, etc.) as described in Section 3.2. An Excerpt of this analysis is shown in Table 4.4.

When reviewing Table 4.4, it is firstly apparent that progression observable in the objectives is also seen in the concepts and keywords included in the schemes. For example, teeth: name and functions, appears in KS2, and the structure and function of the digestive system appears in KS3, thus directly reflecting the progression shown in the objectives. Further, food types appear in KS1 and KS2, and food groups appear in KS3.

When the concepts are viewed across and within the key stages a few concepts are covered on three or more occasions and I would suggest this might begin to show some repetition or a lack of progression. This is especially so if the way pupils are interacting with the material remains the same. These concepts include: food types in groups

Keywords and Concepts	Y1	Y2	Y3	Y5	Y8	Y9
What we eat and drink	*					
Food types in groups (human) vegetables, fruit, bread, rice, cheese, meat		*	*	*		
Food groups (as fats, carbohydrates proteins, etc.)					*	
Water		*			*	
Fats, Starch and Sugar			*	*	*	
Carbohydrates, Proteins, Fibre, Vitamins and minerals					*	
Vitamins and minerals					*	
Humans and other animals need food and drink to stay alive	*					
Food needs of our pets	*					
Food for activity and growth			*		*	
Meat, fish, cheese, lentils, beans for growth			*	*		
Fats, sugars and starches to be active			*	*		
Food group uses: fats, carbohydrates, protein, fibre, vitamins and minerals, water.					*	
Nutrients needed for a healthy diet						*
Adequate diet		*	*	*		
Diet is balanced		*				
Varied diet			*	*		
Healthy and varied diet				*		
Balanced diet-description			*	*	*	*
Water supplied by		*			*	
Fats, starch and sugar supplied by				*	*	
Carbohydrates supplied by					*	
Proteins supplied by					*	
Fibre supplied by					*	
Effects of too much salt					*	*
Vitamins and minerals supplied by				*	*	
Specific deficiencies lead to specific diseases (rickets)						*
Evidence for specific nutrient deficiencies						*
Ethical issues in scientific research -drugs						*
Evaluating conflicting evidence						*
Names and functions of teeth: Incisors, canines, molars			*			
Structure and function of digestive system					*	
Enzymes					*	
Blood carries products of digestion around the body					*	
Utilisation of food depends on digestive, respiratory and circulatory system						*
Respiratory system						*

Table 4.4 Excerpt of the QCA schemes of work analysis of keywords and concepts

(human) vegetables, fruit, bread, rice, cheese, meat covered in Y2, Y3 and Y5; an adequate diet covered in Y2, Y3 and Y5; and a balanced diet including a description in Y3, Y5, Y8 and Y9.

This part of the analysis also revealed that some terms, restricted to KS3 in the objectives, also appear in the main body of the text for KS2, for example, the concept of balanced diet and the food groups including fats, starches and sugars. In order to clarify any potential inconsistencies between these data and the objectives, the main body of the text was analysed in greater detail looking specifically at the structure and content of the paragraphs describing the content and activities.

During this part of the analysis it was apparent that the text describing the content becomes confusing and open to different interpretations by teachers. An example of this is when the term ‘balanced diet’ should be introduced. If you look only at the learning objectives, then the notion of balance is first covered in the objectives in Y8 where it states in Unit 8A ‘that a healthy diet contains a balance of foodstuffs’ and in other sections entitled ‘Which foods provide a balanced diet?’. This would directly tie in with the NC PoS introducing this concept in KS3. However, the phrase begins to appear in the KS1 QCA SoW for Y2 where in Unit 2A it outlines how some pupils will be able to ‘describe how their diet is balanced’. Note how they use the term ‘balanced’ in relation to diet and yet the NC PoS does not introduce the term ‘diet’ until KS2 and ‘balanced’ until KS3. The QCA are therefore suggesting that some pupils will have an understanding of the concept of ‘balance(d)’ two key stages earlier. However, this may be an attempt by the QCA to show potential for differentiation. I suspect that a Y2 pupil could potentially adopt and use the phrase relatively easily, but may not grasp the true scientific interpretation as covered in KS3. The first use of the full phrase ‘balanced diet’ is in SoW for Y3 where in Unit 3A it firstly sets the objective:

Children should learn:

> …that an adequate and varied diet is needed to keep healthy

It then describes the activity:

> Ask children to describe using drawings and writing how they aim to have a balanced and varied diet. Talk with the children about different diets and explain the scientific use of the word 'diet'.

Then it describes the learning outcome

Children should be able to:

> …describe a varied and balanced diet suggesting some foods that are needed for growth and some that enable us to be active.

So the objective did not mention ‘balanced diet’ at all, instead using the terms ‘adequate’ and ‘varied’ (the phrases stated in the KS2 NC PoS), but the activities suggest it and the learning outcome clearly states it.

The full phrase reappears in the text in for Y5 SoW Unit 5A; twice appearing on the ‘about the unit’ page. Firstly, in the ‘where this unit fits in’ column it states:

Children need:

> …to understand that a balanced diet is important for health.

Further in the vocabulary section:

> In this unit children will have opportunities to use:
>
> - words and phrases related to health *eg (sic)* balanced diet, side effect.

Finally, it appears twice in the activities sections. However, the term is not used at all in the objectives preferring to use the term ‘adequate and varied diet’, that is, the phrase that appears in the Y3 SoW. I cannot understand why so many terms are necessary and why you would use one term for the objective and a second for the outcome. From reading the information in its entirety I would suggest that the QCA probably intends the phrase to be introduced at some point in KS2 but this by no means clear. This could make it open to a variety of interpretations by teachers.

The main body of the text in the QCA SoWs could also be open to different and possibly conflicting interpretations, exemplified by the mixing of scientific and non-scientific terms and contradictory statements appearing in the same paragraph. For example, the Y5 SoW Unit 5A, states:

> Help children to use secondary sources eg (*sic*) reference books, CD-ROMs, leaflets from supermarkets, health centres and pharmacies to find out about foods which are rich in fats/oils, those which are rich in sugars/starch and those which provide materials needed for growth…. Help children to produce a display illustrating adequate and varied diets or a week's menus which provide a varied and balanced diet.

Thus, when talking about fats, sugars and starches, the QCA SoW starts by using the correct scientific terminology for the nutrients but then switches to foods ‘provide materials needed for growth’; the SoW does not use the scientific term ‘protein’ in this instance. This partial use of the scientific terms may ultimately lead to the complete introduction of all the scientific terms for food groups earlier than intended. The final sentence of the excerpt appears to be inconsistent with the use of ‘adequate and varied’ and then ‘varied and balanced’. This mix of terms could lead to confusion, especially as neither phrase is defined.

Another point of concern with this excerpt is the logic of introducing the terms ‘starch’ and ‘sugars’ before the term ‘carbohydrates’. I assume the authors thought that pupils would have already heard of ‘sugar’ and this would provide an existing schema for the development of learning (Section 2.3). But ‘starch’ is not a word that is in common usage by the general public these days or by young children. I am also uncomfortable with the introduction of a ‘sub-type’ prior to the introduction of the ‘type’. In my opinion, it is more logical to classify items from big groups such as ‘trees’ to small groups such as ‘oak trees’, ‘beech trees’ or ‘ash trees’. So it makes less sense in this case to define a group (carbohydrates) by its sub-types (starches and sugars). This point has been further developed in Ryland (2009).

Another example of a possible conflict of interpretation occurs in QCA Y5 SoW 5A where it states:

> At this stage children do not need to be able to classify foods formally into groups such as protein or carbohydrate. However, they should know that some foods eg (*sic*) fish, meat, cheese and some vegetables provide materials necessary for healthy growth while other foods eg (*sic*) starches and sugars are more immediate sources of energy for activity, and that fruit and vegetables provide other essentials eg (*sic*) fibre. Most children should be able to understand that energy foods are of two types - carbohydrates (starches and sugars) and fats.

Note that at the beginning of the paragraph it states that pupils do not need to be able to classify foods as carbohydrates, but then the last sentence contradicts this. This paragraph does not therefore hold internal consistency and gives contradictory statements. This may ultimately leave the reader with the notion that carbohydrates should be introduced at this time, and illustrates apparent inconsistencies in the guidance produced to implement the NC PoS.

In the previous paragraphs, I have given a critique of progression outlined in the objectives and content of the F&HE topic within the QCA SoWs. Progression was demonstrated in a number of ways, including an increase in the depth of knowledge by the development of language from personal and everyday to scientific; and in the move from the understanding of concrete to abstract ideas. I also detailed concerns with an apparent lack of progression demonstrated by the objectives when the topic is revisited within KS1 and 2. Finally, I raised concerns regarding how the QCA SoWs may be open to a variety of potentially conflicting interpretations. I will now consider progression with how this content is intended to be addressed through an exploration of the T&LAs.

The QCA SoWs suggest a variety of T&LAs and resources. An excerpt of these is shown in Table 4.5. The method employed in the development of the table was discussed in Section 3.2. The content of the table has been arranged so that similar activities are grouped together so that progression could be better analysed.

Teaching and learning activities	Y1	Y2	Y3	Y5	Y8	Y9
Teacher demo				*	*	*
Discussion	*	*	*	*	*	***
Debate					*	*
Survey of food eaten	*	*				
Favourite food survey		*				
Planning a meal		*		*		
Planning a menu				*		
ICT-make pictogram		*	*			
ICT-to help make fact sheets			*			
ICT-make database of food types				*		
ICT- spreadsheets, graphing and DTP software				*	*	
ICT- simulation software illustrating digestion					*	
ICT-diet analyser					*	
ICT-data logging pulse rate						*
ICT- simulation breathing						*
ICT- simulation of how food is utilised						*
ICT- simulation joints/exercise						*
Looking at Leaflets		*		**	*	
Video		*	*	***	**	*****
CD ROM fact find			*	**	**	
Making poster display or leaflet				*	**	*
Food labels/packets			*	*	*	
Simple charts	*	*				
Charts		*				
Block graph		*				
Pictogram		*	*			
Bar chart			*	*		
Tables			*			
Graph				*		
Line graph (interpret)				*		
Venn diagram (make)					*	
Flow chart						*
Food testing – pupil complete					*	
Pupils making models (animals)	*					
Models		*	*	**	**	**
Real teeth			*			
Heart dissection extension activity						*
Examine own teeth			*			
Investigation				*		*

Key: * indicates one occasion during unit, ** indicates two occasions during unit, etc.

Table 4.5 Excerpt of the QCA schemes of work analysis of teaching and learning activities

The SoWs did show some elements of progression in some T&LA. For example, within the use of ICT, pupils are progressed by an increase of challenge, or from a move from a simple to complex activity, by making a pictogram (Y2 and Y3) to making spreadsheets (Y5 and Y8). Progression can also be observed in the area of graphs and charts when pupils progress from making simple charts in Y1 and simple charts and block graphs in Y2, to interpreting line graphs in Y5 and producing Venn diagrams in Y8 and flow charts in Y9.

Regarding the use of T&LA, the QCA SoWs may also display some limitations, in particular in the repetitive use of some activities. For example, some T&LA, such as ‘discussion’, appear every year. I would not necessarily deem this to be repetitious or lacking in progression as long as the focus of the activity changes. There is also some progression in this area as in Y8 and Y9 ‘debate’ is included. Other activities, although appearing less frequently, may be more repetitious, for example, a survey of foods eaten appears in Y1 and Y2. This appears to show a lack of progression as it seems to be the same activity repeated in consecutive years within the same KS.

There is, however, potential for progression in the analysis of results of such surveys since in Y1 it is suggested that pupils present their results using ‘simple drawing or charts’ and in Y2 using ‘block graphs’. Similarly, ‘planning’ a meal appears in Y2 and Y5. This does show progression because in Y2 a single meal is planned and in Y5 the activity is expanded to include a full menu for a week. This activity, however, may feel repetitious for the pupils if they do not recognise the increased challenge of the Y5 activity. That is, pupils may remember planning a meal before and therefore find the activity repetitious.

Some activities may appear very repetitious even within years. For example, in the Y5 and Y9 SoW a video is suggested on three and five occasions, respectively. For the Y5 pupils the topic of the first two video suggestions is similar as both regard aspects of the heart structure and function. It is therefore possible that a single video may cover both aspects. On the third occasion pupils are to observe the effects of alcohol and drugs. The Y9 video suggestions all have different themes, including how energy from food is utilised, how air is drawn into and expelled from the lungs, specific aspects of the effects of smoke components on cardiovascular function and on developing babies, the effect of alcohol on reaction time and driving skills, and the structure and function of joints and muscle systems. Clearly the topic of the video may offer pupils progression in the understanding of content. However, as the units are around 9-10 hours long, it may appear excessive to include three to five videos unless they were particularly short in length or were used in connection with differing active watch activities. Further, videos used in this manner, despite offering progression in content, may feel repetitious for the pupils.

Popular within the QCA SoWs is the use of models, suggested for use in all years, on a total of eight occasions. However, real specimens are only suggested in Y3 when discussing teeth and in Y9 with a heart dissection suggested only as an extension activity (for high-ability pupils). If real specimens were to be used in later years for all pupils, then this may have provided progression due to the increased challenge of handling and preparing real specimens. This may therefore be a missed opportunity for providing progression for all pupils.

During the QCA SoWs for KS1 to KS3 experiments to be completed by the pupil are suggested on a total of eight occasions, while teacher demonstrations or ICT simulations appear more frequently. Pupils' views on the frequency of these types of activities will be examined in Section 5.3 during discussion of the direct consultation part of the study.

As the QCA SoWs are non-statutory and, further, give a range of activities teachers might complete, it must be noted at this stage that even though some activities appear repetitive this may not be reflected in lesson plans. That is, teachers may choose their preferred activities and ignore others.

In this section I have outlined how, in some units of the QCA SoWs, progression in T&LAs is shown by the increase in challenge or complexity of the activity in areas including ICT use and presenting data in graphs. Further, I have suggested areas where progression in the use of T&LAs is possibly less clear, including the use of discussions and video clips. In the following paragraphs further analysis is completed to compare individual years of the QCA SoWs.

This analysis was performed by finding the total numbers of keywords and concepts and T&LAs for each academic year. Initially, I did this to assess if progression was evident due to an increase in the total number of variables, as this was one of the ways the QCA (2007d) illustrated how progression might be achieved (Section 2.2). The total numbers of keywords and concepts are shown in Table 4.6 and the trend is shown in Figure 4.2.

Total number of	QCA Y1	QCA Y2	QCA Y3	QCA Y5	QCA Y8	QCA Y9
Visit	1st	2nd	3rd	4th	5th	6th
Concepts/ keywords	8	15	32	45	50	48
Teaching and learning activities	8	13	21	25	35	28

Table 4.6 Total numbers of keywords and concepts and teaching and learning activities found in the QCA schemes of work

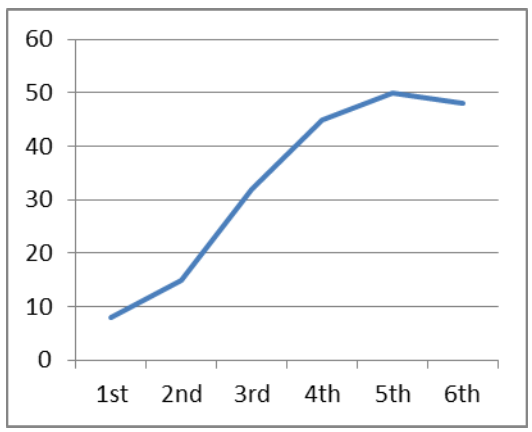


Figure 4.2 Graph to show the total number of keywords and concepts in each visit within the QCA schemes of work

The graph displays a steep increase in total numbers of keywords and concepts in KS1 (1st visit and 2nd visit) and KS2 (3rd and 4th visit) before a levelling off in KS3 (5th and 6th visit). The greatest increase is from the 2nd visit in Y2 to the 3rd in Y3 and this coincides with governmental targets of when pupils should become ‘free readers’ in Y3 (personal communication [email] with the QCA, May 2009). That is, if you have become a free reader in Y3 it makes sense that you would be able to cope with a greater number of variables (keywords and concepts) than a non-free reader. This displays progression by pupils moving from interacting with fewer to more variables. The levelling off in KS3 is less easily explained, but perhaps indicates a maximum number of concepts that can be covered effectively in a set time. That is, if too many concepts are introduced the pupil may not be able to learn them all, or that additional time is required for the understanding of the more complex concepts. Further, this may also indicate that the complexity of the concepts has increased. It should be noted at this stage that this measure of progression may be crude as it does not account for how the pupils are interacting with the material. For example, the pupils may interact with fewer concepts but with greater skills of evaluation (Section 2.2.1).

The number of T&LAs suggested by the QCA is also shown above in Table 4.6. These increase year on year until Y9 when there is a decrease. The increase possibly reflects the number of activities required to cover the increasing number of concepts.
In summary, the QCA SoWs showed progression **across** the KS1, KS2 and KS3 and within KS3 in the area of content and in T&LAs. Limited progression was displayed in content **within** KS1 and KS2 between the first and second time the unit is revisited within a single KS. A small number of concepts appeared to be repetitive as they featured the QCA SoWs in three or more years. The QCA SoWs were also identified as being open to a variety of interpretation. Some potential for limited progression was also observed in

the area of T&LAs with repetitive use of some activities, but this would depend on how the QCA SoWs were implemented by teachers.

4.3.2 Progression in the schools' schemes of work

In this section I present my analysis of the schools' SoWs. The sample primary school uses the QCA SoWs as covered in Section 4.3.1. Their teachers, when developing lesson plans, add to or take away content covered in the QCA SoWs at their own discretion. This is how the QCA intended them to be used (QCA, 1998a). I was not given access to individual lesson plans as these were the personal documents of the teachers so I was unable to identify what they contained. I therefore suggest that the comments regarding the QCA SoWs (Units 1A, 2A, 3A and 5A) discussed above would hold true for the primary school's SoWs. An indication of progression as implemented by an individual teacher may be evident in the pupils' exercise books which will be described in Section 4.4.

The remainder of this section explores the secondary school SoWs as these were developed from the NC PoS (as was confirmed by the HoD and KS3 Coordinator during the interview) and were not adapted from the QCA SoWs. An excerpt of the lesson objectives from the school SoWs is shown in Table 4.7. Although the Y8 SoW gives the statements as 'lesson objectives' they actually appear to be 'learning outcomes' because they detail what pupils should be able to do as a result of the teaching and learning. These so-called 'objectives' are differentiated into all, most and some pupils. Despite this confusion of terms, it is possible to deduce what the objective should be for each set. For

Year	Lesson objectives
8	All pupils will be able to **state** the main food groups and give some examples
8	Most pupils will be able to **explain** the role of each food group within the human body
8	Some pupils will be able to remember the specific tests for each food group
8	All pupils will be able to **define** digestion
8	Most pupils will be able to outline the digestive route
8	Some pupils will be able to **explain** the function of each organ in more detail
8	All pupils will be able to **state** that enzymes are non-living proteins
8	All pupils will be able to **describe** the function of enzymes
8	Most pupils will be able to **explain** that enzymes are specific
8	Some pupils will be able to **explain** the above using the lock and key model
8	All pupils will be able to **describe** the structure of the small intestine
8	Most pupils will be able to **relate** the structure of the small intestine to its function
9	A healthy diet contains the right balance of the foods you need to give you the right amount of energy
9	A person is malnourished if their diet is not balanced; this may lead to the person being too fat or too thin. It may also cause deficiency diseases
9	To **evaluate** information about the effect of food on health
9	Cholesterol is carried around the body by two types of lipoproteins. Low density lipoproteins are bad.
9	Saturated fats increase blood cholesterol levels. Mono-unsaturated and polyunsaturated fats may help both reduce blood cholesterol levels and improve the balance between LDLs and HDLs.
9	To **evaluate** the effect of statins on cardio-vascular disease
9	To **evaluate** claims made by slimming programmes

Table 4.7 Excerpt of the secondary school's scheme of work analysis of lesson objectives

example, the first two rows of the Y8 statements mention the food groups. A suitable objective could be for pupils to 'learn the food groups with examples and the role of each in the human body'. This would show progression from the equivalent section of the KS2 QCA SoWs because pupils in KS2 learn about types of food (meat, rice, etc.) and therefore pupils progress in their understanding by an increase in their depth of knowledge and by a development of their scientific language.

The secondary school's SoW differs from the QCA SoW because the QCA SoWs do not differentiate the objectives. However, the QCA do differentiate the outcomes in the 'expectations' section of the relevant unit. Due to this differentiation in the school's Y8 SoW it displays an understanding that pupils differ in their abilities and that some may progress at different speeds than others. It is also possible that these differentiated objectives allow pupils to progress in key skills within the unit. The first two objectives show progression because all pupils will be able to state the main food groups and most will be able to explain their roles. Potentially some pupils may move from stating to explaining. This is an example of how progression is exemplified by an increase in academic challenge or development of skills.

This pattern is mirrored in other objectives where all pupils can describe the function of enzymes, most can explain that they are 'specific', and some will be able to explain the abstract lock and key model (that illustrates the specificity of enzymes). This type of differentiated objective may therefore aid the progression of some pupils.

In the school's SoW for Y9 the lesson objectives do appear to be 'learning objectives' and not lesson outcomes. They are not differentiated and they state what the pupils should learn during the lesson. They appear to show progression from the school's Y8 SoW. Pupils progress from knowing the food groups and their roles in the body in Y8 to knowing how these food groups need to be in the correct balance to avoid being malnourished or 'too fat or too thin'. This provides progression because it increases the depth of understanding of the concepts. Pupils also progress from learning about fat in the diet to learning about saturated and unsaturated fats, thus moving from concrete to abstract ideas, developing the use of scientific language and increasing the depth of coverage. There is also development in academic challenge from the Y8 to Y9 scheme. Y8 pupils state, describe and explain, while progress in Y9 is achieved by evaluating material (the highest skill in Bloom's taxonomy). Although, as outlined in Section 2.4.2, there is debate in the literature questioning the validity of the assumption that evaluating is truly the highest skill.

The secondary school's SoWs do show progression in the lesson objectives despite the confusion over the terms. To get a clearer picture of progression within the school's SoWs all the text contained in the schemes was subjected to further analysis. This also enabled further comparison with the analysis of the QCA SoWs.

An excerpt of the documentary analysis of content of the secondary school SoWs considering all the text, not just the objectives, can be found in Table 4.8. I have also included within the table the data from the QCA SoWs for Y1, Y2, Y3 and Y5 because the primary school uses these schemes unaltered. When the SoWs were viewed across all six years progression was evident in some areas. This was indicated by the introduction of new concepts, by greater detail being covered each time the topic was revisited, or by the development of the scientific language. For example, in Y2 pupils learn that food and can be placed into groups: vegetables, fruit, bread, rice, cheese, meat. In Y3, pupils are introduced to some of the scientific nomenclature for food groups: fats and sugars and starches, and are taught the names and functions of teeth. In Y5 pupils learn that fats, sugars and starches, vitamins and minerals are supplied by a range of foods, therefore

Keywords and Concepts	Y1	Y2	Y3	Y5	Y8	Y9
What we eat and drink	*					
Food types in groups (human) vegetables, fruit, bread, rice, cheese, meat		*	*	*		
Food groups (as fats, carbohydrates, proteins, etc.)					*	
Water		*			*	
Fats, Starch and Sugar			*	*	*	
Carbohydrates, Proteins, Fibre, Vitamins and minerals					*	
Vitamins and minerals					*	
Humans and other animals need food and drink to stay alive	*					
Food needs of our pets	*					
Food for activity and growth			*			
Meat, fish, cheese, lentils, beans for growth			*	*		
Fats, sugars and starches to be active			*	*		
Food group uses: fats, carbohydrates, protein, fibre, vitamins and minerals, water.					*	
Adequate diet		*	*	*		
Diet is balanced		*				
Varied diet			*	*		
Healthy and varied diet				*		
Balanced diet-description			*	*	*	*
Nutrient/Type supplied by					*	
Water supplied by		*			*	
Fats, starch and sugar supplied by				*	*	
Carbohydrates supplied by					*	
Proteins supplied by					*	
Fibre supplied by					*	
Vitamins and minerals supplied by				*	*	
Health effects: Obesity, Malnourished						*
Salt/blood pressure links						*
Cholesterol health issues						*
Names and functions of teeth: Incisors, canines, molars			*			
Structure and function of digestive system					*	
Enzymes					*	
Food tests					*	

Table 4.8 Excerpt of the schools' schemes of work analysis of keywords and concepts

providing progression by increasing their depth of knowledge. In Y8 the scientific nomenclature for food groups is covered, including fats, carbohydrates, proteins, fibre, vitamins and minerals and water. Finally, in Y9 the adverse effects of diet on health are covered.

Some concepts are revisited twice across the SoWs, such as the notion of a 'varied diet' which is covered in Y3 and Y5. This may initially suggest only limited progression. However, the academic challenge of how the pupils are interacting with the material may offer progression. For example, pupils may move from describing a varied diet to explaining the importance of it.

The concept of 'a balanced diet, including description', which appeared to be repetitive in the QCA SoWs, and therefore the primary school's SoWs, also appeared to be repetitive in the secondary's schools SoWs for Y8 and Y9.

Some additional analysis was undertaken to look at the total number of keywords and concepts found in the schools' SoWs (Table 4.9).

Total number of	School/ QCA Y1	School/ QCA Y2	School/ QCA Y3	School/ QCA Y5	School Y8	School Y9
Keywords/Concepts	8	15	32	45	55	18

Table 4.9 Total numbers of keywords and concepts found in the schools' schemes of work

It was found that in Y8 the SoW had 55 keywords and concepts, which is similar to the number found in the QCA scheme (50). However, in Y9 only 18 keyword and concepts appeared in the school SoW compared with the 48 found in the QCA SoW (previously shown in Table 4.6). Additional analysis was therefore undertaken to compare the content of the QCA SoW for KS3 with the School's own SoW. It was found that the secondary school SoW mirrors the QCA SoW in Y8 with a 54% agreement of the school to the QCA SoW, that is, 54% of the QCA's keywords and concepts appeared in the school SoW. In Y9 there is much less agreement between the school SoW and the QCA SoW, with only 4% agreement, although they do cover some similar concepts such as 'balanced diet' and health effects of 'poor diet'. This disparity seems to be due to the secondary school beginning GCSE work in Y9. It appears that they may have cut out material not relevant to the GCSE and also included new material that does not appear in the QCA SoW such as 'cholesterol'.

The school's SoW for Y8 is similar in the amount of teaching time allotted for the unit to that of the QCA SoW, as both are approximately 8 hours long. The school's SoW for Y9 is much shorter at 4-5 hours. This is because the food topic forms a subtopic of a much larger GCSE module/unit. The school's Y9 subtopic therefore contains fewer keywords and concepts than the QCA unit.

In summary, the secondary school's SoWs do show progression in content in a similar way to the QCA by increasing the depth of knowledge, by the development of scientific knowledge, and with the understanding of abstract ideas.

The next stage of the research was to analyse the detail of T&LA within the schools' SoWs (Table 4.10). The detail of the QCA SoWs has again been included for the primary school's SoWs because they use the unaltered schemes. The progression contained within the T&LAs in the KS1 and KS2 schemes has therefore been outlined in Section 4.3.1. Progression in the secondary school's SoWs is also demonstrated in a similar way to the QCA SoWs, for example, in the use of ICT where pupils in Y8 produce a PowerPoint presentation and those in Y9 use ICT to analyse their diets.

As with the QCA SoWs some T&LAs that appear repetitive, such as discussion and the use of videos, would not necessarily be indicative of limited progression if the topic chosen for discussion or shown in the video changes as discussed earlier. However, occasionally the same activity appeared twice in a single year's SoW, for example in Y8 when making posters or leaflets. I am unsure if any teacher would seek to complete all the activities in the SoW and assume that teachers would only use such activities once per unit. This will be further clarified when reporting on the pupil and teacher consultations (Chapter 5 and Chapter 6, respectively).

Teaching and learning activity	Y1	Y2	Y3	Y5	Y8	Y9
Teacher demonstration				*		
Discussion	*	*	*	*	**	
Pupil teaching pupil					*	
Visit by vegan, vegetarian or restaurant owner			*			
Visit by school nurse or health professional (tooth decay)			*			
Favourite food survey		*				
Survey of food eaten	*	*				
Survey of pet foods	*					
Planning a meal or menu		*		*		
ICT-make pictogram		*	*			
ICT-to help make fact sheets			*		*	
ICT-make database of food types				*		
ICT- spreadsheets, graphing and DTP software				*		
ICT-produce PowerPoint on organ functions in digestion					*	
ICT-diet analyser						*
Leaflets		*		**		
Video		*	*	***	*	*
Reference books			*	*		*
Make poster display or leaflet				**	*	
Make fact sheet			*			
Food labels/packets			*	*		*
Drawing	*	*	**			
Simple charts	*	*				
Charts		*				
Block graph		*				
Pictogram		*	*			
Bar chart			*	*		
Tables			*			
Graph				*		
Line graph				*	*	
Experiments/food testing (chemical testing) Demo					*	*
Food testing – pupil complete					*	
Pupil participation demonstration					**	
Pupils making models (animals)	*					
Models		*	*	**	**	
Real teeth specimens and examining own teeth			*			
Measuring pulse rate				*		
Investigating effects of exercise				*		
Visking tubing experiment					*	

Key: *indicates one occasion during unit, **indicates two occasions during unit, etc.

Table 4.10 Excerpt of the schools' scheme of work analysis of teaching and learning activities

As with the QCA SoWs I analysed the total number of T&LAs that appeared in the school's SoWs (Table 4.11). The secondary school's SoW was not based on the QCA SoWs and displayed a slight decrease in the total number of T&LAs in Y8 from Y5 and a large decrease in Y9. Fewer T&LAs appeared in the secondary school SoWs than in the QCA (data for the QCA were previously shown in Table 4.6) in both Y8 (35) and Y9 (28). The fewer T&LAs suggested by the school's SoWs may either be a reflection of a resources issue, that is, they may not have the equipment or software to provide certain activities, or a consequence of the school SoWs suggesting fewer activities to choose from to teach each objective. It may also be the case that activities used by the teachers might not be shown in the SoW at all.

Total number of	School/ QCA Y1	School/ QCA Y2	School/ QCA Y3	School/ QCA Y5	School Y8	School Y9
Teaching and learning activities	8	13	21	25	21	8

Table 4.11 Total number of teaching and learning activities found in the schools' schemes of work

I also analysed the percentage agreement of T&LAs in the secondary school's SoW with the QCA SoW for each corresponding year. There is a 17% agreement of the school SoW to the QCA SoW in Y8, reducing to 7% agreement in Y9.

In addressing RQ1b, the QCA SoWs used by the primary school illustrates progression in several ways when viewed at the key stage level (across key stages 1-3 at the macroscopic level). Limited progression cause by repetition of content has been identified within KS1 and KS2.The secondary school SoWs shows progression from KS2 to KS3 and within KS3.

4.4 Progression in Teaching and Learning of Food and Healthy Eating as covered in the Pupil Exercise Books

Data were collected from either two or three exercise books belonging to pupils in each of the sample classes from Y2, Y3, Y5, Y8 and Y9. All eleven exercise books in the analyses were selected by the teachers to represent pupils with 100% attendance and completion of all homework during the F&HE topic and therefore provided an indicator of the curriculum experienced by the whole class. As the lesson objectives were not included in the exercise books, I concentrated my analysis on keywords and concepts, and T&LAs.

Section 4.4.1 explores progression in pupils' exercise books and Section 4.4.2 details some comparative analysis of the exercise book data with that from the NC PoS and the SoWs analyses (previously discussed in Sections 4.2 and 4.3, respectively).

4.4.1 Progression in pupils' exercise books

The first part of the analysis considered keywords and concepts evident in pupils' exercise books. An excerpt of the analysis can be found in Table 4.12. Progression was observed in the exercise books in some areas. For example, in Y2 pupils learnt the names of the different types of teeth and in Y3 they learnt the functions of the different types of teeth. This is progression exemplified by an increase in the depth of knowledge about teeth. In Y5 pupils were progressed further in their knowledge of digestion by learning

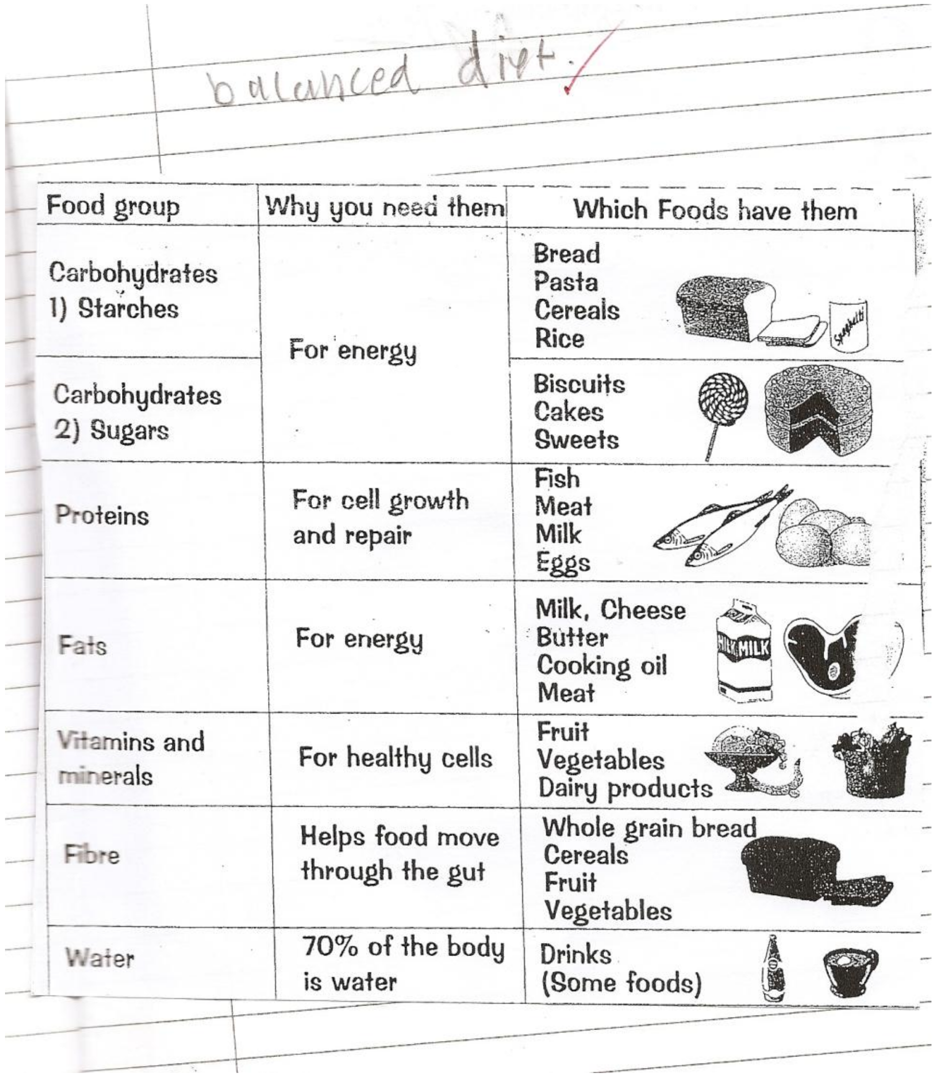
Keywords and or Concepts	Y2	Y3	Y5	Y8	Y9
Food types in groups (human) vegetables, fruit, bread, rice, cheese, meat	*				*
Food types in groups e.g. bread and grains group	*				
Food groups		*	*	*	*
Fats, Proteins	*	*	*	*	*
Sugar, Water		*	*	*	
Fibre, Vitamins and minerals		*	*	*	*
Fats and Proteins supplied by	*	*	*	*	*
Water		*	*		
Carbohydrates supplied by	*	*	*	*	*
Starch supplied by		*	*	*	
Sugar supplied by		*	*	*	
Fibre and vitamins and minerals supplied by		*	*		*
Food for activity and growth		*			*
Meat, fish, cheese, lentils, beans for growth					
Fats, sugars and starches to be active					
Fats- Energy		*	*		*
Fats- Insulation			*		*
Carbohydrates-Energy	*	*	*	*	*
Protein for growth	*	*	*	*	*
Vitamin/min-keep healthy		*	*		*
Variety of foods linked to staying healthy	*				
Variety (of foods)	*				
Concept of diet					
Varied diet and/or Adequate diet					
Healthy and varied diet					
Healthy diet				*	
Healthy balanced diet					
Diet is balanced					
Balanced diet-description		*	*	*	*
Healthy/Unhealthy		*	*		*
Malnourished					*
Cholesterol health issues					*
Names of teeth : Incisors, canines, molars, premolars	*	*	*		
Functions of teeth		*	*		
Structure and function of digestive system			*	*	
Digestion e.g. fats to fatty acids glycerol				*	
Role of enzymes				*	
Food tests				*	

Table 4.12 Excerpt of the pupils' exercise book analysis of keywords and concepts

the structure and function of the digestive system, thus increasing the depth of knowledge and increasing their scientific vocabulary. When the topic was revisited in Y8, pupils were taught about enzymes, food tests and the chemical process of digestion, and therefore progressed by having to deal with more abstract concepts. In Y9 the wider health effects of diet were covered. This allowed pupils to develop skills of evaluation when considering the health effects of a poor diet.

Apart from these areas where progression was evident, the analysis also uncovered several areas of concern. Firstly, there was evidence of the early introduction of scientific terms for the food groups such as ‘carbohydrate’ and ‘protein’. Both Y2 exercise books from the sample school contained these terms. Therefore, pupils were being introduced to terms in KS1 that, according to the NC PoS, should be introduced in KS3. Not only were these terms introduced in Y2, they were repeatedly covered in all the sample years. This is clear evidence of repetition of taught material. The sources and uses of the food groups, fats, carbohydrates and proteins, were also repetitively covered in all the sample years. Similarly, the concept ‘balanced diet’ was introduced in Y3 (KS2) and repeated in all other sampled years and again ‘balanced diet’ only appears in the NC PoS for KS3.

Figure 4.3 is an example of Y3 classwork that shows, firstly, the food groups: uses and sources, were considered to be so important that it warranted a photocopied table containing all the information and, secondly, that the pupil has correctly answered a question (text not shown in figure) with the words ‘balanced diet’ therefore confirming its use with Y3 pupils. Thirdly, the photocopied table twice refers to ‘cells’. Cells are a KS3



balanced diet.

Food group	Why you need them	Which Foods have them
Carbohydrates 1) Starches	For energy	Bread Pasta Cereals Rice
Carbohydrates 2) Sugars		Biscuits Cakes Sweets
Proteins	For cell growth and repair	Fish Meat Milk Eggs
Fats	For energy	Milk, Cheese Butter Cooking oil Meat
Vitamins and minerals	For healthy cells	Fruit Vegetables Dairy products
Fibre	Helps food move through the gut	Whole grain bread Cereals Fruit Vegetables
Water	70% of the body is water	Drinks (Some foods)

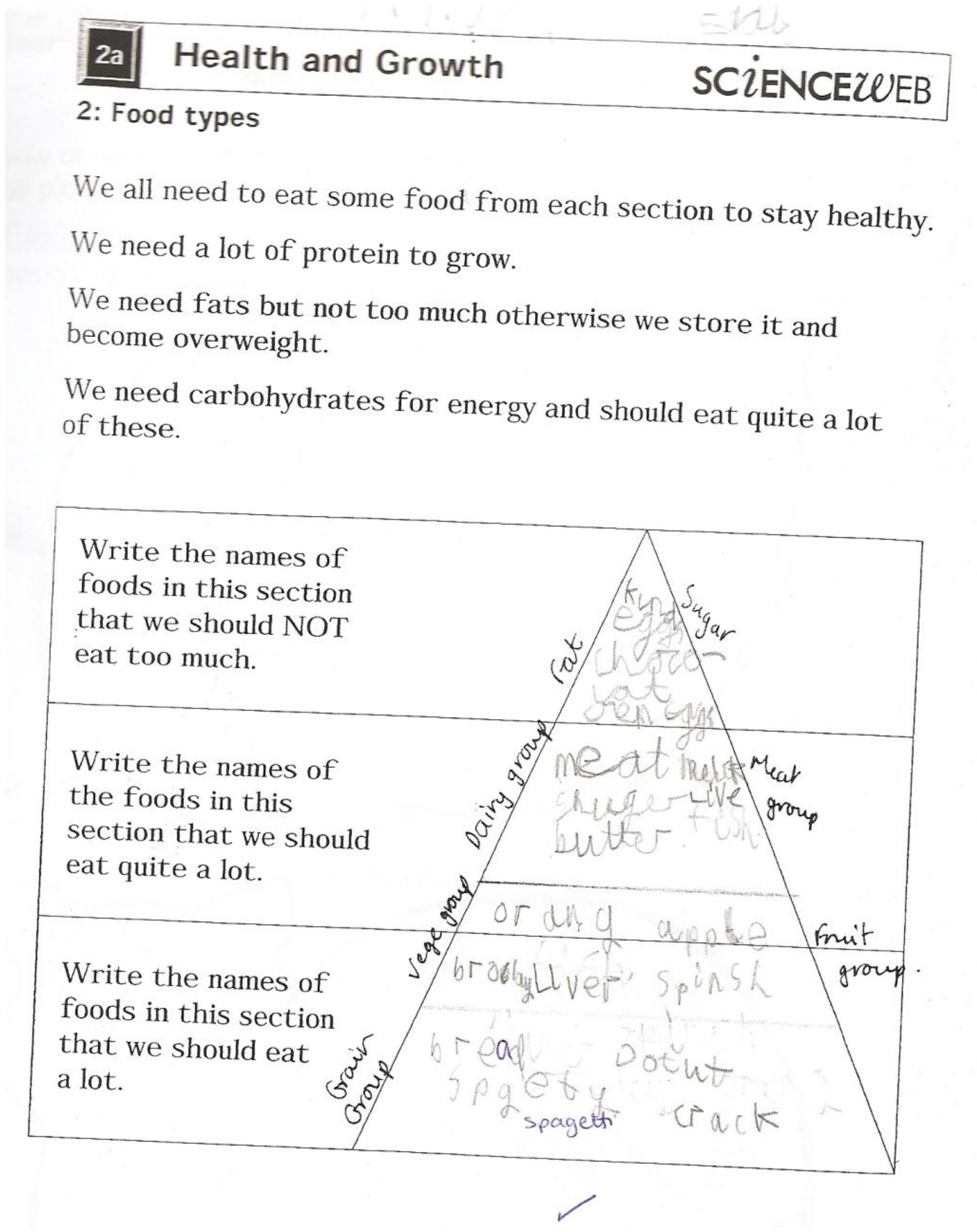
Figure 4.3 An example of Y3 classwork detailing the concepts of food groups and balanced diet

concept in the NC PoS, and the topic including the accompanying nomenclature is introduced in the QCA SoWs in Y7. This illustrates how the early introduction of scientific concepts and language is also potentially occurring in other topics/areas of the curriculum. During the course of this study I have identified the table as being photocopied from the Coordination Group (CGP) revision guide for KS2 (Parsons, 1999 reprinted 2005). This book was the best-selling revision guide for KS2 on Amazon.co.uk in the period up to June 2009. The guide has the subtitle 'the important bits' suggesting that the concepts included are important KS2 material, despite these particular concepts (scientific words for food groups: proteins, carbohydrates, etc. and cells) only featuring in the NC PoS for KS3. This appears to show that the NC PoS has been misinterpreted by the authors of the CGP guide.

When considering the retention of the basic terms for food types, one of the Y9 books contained some of these such as food types in groups (human) vegetables, fruit, bread, rice, cheese and meat, alongside the more advanced terms such as vitamins and minerals and protein. Personally, I think this may have been the student using unsuitable resources as opposed to the teacher teaching the basic concepts as this was largely a self-study project. The second Y9 book only contained age-suitable terms, suggesting that this pupil followed the teacher's guidance more accurately than the first pupil.

The next part of the analysis of the curriculum as experienced by pupils was to look at what was not observable in pupil exercise books. Notable by their absence in all the exercise books were many of the terms connected to diet that appear in the NC PoS and QCA SoWs. For example, an 'adequate' and a 'varied' diet were both absent from all KS2 books even though they appear in both the NC PoS and QCA SoWs (which the school reported using as their SoWs). It may be that these were discussed in lessons but not written down in the books. However, by contrast to the absence of 'adequate' and 'varied diet', the concept of 'balanced diet' was covered repeatedly in Y3, Y5, Y8 and Y9. This would seem to suggest the omission of the basic concept because of a preference for the more advanced one. Further, in Y2, there seemed to be the dual teaching of basic and advanced concepts in some areas (food types and groups). This means both types of concepts were being covered at the same time, for example by calling a food group the ‘meat’ [basic concept] and ‘protein’ [advanced concept] group. An example of work completed by a Y2 pupil that contains both concepts is shown in Figure 4.4. Towards the top of the worksheet information is provided for the pupil about the names and uses of some key nutrients. The keywords proteins and carbohydrate appear clearly on this KS1 worksheet despite the NC PoS not including them until KS3. It also appears that someone, potentially the teacher, has written on some of the basic terms (dairy, meat, grain group, etc.) prior to photocopying. This worksheet also illustrates the complexities of the topic. For example, it details how carbohydrates are needed for energy and that we should eat quite a lot of these. Then, in the task, pupils are asked to write the names of foods that we should not eat too much of at the top of the pyramid. Someone has written ‘sugar’ by the side of the image presumably in order to help the pupils complete the task. However, sugar is a carbohydrate and therefore this creates a conflict of information.

Further, the pupil has made several errors in the completion of the task which remain uncorrected by the teacher. For example, butter is included in the section that we can eat quite a lot of. The pupil may have been confused due to the inclusion of the words ‘dairy group’ making him think it was the correct to include butter in that section. However, butter is more appropriately placed in the ‘fat’ group that we should not eat too much of.


2a Health and Growth SCIENCEWEB

2: Food types

We all need to eat some food from each section to stay healthy.

We need a lot of protein to grow.

We need fats but not too much otherwise we store it and become overweight.

We need carbohydrates for energy and should eat quite a lot of these.

Write the names of foods in this section that we should NOT eat too much.

Write the names of the foods in this section that we should eat quite a lot.

Write the names of foods in this section that we should eat a lot.

Figure 4.4 An example of Y2 classwork detailing the dual teaching of basic and advanced concepts

The worksheet is not consistent with the statutory content of the NC PoS. It may be that the teacher had assessed where the pupils were (Section 2.3.1 and Section 2.4.1) and decided to progress the pupils further than the statutory content, that is, building on knowledge as Bruner described (Bruner, 1960). This possibility is explored in the teacher interviews (Sections 6.2 and 6.4) and further discussed in Section 7.2. The activity could be made appropriate by deleting all the text regarding fats, carbohydrates and proteins and the handwritten text on the sheet. This would allow the pupil to simply detail the types of food that we should eat a lot of (rice, pasta, fruit and vegetables), food that we should eat quite a lot of (fish, meat, eggs, beans, nuts, seeds) and foods that we should not eat too much of (butter, sugar, sweets).

The worksheet shown Figure 4.4 is an example of a number of worksheets produced by external bodies and purchased by the school to include in their resources. This worksheet was produced by a company called 'Science Web' (Science Web, n.d.). This organisation produces supporting materials for schools. On their website (*Ibid.*, [online]) they make the following claims for the worksheets they produce:

> All work relates to the National Curriculum Key Stage 2, Science Unit 2A, Health and Growth …all work relates directly to the QCA scheme of work for Science.

The wordings of these claims would imply that the worksheets were based on the NC PoS and the QCA Y2 SoW unit. However, on inspection, these worksheets covered concepts such as 'proteins: sources and uses'. These are concepts that are not in the QCA SoW for Y2 and actually only appear in these specific terms in the QCA SoW for Y8. It appears that this company may have misinterpreted the QCA SoW and developed the concept to a level suggested only for KS3 pupils. The primary school in the study, having adopted the use of Science Web worksheets, appears to have introduced the concept early, probably unwittingly. This evidence appears to support the suggestion in Section 4.3.1 that the QCA SoW were confusing in parts and open to a number of interpretations.

The exercise book analyses also raised a concern as to whether it was appropriate to ask pupils to make judgments on 'healthy' and 'unhealthy' foods, particularly when later in their education they may learn that a positive judgment was incorrect. To exemplify this point Figure 4.5 illustrates a second piece of Y3 classwork.

Firstly, as highlighted by the pupil who has underlined the phrase 'a ring', the task/instruction is a little confusing. Should a single ring be drawn around all the food or individual rings around each food (as suggested by how the worksheet has been completed).

Secondly, what is meant by 'good'. 'Good' could mean that the food has a beneficial use in the body and therefore all the food pictured is 'good' for you. Alternatively, does good, in this instance, actually mean 'healthy' as suggested by the title of the sheet? The pupil has interpreted the instruction as being the latter and has drawn rings around a number of the food items. The second part of the task refrains from using 'bad' or 'unhealthy' and asks pupils to put a cross through food that you should 'not eat too much' of. Thus, the judgment of seemingly good or healthy and not so good or potentially unhealthy foods is left for the pupil. Some of the choices are simple: fruit and vegetables receive a ring and sweets receive a cross. However, other choices are far more complex. Towards the left of the sheet a burger is illustrated. The pupil has initially put a cross through it, potentially knowing that he should not eat too many of these, before changing his mind. The teacher has then marked the answer as incorrect (but she too appears to have ticked it first before

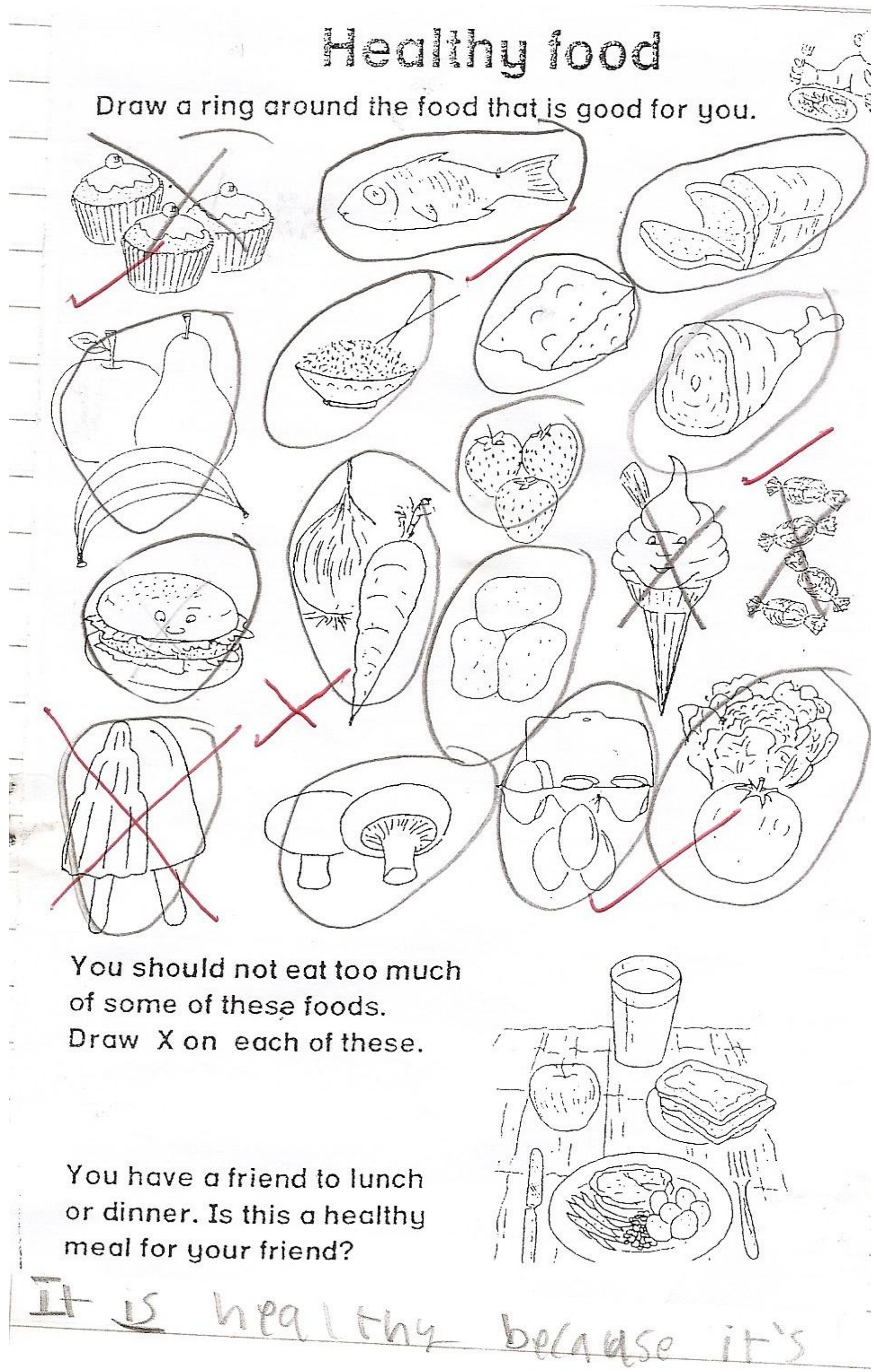


Figure 4.5 An example of Y3 classwork showing conflicting reasoning

changing her mind). This highlights a major concern in the provision of progression in this topic. Consider the burger from the Y3 pupil's point of view; the burger consists of a bread bun (bread and grains group), a beef burger (meat group), a cheese slice (dairy group), and lettuce, onion, gherkins and tomato (fruits and vegetable group). The burger therefore perfectly illustrates an example of a varied diet because all the groups of food types are represented in a single meal. The burger should illustrate food that is 'good' for you in this instance. The teacher has marked it incorrect presumably because, as many people would suggest, burgers contain unhealthy amounts of saturated fats and salt, etc. The key point is that this pupil and others taught according to the schools' SoWs will not be taught about saturated and unsaturated fats and the effects of salt on the body until Y9. This means that there is no way that the Y3 pupil could have answered the question correctly. By putting a ring around the burger based on his level of knowledge provided by the progression in the curriculum he would be correct, but, later in the course of his education he should discover this to be incorrect. Other items of food illustrated on this sheet also create conflict within the notion of healthy/unhealthy. Cheddar cheese, for example, has four times more saturated fat than a standard (Burger King) burger, yet it is circled as a food that is good for you and marked as correct. Cheese is taught in the curriculum as a healthy food for children because of its protein and calcium content. In 2007 the Food Standards Agency reclassified cheese as a junk food based on its saturated fat content (Derbyshire, 2007). Also illustrated is a leg of lamb or pork. Again, this has far more saturated fat than the burger yet it appears to be a healthy choice. Finally, bread is illustrated as a food that is good for you and does not appear to be a food that you should not eat too much of, yet a single slice of bread can contain around 0.5g of salt

(The Independent, 2011) despite guidelines to reduce salt in bread set out by the Department of Health in 2007. Therefore, two slices of bread amounts to a third of the RDA of salt for a 6 year old child (NHS, 2011). Bread frequently appeared on worksheets in the study as an example of a food that you should eat a lot of yet two slices for breakfast, two for lunch and two accompanying dinner alone would equate to the full RDA of salt for a 6 year old child. In general I would question whether, in the provision of progression, we should be teaching pupils 'facts' that they later find out, during the course of the curriculum, to be incorrect. Secondly, we should not expect pupils to make judgments that they are unequipped for.

Another point I would like to highlight about this worksheet, directly connected to the importance of the research, is the hidden message in the worksheet. 'Good' foods gets a circle but food that 'you should not eat too much' of (i.e. still good but not necessarily overly healthy) get a cross. Now consider what a cross generally means to pupils. A cross means something is wrong. The hidden message is therefore that it is wrong to eat these foods. This creates a negative connection with certain foods, and therefore some sensitive children may feel bad or guilty for eating them. This worksheet in isolation may have no effect but if this message is reiterated many times it may contribute to vulnerable pupils developing eating disorders (Ryland, 2011). Eating disorders appear to be on the rise, for example anorexia cases requiring hospital treatment have risen by 80% in the last 10 years (The Telegraph, 2009). It must be noted that many of the foods often deemed unhealthy can still be part of a healthy diet. Fat (butter, oil, etc.) for example, is not only important for energy storage but also as a component of cells. Further, a diet lacking in fat seriously impacts the body's ability to absorb fat-soluble vitamins.

This worksheet could be improved by the removal of contentious items of food; the altering of the task to encourage pupils to circle all the food as 'good' as a part of an adequate and varied diet; and by the use of a small circles around the foods you should not eat too much of.

In summary, progression in the exercise books was illustrated in keywords and concepts in the area of digestion, and limited progression caused by repetition of content was illustrated in the area of food groups (sources and uses) where concepts appeared early in the exercise books and were then repeated during each revisit.

I will now consider progression in the area of T&LAs (Table 4.13).

Teaching and learning activity	Y1	Y2	Y3	Y4	Y5	Y8	Y9
ICT any evidence of use							
Survey of food eaten			*				
Survey of pet foods			*				
Label diagram			*				
Simple charts							
Complex graphs or charts					*		
Flow chart							
Report or project							*
Food testing (chemical testing) demonstration						*	
Food testing - pupil complete						*	
Investigation			*		*		
Experimental write up						*	

Table 4.13 Excerpt of the pupils' exercise book analysis of teaching and learning activities

This part of the analysis was challenging because there were too few T&LAs represented in the exercise books to accurately judge whether pupils were experiencing progression in this area. Further, data regarding T&LAs employed during lessons are probably less reliable than keywords and concepts because an activity undertaken with the pupils might not necessarily be evident in the books, for example with the use of models, videos, teacher demonstrations, discussions, debates, school trips, etc. For the purpose of this discussion, practical or experimental/investigatory work means: 'Any science teaching and learning activity in which pupils, working individually or in groups, observe and/or manipulate the objects or materials they are studying'. If experimental/investigatory work had been undertaken it is hoped that this would be reflected in the books, possibly as a write up or a results table. From reviewing the exercise books there was indeed some evidence of experimental work. In Y3 two investigations were undertaken in connection with teeth. Y5 pupils undertook an investigation looking at the effects of exercise on the body. The investigation in Y3 was largely based on descriptive observation, and in Y5 quantitative measurements were taken of pulse rate. This appears to show progression from describing phenomena in Y3 to measuring phenomena in Y5. The Y8 pupils undertook a food testing experiment and completed a write-up. This was not an investigation *per se* so it did not display progression in this area, however it did involve the use of scientific equipment and chemicals and therefore provided progression in the area of skill and challenge. During Y2 and Y9, it would appear that no experimental work was undertaken, although, the Y2 pupils did receive a visit from the dentist who showed them how to brush their teeth properly. Pupils were asked about T&LAs during the pupil consultation (Chapter 5) and this gave a better indication of the T&LAs employed by teachers.

There were also some aspects of T&LA use that raised concerns. For example, there was a general lack of graphs or charts in the analysis with only Y5 having a graph in their books. Also absent was evidence of ICT use, but that may or may not be a fair reflection of the pupils' experience. The significance of these absences will be discussed in Section 4.4.2, and also Section 7.3 when the data on T&LAs detailed above are compared to responses in questionnaires and focus groups carried out during the pupil consultation.

In summary, progression in the exercise books was illustrated in the contents outlining digestion, but there was repetition in the area of food groups (sources and uses). Regarding T&LAs, there was some progression in performing investigations skill in KS2, with some further development in KS3. However, two academic years performed no investigative work, and progression was not observable in the interpretation of results with graphs and charts.

4.4.2 Comparative analysis of the exercise books with the National Curriculum programme of study and the schemes of work

The data on content contained within the SoWs and exercise books were compared with the NC PoS. An excerpt of the summary findings are shown in Table 4.14. This analysis was completed to gain a greater understanding of when the statutory content of the NC PoS was introduced. The data show that some aspects of the NC PoS content were introduced 'early' (before they are stated in the NC PoS), such as the key nutrients and

Key stage	Key statutory concept	Where the concept was observed in the schemes of work								Where the concept was observed in the exercise books				
		Y1	Y2	Y3	Y5	QCA Y8	Y8	QCA Y9	Y9	Y2	Y3	Y5	Y8	Y9
1	Humans and other animals need food and water to stay alive	*	*											
	Exercise linked to staying healthy		*		*									
2	Food is required for activity and growth			*		*		*			*			*
	Varied diet			*	*									
	Adequate diet		*	*	*									
3	Names of nutrients:													
	Fats			*	*	*	*			*	*	*	*	*
	Carbohydrates				*	*	*			*	*	*	*	*
	Proteins					*	*			*	*	*	*	*
	Sources of the key nutrients:													
	Fats, carbohydrates, and proteins					*	*			*	*	*	*	*
	Function of digestion					*	*					*	*	
	Role of enzymes					*	*						*	
	A balanced diet			*	*	*	*	*	*		*	*	*	*

Table 4.14 Key statutory content from the National Curriculum Programme of Study and where they were observed in the schemes of work and pupils' exercise books

their sources, balanced diet, and the function of digestion. Some were covered ‘on schedule’, such as the role of enzymes, and some were absent all together, such as varied diet and adequate diet. Out of a total of thirty-one concepts identified in the NC PoS, seven (23%) were absent from exercise books, thirteen (42%) were introduced early in exercise books, and eleven (35%) were introduced on schedule.

When the detail of all the documents was studied, and the frequency of revisiting was analysed, some aspects seem to show some repetition suggesting limited progression. These were concepts that were revisited three or more times, such as the key nutrients and their sources. These are introduced early in exercise books and are revisited every year the topic is taught. Balanced diet is introduced early in the SoWs and is revisited in Y3, Y5, Y8 and Y9 in both the SoWs and exercise books. Some concepts appear repetitive in the SoWs but are missed out in the exercise books. For example, food types in groups (human) such as vegetables, fruit, bread, rice, cheese, and meat. The QCA SoWs cover these concepts in Y2, Y3 and Y5. Y2 books did mention the basic groups but alongside the more complex terms. That is, instead of ‘the meat group’, they refer to it as ‘the meat and protein group’. Books from Y3 and Y5 only featured the more complex forms (carbohydrates and proteins, etc.). Thus, all the pupils who were represented in the exercise book study were aware of the complex form of the concept from Y2. The basic term did reappear in a Y9 project, but this is probably due to the pupil selecting inappropriate sources during the project work.

Other concepts from the 1999 NC PoS were not directly observed in exercise books, for example that blood carries the products of digestion and respiration. These may have been talked about or missed out entirely. As these are both fundamental concepts and have links with other areas of the curriculum, I think it is highly likely that they are covered in a different topic/unit. For example, the concept describing how blood carries the products of digestion was covered in the QCA SoWs but not secondary school SoWs. However, it was found, after reviewing information about the SoWs provided by the secondary school, that they cover these concepts as part of a topic on the circulatory system.

In general, it appears to be that the progression shown in the NC PoS and the SoWs differs from the progression shown in exercise books.

Using the Ryland model of the spiral curriculum (Section 2.4.1), the intended progression of the concept ‘food types’ across the key stages as observed in the NC PoS and QCA SoWs, at the key stage level, is illustrated in Figure 4.6, and the observed progression shown in the exercise books is illustrated in Figure 4.7.

From reviewing Figures 4.6 and 4.7 it can be seen that pupils’ observed experience of this particular concept varies greatly from the intended experience. The NC PoS and SoWs intend there to be a revisit to the concept during each keys stage. During each revisit pupils’ knowledge of the concept ‘food types and groups’ progresses from the prior key stage as shown by an overall increase in the breadth of coverage, development of

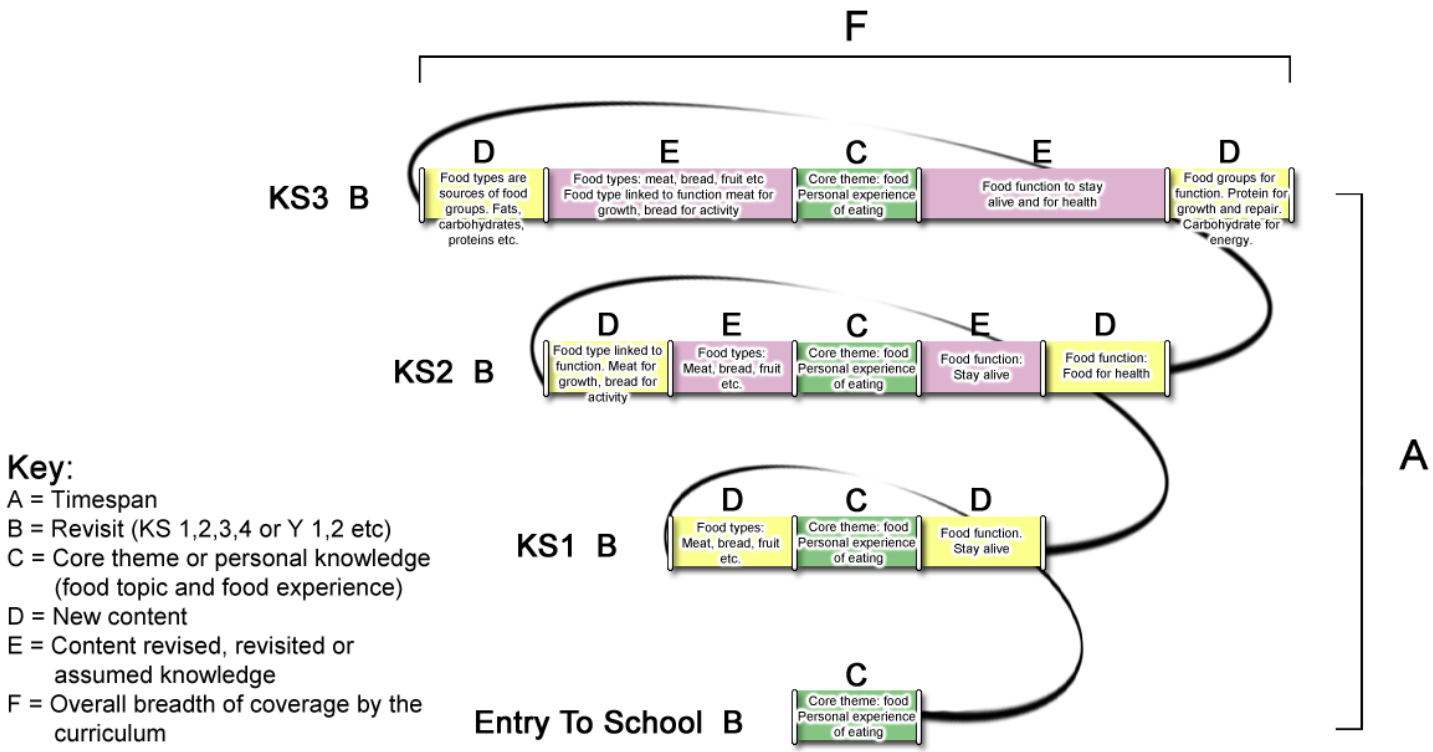


Figure 4.6 The intended progression of the concept 'food types' across the key stages as observed in the National Curriculum Programme of Study and QCA Schemes of Work

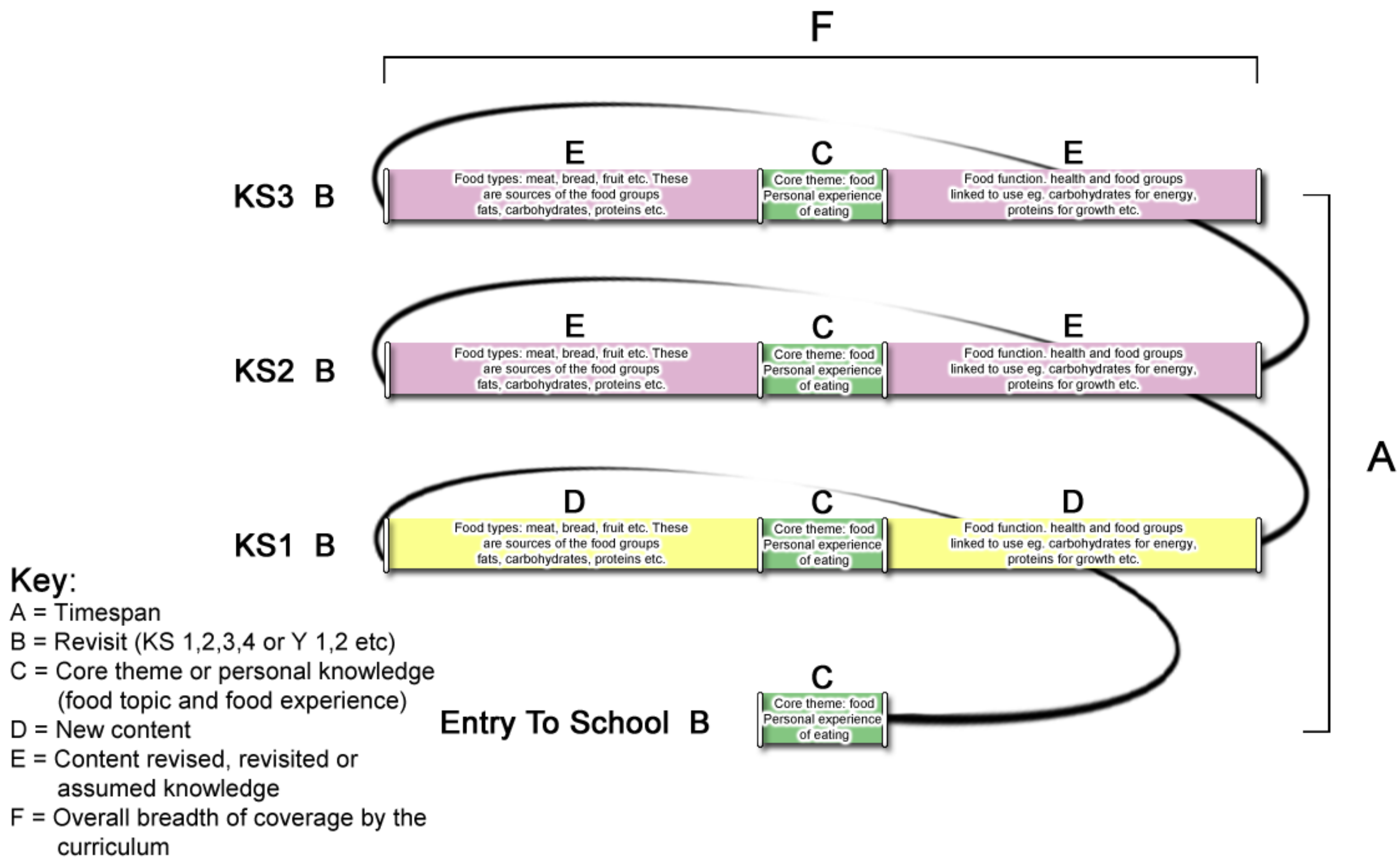


Figure 4.7 The observed progression of the concept 'food types' across the key stages as shown in the exercise books

scientific knowledge, depth of understanding, etc. In Figure 4.7 it can be seen that pupils experience a large increase in their understanding KS1 but then there is no further progression, of this particular concept in the following two key stages. They do not experience progression by increasing depth or breadth of the concept.

The next part of the comparison only considers the SoWs and exercise books because the NC PoS does not contain T&LAs. When the T&LAs within each source were compared (Table 4.15) there were some activities present in the SoWs that were absent from exercise books, for example graphs or charts. Some form of graph or chart is present in all SoWs apart from the Y9 school SoW. Only Y5 actually had a graph in their books. The relevance of this is that part of the progression displayed by the QCA SoWs was based on the progression in graph work, yet it would seem that this was an under used activity in lessons. This however, may be due to the graphs being elsewhere such as on the walls forming a display, or it may be a due to the teachers choosing not to complete that part of the SoWs as they are not obliged to teach it. Also absent from the books was evidence of ICT use, but that may or may not be a true reflection of the pupils' experience as, again, they may have used ICT but have not recorded evidence of it. This situation will be clarified in Chapter 5 when details of the pupil questionnaires and focus groups will be discussed.

	Year 2		Year 3		Year 5		Year 8			Year 9		
Teaching and learning activity	QCA SoW	Exercise book	QCA SoW	Exercise book	QCA SoW	Exercise book	QCA SoW	SoW	Exercise book	QCA SoW	SoW	Exercise book
ICT-make pictogram	*		*									
ICT-make database of food types					*							
ICT-to help make fact sheets			*					*				
ICT-produce PowerPoint on organ functions in digestion								*				
ICT-spreadsheets, graphing and DTP software					*		*					
ICT-data logging pulse rate										*		
ICT-simulation illustrating digestion							*					
ICT-simulation breathing										*		
ICT-simulation of how food is utilised										*		
ICT-simulation joints/exercise										*		
ICT-diet analyser							*				*	
Simple charts	*											
Charts	*											
Block graph	*											
Bar chart			*		*							
Pictogram	*		*									
Graph					*							
Line graph					*			*				
Venn diagram							*					
Complex Graphs or charts						*						
Flow chart										*		

Table 4.15 Excerpt of the analysis of teaching and learning activities as observed in the schools' schemes of work and in pupils' exercise books

Further analysis was undertaken of the totals of concepts and keywords and T&LAs observed in the SoWs and exercise books (Table 4.16).

Totals	QCA Y1	QCA Y2	Ex Bk Y2	QCA Y3	Ex Bk Y3	QCA Y5	Ex Bk Y5	QCA Y8	S SoW Y8	Ex Bk Y8	QCA Y9	S SoW Y9	Ex Bk Y9
Concepts and Keywords	8	15	29	32	49	45	75	50	55	50	48	18	36
Teaching and Learning Activities	8	13	6	21	9	25	8	35	21	9	28	8	1

Key: QCA = QCA scheme of work, S SoW = School scheme of work, Ex Bk =Exercise book

Table 4.16 Total numbers of concepts and keywords and teaching and learning activities observed in the schemes of work and pupils' exercise books

It can be seen that during KS1 and KS2 more keywords and concepts appear in pupil exercise books than appear in the QCA SoWs which were adopted as the school's SoWs. This indicates that more concepts were covered during lessons than were outlined in the schemes. This is a cause for concern because, as stated above, many concepts were introduced earlier than recommended. This may contribute to the greater number of keywords and concepts being recorded in books and raises an additional concern that schools/teachers may be missing out activities, such as experimental work, to include more factual content. This would push pupils beyond the content that is required by the NC PoS. This may be due to pressures to achieve better examination results or it may actually be a desire to progress their pupils further. As highlighted in Section 4.3 there was limited progression in the SoWs at the intra-key stage level. Therefore teachers who teach pupils during the second revisiting in a key stage (Y2 and Y5), knowing that pupils already fully understand the material from the first visit, and who wish to provide progression, may deliberately decide to progress pupils into material intended for the next key stage. But in doing so, teachers are possibly putting greater importance on content rather than pupil experience. There may be other implications of this approach, for example, regarding potential effects on long-term memory. The learning of facts and the completion of T&LAs (influenced by learning styles) are thought to use different parts of the brain (Morris, 2006). That is, if pupils spend more time learning the content whilst completing activities incorporating a number of learning styles then they may gain better understanding and/or improve long term memory. Benefits of concentrating on content may include completing a GCSE early or allowing time for doing separate sciences beginning in Y9. The costs may include boredom due to reduced amounts of time for practical work or repetition of teaching content when teachers in later year groups do not take into account what pupils already know. The reasons for the early introduction of concepts is further discussed during Chapter 6, the teacher consultation.

At KS3 the number of concepts and keywords in the Y8 exercise book is identical to that in the Y8 QCA SoW and is slightly less than the school's own SoW. This suggest that the teacher is more closely adhering to the SoW.

It can also be seen that the numbers of observable T&LAs were, without exception, lower in the exercise books than in either the QCA or the school's own SoW. Again, this may be due to the fact that SoWs suggest a number of activities to achieve the same objective. The number of T&LAs observable in the exercise books was fairly static ranging from six to nine activities per year group, with the exception of Y9 when there was only one T&LA. When you view these total numbers of activities alongside the suggested length of unit shown in Table 4.17 you can see that in KS1 and KS2 there are slightly fewer T&LAs in the exercise book than the unit is hours long. In Y8 there seems to be one more T&LAs than the unit is hours long. This suggests that pupils complete a single activity in their exercise books per lesson. The large dip in Y9 is due to pupils being given the unit as a self-study exercise which culminated in the production of a project. This T&LA did not appear in either SoW. The inclusion of this activity seems in part due to the school's policy of the high-achieving Y9 pupils beginning their GCSE course in Y9 (to enable time to complete three separate sciences), as confirmed during the teacher interviews. The consequence was that pupils were expected to complete such work as self-study in order to save time.

	Exercise book Y2	Exercise book Y3	Exercise book Y5	Exercise book Y8	Exercise book Y9
QCA length of unit (hours)	9	12	10	8	8.5
Total teaching & learning activities	6	9	8	9	1

Table 4.17 Total numbers of teaching and learning activities observed in pupil exercise books compared with length in hours of the QCA scheme of work

Some further analysis was completed by comparing the QCA SoWs with exercise books. The percentage agreement between the exercise books and the age appropriate QCA SoW was determined, that is the percentage of the keywords and concepts from the QCA SoWs that were observable in the exercise books. The findings are shown in Table 4.18.

	% Agreement of Y2 exercise book with QCA Y2 scheme of work	% Agreement of Y3 exercise book with QCA Y3 scheme of work	% Agreement of Y5 exercise book with QCA Y5 scheme of work
Keywords & Concepts	13%	32%	26%

Table 4.18 Percentage agreement of keywords and concepts in primary pupils' exercise books compared with the QCA schemes of work

When reviewing the findings for the primary school, it can be seen that the highest agreement of keywords and concepts was in Y3, where 32% of the concepts suggested by the QCA SoWs were observable in exercise books. This was largely attributable to the work undertaken on teeth. When the Y5 exercise books were compared with the Y8 QCA SoW (results not shown in table) a surprising result was found. Sixty percent of QCA Y8 keywords and concepts were found in Y5 exercise books. That is much higher than the agreement with the age appropriate SoW (Y5). These keywords and concepts were those connected to food groups and the digestive system**.** From analysing pupil exercise books, it became apparent that although the primary school uses the QCA SoW, a great deal of extension occurs particularly in the area of the digestive system during Y5. The digestive system does not appear in the QCA Y5 SoW at all but it was covered in Y5 exercise books in some detail. At first sight this appears to be the primary school working beyond their remit, but in the QCA SoWs the accompanying teacher's guide KS1 and KS2 (QCA, 1998a, p.3) states:

> The exemplar SoW can be used as a basis for work in science if a school wishes. However, there is no compulsion to do so. Teachers may wish to use it to develop or refine their own SoW, amending or adding material, as appropriate, to meet the needs of the children in their school.

This statement suggests that teachers have a free rein allowing them to add material they feel is appropriate for their own pupils. There may be no adverse effects of this strategy, but if this is not taken into account in later years by teachers, as it appears not to be from the exercise books analysis, a certain amount of repetition of teaching material is inevitable. Secondary school teachers may be aware that some of their pupils are familiar with the material but, as this might not be the case for all, they may be compelled to cover all the concepts covered in the NC PoS regardless of prior knowledge.

The percentage agreement of T&LAs in the exercise books and the QCA SoWs used by the primary school was also calculated (Table 4.19). It appears that although Y2 and Y3 were completing activities in class they were not the activities suggested by the QCA SoW, leading to the lack of agreement, despite the school claiming to follow the QCA SoW. There was some correlation in Y5 where some of the activities completed were included in the QCA SoW used by the primary school.

	% Agreement of Y2 exercise book with QCA Y2 scheme of work	% Agreement of Y3 exercise book with QCA Y3 scheme of work	% Agreement of Y5 exercise book with QCA Y5 scheme of work
Teaching and learning activities	0%	0%	8%

Table 4.19 Percentage agreement of teaching and learning activities in the primary pupils' exercise books compared with the QCA schemes of work

The secondary school exercise books were compared both with the QCA SoWs and the schools own SoWs. The percentage agreements are shown in Table 4.20.

	Agreement of School SoW to QCA SoW Y8	Y8 Exercise Books % Agreement to		Agreement of School SoW to QCA SoW Y9	Y9 Exercise Books % Agreement to	
		QCA SoW	School SoW		QCA SoW	School SoW
Keywords and Concepts	54%	54%	66%	2%	6%	55%
T&LA	17%	6%	24%	7%	0%	0%

Table 4.20 Percentage agreement of secondary pupils' exercise books compared with the QCA schemes

As discussed earlier in this section there were slightly more keywords and concepts covered in the school SoW than QCA in Y8 and fewer concepts were covered in the school SoW than in the QCA SoW for Y9. When the two SoWs were compared, there was a 54% agreement between school and QCA SoW in Y8. There was also 54% agreement between the Y8 exercise book and the QCA SoW. The highest agreement was between the Y8 exercise books and school's own SoW, at 66% agreement, suggesting that the Y8 teacher seems to be adhering more closely to the scheme than the other teachers involved in the study. At Y9 there was only 6% agreement of exercise book to QCA SoW but a 55% agreement to the schools SoW. The discrepancy between the school SoW for Y9 and the QCA SoW was, in part, due to the fact that the school has decided to begin GCSE work in Y9. They appear to have kept in the school SoW only concepts that are relevant to the GCSE syllabus.

When considering T&LAs, the agreement between the school SoW and QCA SoW was 17% in Y8 and 7% in Y9. The agreement between the exercise books and school SoW was highest in Y8, with 24%.

In summary, the KS1 and KS2 exercise books appeared to be content-heavy, but activity-light when compared with both the QCA and school's SoWs. The Y8 exercise books seem to have similar amounts of content to the SoWs, but were again activity light. The Y9 books were also content-heavy/activity-light when compared to the school's own SoWs. In some ways the absence of activities may highlight the limitations of this documentary analysis for the reasons mentioned earlier (pupils may have completed an activity but have nothing in their exercise books to 'show' for it, for example when having a discussion or watching a video). This might explain a certain percentage discrepancy but the percentage agreements between exercise books and the schools' own SoWs seem to be extremely low in the area of activities, whereas there was a much greater agreement in the area of keywords and concepts. The use of T&LAs was further explored during the pupil and teacher consultation (Chapters 5 and 6, respectively).

In addressing RQ1c, the pupil exercise books showed progression in content in some areas and repetition in others. Those areas that appeared repetitive were also areas that appeared to be introduced earlier than the NC PoS suggested. Progression was achieved during the later stage of KS2 by teaching content from KS3 (NC PoS and SoW).

Progression within the T&LAs was more difficult to assess, but progression evident within the SoWs was not displayed in the exercise books in some areas.

4.5 The 2007 National Curriculum Programme of Study and The National Science Strategy

In this section I will discuss two additional documents that were available shortly after the start of the study. Section 4.5.1 discusses the 2007 NC PoS for KS3 (QCA, 2007c) and Section 4.5.2 discusses the 2007 National Strategies for Science (Department for Children, Schools and Families (2008a, b and c).

4.5.1 The 2007 National Curriculum programme of study for key stage 3

The NC PoS for KS3 underwent a review in the Spring of 2007 and a subsequent change, published in September 2007 (QCA, 2007c), for implementation in September 2008 (Y7). The documentary analysis discussed previously in this chapter focused on the 1999 version, as all pupils included in the study were being taught according to that version. I have included the 2007 document in this study because from September 2008 pupils entering Y7 will be taught according to this version and I felt that this study should take the changes into account. The QCA SoWs remained unchanged and were not under review for change based on the 2007 NC PoS (personal communication [email] with the QCA, September 2008).

The 2007 NC PoS (QCA, 2007c, pp.210-211) states:

> 3.3c, conception, growth, development, behaviour and health can be affected by diet, drugs and disease.

And in the explanatory notes:

> Diet, drugs and disease: This includes the importance of healthy eating complemented by regular exercise

It is difficult to say if the 2007 NC PoS shows progression in relation to the previous two key stages, because it is less detailed compared to the 1999 version. It is considerably shorter, consisting of only two sentences and makes no reference to, for example, the scientific vocabulary used to describe nutrients (carbohydrates, proteins, etc.) or digestion. It appears to show continuity. It does not seem to demonstrate progression in the same identifiable way as the 1999 PoS. This may or may not be relevant depending on whether the school SoWs and or QCA SoWs change. If the SoWs remains the same then the changes brought about by the 2007 PoS are unlikely to affect pupil experiences. The QCA SoWs also remained unchanged until May 2010 when they were archived by the newly-elected government, but not replaced or updated. The government, however, instituted a curriculum review during the spring of 2011. I submitted data to that review (based on findings described in Ryland, 2009; Ryland, 2010 a and b; Ryland, 2011); however, at the time of writing, no new curriculum has been published.

4.5.2 The National Strategies 2008

As the 2007 PoS appeared to be vague I completed some analysis of the National Science Strategy documents, as these were intended to be additional guidance on the new PoS. The key section relevant to this study is ‘2.1 Life processes: nutrition’ (Department for Children, Schools and Families, 2008c). This section deals with plant and animal nutrition.

My first observation of this document was that ‘nutrition’ (how the text refers to aspects including F&HE) is suggested to be revisited in all years of KS3 and KS4 (and this is confirmed by the detail contained in the sections entitled ‘amplification - pupils could learn’, ‘strategies for progression’ and ‘rich questions’). This exceeds the frequency suggested by the QCA in the SoW.

When reviewing the yearly learning objectives (Table 4.21) there is progression in the use of verbs connected to each objective. In Y7 pupils ‘describe’, in Y8 they ‘explain’, in Y9 and Y10 they are still explaining but the number of objectives has increased, and in Y11, they both ‘explain’ and ‘evaluate’. This progression of learning seems to mirror that suggested by Bloom (1956), i.e. moving from a basic description of knowledge to the evaluation of knowledge at its most advanced level. Although the objectives do seem to show progression I am not convinced that the frequency of revisiting is necessary. My concern is that the more frequently a topic is revisited the greater the chance of unintended repetition. The objectives for Y7 and Y8 could be covered in a single year. If you were teaching the role of the digestive system, it is highly likely you would also explain it. Further, if you review the objectives for Y9 and Y10, in Y9 (Department for Children, Schools and Families, 2008c, p.2)

> …explain how chemical, physical and biological factors can disrupt the seven life processes.

and in Y10 (*Ibid.*, p.3)

> …explain why certain chemical, physical and biological factors can disrupt the seven life processes.

Year	Yearly learning objectives
7	• **describe** the role of organ systems in plants and animals that can contribute to the seven life processes
8	• **explain** how the organs and tissues in plants and animals function to support the seven life processes in a healthy organism
9	• **explain** how the specialisation of cells in plants and animals support the seven life processes in a healthy organism • **explain** how chemical, physical and biological factors can disrupt the seven life processes
10	• **explain** how individual intracellular and extracellular processes and structures in plants and animals support the seven life processes • **explain** why certain chemical, physical and biological factors can disrupt the seven life processes
11	• **explain** how the different intracellular and extracellular processes work together to support life in familiar contexts • **evaluate** the impact of chemical, physical and biological factors and explain their effects on the life processes
Ex	• use and **apply** their understanding of how life processes in organisms work together in unfamiliar contexts • **critically evaluate** the relative impact of chemical, physical and biological factors and their effect on life processes in unfamiliar contexts

Key: Ex = ‘Extension’

Table 4.21 The National Strategies yearly learning objectives

the progression subtly moves from ‘how’ in Y9 to ‘why’ in Y10. As these are so similar it is difficult to imagine a situation where a teacher would not stray into the ‘why?’ when describing the ‘how?’.

The document also describes what pupils could learn and gives possible strategies for progression (Department for Children, Schools and Families, 2008a). When considering Y7, where this extra detail is included, you can see the danger of repetition. As stated above, the Y7 objective was to describe the role of the digestive system, but when you look at the 'what pupils could learn' it states (*Ibid.*, p.1) 'use a simple model to explain the purpose of digestion'. This seems to be more appropriate for the Y8 objective (Department for Children, Schools and Families, 2008c, p.1):

> …explain how the organs and tissues in plants and animals function to support the seven life processes.

This appears to confirm my concern stated above and supports my argument that the material suggested for Y7 and Y8 should be combined and taught in a single year.

I have a further concern when considering the strategies for progression in Y8 (Department for Children, Schools and Families, 2008a, p.2):

> Create opportunities for pupils to evaluate whether the selection and management of variables in an investigation about enzyme function has affected the pattern of results.

And Y9:

> Involve pupils in creating and assembling their own models to explain how enzymes work. Support pupils to evaluate and modify these models.

In my opinion the ideal time for pupils to create their own models to explain how enzymes work would be immediately following investigations on enzyme function. This is because pupils would at that time have a clear understanding of the factors affecting enzyme function and such timing also help pupils understand their results. For example, pupils may investigate the effect of an enzyme inhibitor on the speed of reaction. This is an abstract principle that they may find difficult to visualise. The creation of a model to show how inhibitors block the substrate binding sites would allow the pupils to visualise this principle and to consolidate their knowledge based on the investigation.

When the detail of the ‘amplification - pupils could learn’ section was analysed, it became apparent that it contained concepts from the 1999 NC PoS for KS3 including: scientific terminology to describe the food groups; the function of the different food groups; structure and function of the digestive system; and enzymes. Those keywords/concepts from the 1999 PoS not included in the document include ‘balanced diet’ and aspects connected to the circulatory system. ‘Balanced diet’ seems to be missed out entirely from the National Strategies, but work is included on the dietary needs of different people. It is likely therefore that the concept of balanced diet would be discussed in lessons. The circulatory system, though not found in this topic, is found in a different document connected to respiration (Department for Children, Schools and Families, 2008d). The main difference between the National Strategies yearly learning objectives and the 1999 NC PoS is in the grouping of content. The National Strategies group the content into categories connected to the seven life processes, whereas the 1999 NC PoS, although dealing with the life processes, group the content into sections entitled ‘humans as organisms’ and ‘green plants as organisms’. Further, all the topics seem to be revisited on a yearly basis within the National Strategies, whereas the 1999 NC PoS is non-specific and suggest one visit per key stage only. My concern is that all topics are not equal in complexity and therefore to assign a yearly revisit to all seems to be an oversimplification. As discussed earlier in this chapter, when topics were revisited in the same key stage there seemed to be little progression shown in the SoWs and exercise books in some areas. The National Strategies seem to suggest the number of times the food topic is revisited should increase, and I therefore suggest that the chances of limited progression or repetition will also increase if schools closely adhere to the yearly learning objectives suggested by the National Strategies.

The overall intention of the National Strategies seems to be laudable in that it is providing additional guidance for teachers; however, in practice it may cause to confusion or overburden them with the frequency of revisiting.

4.6 Documentary Analysis Summary

The 1999 NC PoS illustrates both continuity and progression. The QCA SoWs also illustrate continuity and progression when viewed at the inter-key stage level, that is, when moving from one key stage to the next. However, when the text was analysed at the intra-key stage level, progression was less clear and, in KS1 and KS2, it appeared that the objectives did not differ enough to ensure progression in, and avoid repetition of, the teaching material.

The exercise book analysis provided a good source of evidence of the curriculum experienced by pupils regarding content (concepts and keywords). The data showed that much of the material was introduced earlier than the governmental literature recommended, and some content appeared to be covered repetitively with the pupils. Despite this, each time the F&HE topic was revisited there were elements of progression, but this was achieved by the early introduction of content, leading to potential repetition in later years.

During the exercise book analysis, although this was carried out rigorously, the nature of the data was such that the detailed nature of the demands placed on pupils by T&LAs was not always explicit from the text alone. Further, not all T&LAs are recorded in the exercise books and this made it difficult to assess progression in this area. However, progression that was evident in the SoWs and in the Sc1 section of the NC PoS was not observable in the exercise books in the area of ICT and the production of graphs. Pupils' experiences in this area will be further clarified when reporting on the pupil consultation and teacher interviews (Section 5.2, 5.3 and 5.4, and Section 6.3 and 6.5).

In summary, considering the evidence presented in this chapter, the answer to the research question 'Do pupils experience progression in the National Science Curriculum when learning about food and healthy eating?' appears to be that the pupils do experience progression in the learning of content in some areas but experience repetition in others. It also appears that in KS2 progression is achieved by the early introduction of KS3 concepts. This ultimately increases the likelihood of repetition of concepts at KS3. Further, in the application of T&LAs, pupils do not appear to experience a wide variety and may also not be experiencing progression with their use in this topic. In general, it appears to be that the intended progression shown in the NC PoS and the SoWs differs from that observed in exercise books.

CHAPTER 5

PUPIL CONSULTATION

5.1 Introduction

The purpose of the pupil consultation was to explore RQ2: What are pupils' views on the content, teaching and learning activities, and progression in the food and healthy eating topic? Their views were elicited using questionnaires and focus groups. Questionnaires were completed by a class of pupils from Y5, Y8 and Y9. These were administered pre- and post-teaching of the F&HE topic. A sub-sample of twelve pupils from each of Y5, Y8 and Y9, who had all completed the questionnaires, and a sample of twelve pupils from Y6, also participated in focus groups.

The F&HE topic fell in the mid-range for popularity with the pupils (Appendix 5.1), indicating that they neither strongly liked, nor disliked it. This made it very suitable to explore pupils' views because a more balanced view was likely to be elicited rather than more polarised views linked to each end of the popularity spectrum.

The findings from this phase of the research, including both the questionnaires and the focus groups, produced a large amount of data that required an appropriate method of handling. This was achieved by coding, clustering and presenting in themes (Gough and Scott, 2000). I first highlighted key text on a paper copy of the transcript, then entered this into summary tables (questionnaires) or compacted recording sheets of the focus groups (Appendix 5.2). Answers were kept as succinct as possible without losing the meaning by restricting them to single words or short phrases. For example, if a pupil responded to the question ‘Do you think learning about food is important?’ with ‘yes’ and ‘I think it is important because it helps you keep healthy’, this would be coded as ‘yes’, ‘health benefits’. Where coding could be open to interpretation validation by others was sought. An example of this was with the use of the phrase ‘OK’. A question in the pre-teaching questionnaire on feelings gave the pupils eight options: three positive; three negative; OK; and the opportunity to write any word they felt appropriate. I included the option of ‘OK’ to be used with the definition: ‘Not excellent and not poor; mediocre’ (The Free Dictionary, n.d.b). The pupils were also asked to write down why they felt that way. When reviewing responses to this part of the question I grouped the reasons the pupils gave for ‘OK’ into three categories: positive, negative and mixed. In order to validate these groupings, I sent the eighteen Y8 responses to three teachers (not connected to the study) and asked them to group them into the three categories. Out of the three teachers two respondents matched my grouping exactly and the third differed in only one response. I concluded that the method I was using was valid and consistent, and so this approach was adopted with all the responses in the study.

This chapter analyses the findings from the questionnaires and focus groups. Section 5.2 deals with the questionnaires, Section 5.3 deals with focus groups, and Section 5.4 synthesises the data compiled from both research instruments.

5.2 Pupils' Views on the Food and Healthy Eating Topic: Questionnaire Findings

This section addresses pupils' views on the content, T&LAs and progression obtained from the questionnaires. Pupils completed questionnaires pre- and post-teaching of the F&HE topic.

In Section 5.2.1 and 5.2.2 I analyse pupils' views on the content and T&LAs in relation to the F&HE topic respectively. In Section 5.2.3 I report on pupils' 'views' on progression inferred from their responses to the questionnaires.

In these sections when quoting pupils' responses the pupil's academic year is given in brackets followed by the pupil number. Square brackets '[ ]' indicate where I have added word/s to explain the context or clarify the quotation and an ellipsis '…' indicates unnecessary text omitted because it did not alter the meaning of the quote.

Please note that the sample size of Y8 pupils in the post-teaching questionnaires was reduced compared with the pre-teaching questionnaire due to some of the pupils being involved with a French exchange trip.

5.2.1 Pupils' views on content: questionnaire findings

I begin by discussing responses to selected questions that relate to positivity towards, interest in and enjoyment of the content of the F&HE topic. Then I discuss responses to questions relating to the location of learning about F&HE.

Pupils' views on the content of the F&HE topic were sought pre and post-teaching of the topic. In the pre-teaching questionnaire pupils were asked if they thought learning about food was important (Table 5.1) and to explain their answers.

Important	Y5 n=18 (%)	Y8 n=29 (%)	Y9 n=28 (%)
Yes	18 (100)	26 (90)	27 (96)
No	0 (0)	1 (3)	1 (4)
Yes and No	0 (0)	2 (7)	0 (0)

Table 5.1 Pupils' responses to: Is learning about food & healthy eating important?

The overwhelming majority of pupils across all three years responded that learning about food was important. The reasons given for the topic being important display a very strong theme in that sixty-nine of the seventy-one pupils cited health benefits. The remaining two pupils linked the importance to gaining knowledge for tests/exams. These answers suggest that pupils feel the subject is important because they can see the intrinsic value to themselves. Firstly, they want to be healthy and this knowledge will help them achieve that aim. Secondly, a small number of the pupils recognise the importance of the knowledge for future examinations.

In the pre-teaching questionnaire pupils were asked to tick a mood cloud that best described how they felt when they discovered they were going to be learning about F&HE. They were given three positive options, three negative options and a mid-range response of 'OK'. If they could not find a suitable word they were permitted to write their own word in an empty cloud, although this was rarely used. Their responses were collated into three categories: positive, mid/neutral and negative responses (Table 5.2). Around two-thirds of Y5 pupils gave a positive response; this dropped substantially to around a quarter in Y8 and Y9.

Response grouped as	Y5 n=18 (%)	Y8 n=29 (%)	Y9 n=28 (%)
Positive	11 (61)	7 (24)	7 (25)
Mid/Neutral	6 (33)	19 (66)	19 (68)
Negative	1 (6)	2 (7)	2 (7)

Table 5.2 Pupils' responses to: How do you feel about learning about food and healthy eating?

The second part of the question required the pupils to state the reasons for their views. Reasons for positive feelings given by the Y5 pupils were mainly connected to perceived health benefits (seven pupils). The remainder of the Y5 pupils gave more general responses such as they generally liked Science, and two pupils stated that they liked learning new things. The Y8 and Y9 pupils who gave positive responses also largely attributed this to 'health benefits' and further for 'exams'. The majority of secondary pupils with negative feelings appeared to attribute these to less clear progression (Section 5.2.3). It may be that the negative feelings expressed by older pupils were influenced by their memories of learning about food in the past in school. It may also be that their experiences outside of school or in other school subjects influenced their feelings on returning to the topic. The mid-range response of 'OK' was justified with similar reasoning given by both the positive and negative groups, although justifications tended towards negative reasons.

In the post-teaching questionnaire pupils were asked to comment on how much they enjoyed learning about F&HE (Table 5.3).

Response	Y5 n=17 (%)	Y8 n=20 (%)	Y9 n=30 (%)
Lots	7 (41)	4 (20)	2 (7)
Quite a bit	4 (24)	7 (35)	5 (17)
A bit/A little	6 (35)	9 (45)	20 (67)
Not at all	0 (0)	0 (0)	3 (10)

Table 5.3 Pupils' responses to: How much did you enjoy learning about food and healthy eating this time?

The pupils' relative enjoyment of the F&HE topic decreases with age, dropping substantially in Y8 and then further in Y9. This could be because their experiences during the topic affected their views in the later years, for example due to the T&LAs employed, or it might have been that continuing to revisit the subject had an adverse impact.

In the post-teaching questionnaire pupils were asked if they found the F&HE topic interesting (Table 5.4) and to give reasons for their response.

Response	Y5 n=17 (%)	Y8 n=20 (%)	Y9 n=28 (%)
It was very interesting	7 (41)	6 (30)	4 (14)
Some was interesting	10 (59)	13 (65)	23 (82)
Not at all Interesting	0 (0)	1 (5)	1 (4)

Table 5.4 Pupils' responses to: Did you find the topic interesting?

Again, pupils appeared to become less interested as they grew older. The reasons given for finding the F&HE topic very interesting included: in Y5 finding out new things (three pupils), particularly work about the 'digestive system'; in Y8 pupils mentioned that it was interesting finding out about 'digestion' (four pupils); and in Y9 pupils found it interesting because they generally liked Science or Biology (two pupils). The concepts highlighted by Y5 (digestive system) and Y8 (digestion) were new to them that year as outlined during the document analysis (Section 4.4). From this it can be inferred that when pupils experience progression through an increase in their depth of knowledge it heightens their interest. Conversely, seven pupils in Y5, ten pupils in Y8 and eleven in Y9 responded that they knew elements of the content already, and this negatively affected how interesting they found it. This suggests that each time the topic is revisited there is a negative impact on how interesting the pupils find the topic because work is familiar to them, and a positive impact when material appears new to them. Other pupils gave answers without a focus such as 'it's boring' or 'it's just not interesting'. One finding from this question was that prior to Y9, only one pupil mentioned T&LAs in their response. In contrast, in Y9 nearly one-third of pupils (eight pupils) mentioned T&LAs in their responses. This suggests that it had become an important issue for them. As a consequence this point was investigated through progressive focussing (Hammersley, 2006) during the focus groups and will be discussed further in Section 5.3.

Tables 5.2, 5.3 and 5.4 all show the same trend: pupils' anticipation for learning about F&HE, and their enjoyment of and interest in the topic, all become less positive with age.

In the post-teaching questionnaire pupils were asked if they would like to learn more about food in the future (Table 5.5), and to give their reasons.

Response	Y5 n=16 (%)	Y8 n=20 (%)	Y9 n=27 (%)
Yes	11 (69)	17 (85)	11 (41)
No	4 (25)	2 (10)	16 (59)
Yes and no both ticked	1 (6)	1 (5)	0 (0)

Table 5.5 Pupils' responses to: Would you like to learn more about food in the future?

Pupils in Y8 were most likely to respond that they wanted to learn more about food in the future, and their reasons for wanting to know more appeared to be linked to diet, mentioning such things as ideal portion size, vegetarian diets, deficiencies arising out of a 'no or low carbohydrate' diet and 'low fat' foods. These responses are interesting when compared to the data in Table 5.4 where the majority of Y8 pupils only found *some* of the topic interesting. It would appear that Y8 would find the F&HE topic more interesting if different concepts were covered. Pupils in Y9 appear to hold the most negative view, with more than half not wanting to learn more in the future.

When considering all three years, all the pupils (twenty-two) who responded with negative views stated they had learnt enough already or gave reasons linked to repetition of content in Science lessons, in other lessons or both. Those who responded with positive views (thirty-nine pupils) gave a variety of reasons, some of which were linked to wanting to find out information that is covered in later years of the school curriculum (thirteen pupils).

The next paragraphs analyse data collected on the location of learning about F&HE using questions that appeared in one or both questionnaires. The questions appearing in both questionnaires were included to see if pupils' opinions were affected by the teaching of the F&HE topic.

Pupils were asked to comment on whether they thought they should learn about F&HE in school Science lessons (Table 5.6) and to give reasons as to why they felt that way.

In the pre-teaching questionnaire the majority of pupils in all years responded that they thought F&HE should be covered in Science lessons, and they gave a variety of reasons. The vast majority highlighted the importance of the knowledge for health benefits. Less popular reasons included the connection to nutrition, life processes and how the body

Response	Y5		Y8		Y9	
	Pre n=18 (%)	Post n=17 (%)	Pre n=29 (%)	Post n=20 (%)	Pre n=28 (%)	Post n=27 (%)
Yes	15 (83)	17 (100)	20 (69)	17 (85)	15 (54)	19 (70)
No	2 (11)	0 (0)	7 (24)	2 (10)	13 (46)	7 (26)
Yes and No	1 (5)	0 (0)	2 (7)	1 (5)	0 (0)	1 (4)

Table 5.6 Pupils' responses to: Should you learn about food and healthy eating in school science lessons?

functions. With these responses pupils may be highlighting how F&HE directly relates to Science and the Science curriculum and therefore displaying an ability to recognise how key concepts link to each other. The data also show that pupils' belief in learning about F&HE in science lessons decreases with age. By Y9, nearly half of the pupils believed learning about F&HE in Science lessons to be unnecessary. Reasons for the negative responses given by the two Y5 pupils included that they know it already because their parents tell them about it at home. Nearly all of the pupils in Y8 (five pupils) and Y9 (thirteen pupils) who responded negatively stated that the material was covered in other lessons (PSHE or DT: Food) or provided by other sources, such as parents, and therefore content in Science is repetitive. For example:

> We learn about it in lifetracks [PSHE] so we go over the same things (Y9, 2)

And,

> It's getting boring as we do it loads in other lessons and learn the same stuff over and over. (Y9, 15)

A small minority of pupils ticked both the 'yes' and 'no' boxes stating, for example, 'Yes need to learn it in Science but already know it' (Y5, 9) and 'It's to do with Science but it's covered in DT food' (Y8, 25). The second comment is possibly suggesting they think it is unnecessary to have similar concepts covered in both subjects. Another pupil stated:

> You hear about it all the time and it gets annoying rather than interesting. (Y8, 11)

These comments suggest that pupils recognise that F&HE is important to learn about and that it is to do with Science, but they think that the revisiting of subject matter in Science and elsewhere is unnecessary. This general attitude is further discussed in relation to progression in Section 5.2.3.

Table 5.6 also gives the data from this question when it was repeated in the post-teaching questionnaire. The majority of pupils in all years responded that they thought F&HE should be covered in Science lessons, their reasons including that it is important knowledge for health benefits (fifteen Y5 pupils, eleven Y8 pupils and ten Y9 pupils) and the connection to 'how the body functions' (five Y8 pupils and four Y9 pupils) making it a Science topic. However, pupils' belief in learning about food in Science, as in the pre-teaching questionnaire, decreases with age and by Y9 around a quarter of pupils believe it to be unnecessary because the material is also covered in PSHE or DT: Food or has already been covered in Science lessons (seven pupils).

An interesting finding from asking the same question in both questionnaires appears to be that in all age groups the pupils' responses become more positive following teaching. This could be due to the pupils finding out new material during the F&HE topic that they directly attribute to Science rather than other subjects such as DT: Food. For example, in Y5 pupils learnt about the 'structure of the digestive system'; in Y8 'the process of digestion', and in Y9 the 'health effects of cholesterol'. There may also be a realisation that they may not know everything connected with food as they have learnt new material this time, that is, they experienced progression in the concepts. This point is further developed in Section 5.2.3.

A question in the pre-teaching questionnaire was designed to elicit the sources of pupils' knowledge of F&HE. Responses to this question (Table 5.7) confirmed that pupils receive information about F&HE from a wide range of sources.

Source of information	Y5 n=18 (%)	Y8 n=29 (%)	Y9 n=28 (%)
Television or radio programmes	5 (28)	23 (79)	20 (71)
Other lessons	4 (22)	19 (66)	22 (79)
Posters, displays or leaflets at the doctors	5 (28)	22 (76)	18 (64)
Family	9 (50)	22 (76)	21 (75)
Posters, displays or leaflets at the dentist	5 (28)	16 (55)	17 (61)
Cereal packets	4 (22)	14 (48)	13 (46)
Nursery or preschool	4 (22)	12 (41)	10 (36)
Magazines or books, for example, Horrible Science	4 (22)	13 (45)	9 (32)
The internet	3 (17)	11 (38)	12 (43)
Posters, displays or leaflets at the supermarket	3 (17)	10 (34)	13 (46)
Friends	1 (6)	8 (28)	7 (25)
Youth groups	0 (0)	4 (14)	0 (0)

Table 5.7 Pupils' responses to: Please tick where you have learnt about food and healthy eating

The most popular sources for each age group are highlighted in green. All three age groups had the family amongst their top two. Posters and TV or radio programmes also contribute to pupils' background knowledge. Other lessons are reported as a common source of learning about F&HE by the older age groups, with more than two-thirds of Y8 and Y9 identifying it as a source**.** This indicates that many KS3 pupils recognise that F&HE is part of the curriculum in several school subjects; this point was further explored in focus group discussion (Section 5.3.1), and this sentiment was also suggested previously in the explanation of their views on learning about F&HE in Science lessons (Table 5.6).

In conclusion, pupils' views on the content of the F&HE topic can be summarised as follows:

- The majority of pupils, of all ages, recognise the importance of learning about F&HE and link this to knowledge for health reasons or for exams.
- Pupils' positivity towards, enjoyment of, and interest in, the F&HE topic decreases as they get older.
- Pupils in Y9 are less likely to want to learn anymore about the F&HE topic, and pupils in Y8 are most likely to want to learn more.
- The majority of pupils in all age groups believe they should learn about F&HE in Science lessons although they do learn about the topic from a wide range of sources.

These summary points and trends will be discussed and compared with those identified in the literature review in Chapter 7.2.

During the analysis of the data on content of the F&HE topic, it became apparent that Y9 pupils' views on the F&HE topic were strongly influenced by T&LAs. In the following section these views will be discussed in greater detail. Further, some of the responses given by the pupils in this section offered an insight into their experience of progression. These will be further discussed in Section 5.2.3

5.2.2 Pupils' views on teaching and learning activities: questionnaire findings

In order to determine pupils' views on the T&LAs employed during the F&HE topic a shortlist of sixteen possible activities was compiled after reviewing the SoWs. The validity of this list was sought from the teachers involved in the study. The teachers were provided with the list and asked to identify any key T&LAs missing from it or those included that should be cut out. No alterations were suggested by the teachers, thus validating the list. The list included six activities that are only likely to be completed within the F&HE topic, such as 'planning a meal', 'keeping a food diary' and 'cutting out food labels'. The remaining activities were selected as generic activities in lessons such as 'poster work', 'experiments' and the 'using or making models'. For the purpose of this discussion, practical or experimental/investigatory work means: 'Any Science teaching and learning activity in which pupils, working individually or in groups, observe and/or manipulate the objects or materials they are studying' (as detailed in Section 4.4). Practical work helps pupils make links between two domains of knowledge: that of objects and observables, and that of ideas. Creative work refers to the design and making of posters, leaflets, displays and models. In order to use the space on the questionnaire economically, activities likely to appear in most lessons such as question-and-answer sessions, use of text books and worksheets were omitted. The category of ‘other’ was included so that pupils could include other activities *they* thought relevant. Pupils’ opinions on activities such as writing or text book work were discussed in the focus groups (Section 5.3). The same list of T&LAs was included in questions appearing in both the pre- and post-teaching questionnaires.

In the pre-teaching questionnaire pupils were asked about how much they enjoyed the listed activities completed during the previous occasion they were taught about F&HE in Science lessons. Pupils expressed their opinions using a three point scale: ‘enjoy’ (positive), ‘indifferent’ (neutral) and ‘did not enjoy’ (negative) (Table 5.8). Pupils’ views on these T&LAs may have also been influenced by their experience in other topics. Data from this section were triangulated with the perceived views of pupils as expressed by their teachers in Section 6.3.

In order to focus on the T&LAs with higher sample numbers only certain categories are presented in the table. Only a half of the activities given as options in the question qualified for inclusion in the table. Due to the low sample number in the question in general the following statements regarding the popularity of the T&LAs may be subject to bias. Other T&LAs may have been very popular but because they were not completed by the pupils or, at least, not in sufficient numbers, they have not been reported.

Activity	Y5			Y8			Y9		
	+	=	-	+	=	-	+	=	-
Group work	2	2	1	18	1	0	13	3	1
Planning a meal	9	0	0	5	5	1	4	2	1
Fact find	2	1	0	4	5	1	6	4	3
Poster work	9	1	0	15	3	0	18	2	0
Cut Labels	8	2	0	1	2	2	1	2	3
Graphs or Charts	3	3	3	0	5	6	3	5	4
Experiments	3	1	0	6	4	0	0	0	0
Proportion	75%	20%	5%	42%	42%	16%	42%	38%	20%

Only rows where ten pupils or more in one of the age groups had completed the T&LAs were extracted from the complete data set

Key: + Enjoyed (the positive viewpoint),
= Indifferent (the neutral viewpoint),
- Did not enjoy (the negative viewpoint)

Table 5.8 Pupils' responses to: Which of these activities can you remember doing when you last learnt about food and healthy eating.

Conversely, other T&LAs that may have proved particularly unpopular may also not have been completed with the pupils. With this limitation in mind, poster work activities were consistently popular across all three age groups. Planning a meal was popular with all Y5 pupils who completed it, but there was a drop in enjoyment of this activity in Y8. This may be because the activity had been completed previously and therefore the novelty of completing such an activity had decreased, although this type of repetition seems to have had no bearing on pupils' enjoyment of poster work. It may be that completing a similar writing-based activity is unpopular, whereas completing a similar poster work activity is not unpopular. Group work was consistently popular with KS3 pupils.

Activities the pupils did not enjoy are fewer in number but do show some consistency across the age groups. Graph work is a relatively unpopular activity, with a third to a half of pupils who completed the activity not enjoying it. This may be due to their general feelings towards mathematical activities, or it might be a consequence of it being a performed as an individual activity.

Cutting out food labels was a fairly popular activity with the Y5 pupils with around three-quarters of the pupils enjoying it but an unpopular activity with Y8 and Y9 with around half of the pupils who completed the activity saying they did not enjoy it. However, the numbers involved were very small.

The final row of Table 5.8 gives the proportion of all the responses with a positive, indifferent or negative outcome. These were calculated based on all the optional categories by calculating column totals and working out the proportion of the total for each category (enjoy, indifferent and did not enjoy). This figure is given as a percentage. For example, 75% of all Y5 responses were positive.

The proportion of positive responses is highest in Y5, dropping to 42% in Y8 and Y9 and, in addition, there is approximately a doubling of indifference from Y5 to Y8 and Y9. This suggests there is less enjoyment of the activities performed in class as children get older, an aspect investigated in more detail during the focus groups. Furthermore, the proportion of pupils giving a negative response (did not enjoy) increased with age. This confirms the suggestion made in Section 5.2.1 that activities seem to have an impact on views in Y9. This point was highlighted when pupils' were asked whether they thought the F&HE topic was interesting. As part of that question pupils gave a response on a three point Likert scale as well as giving a written explanation for their feelings. In Y5 no pupils mentioned T&LAs as part of their answer. In Y8 a single pupil raised a point about not enough practical work, but in Y9 eight pupils mentioned T&LAs in their response. The majority of those mentioning T&LAs did so in a negative way stating discontent with the T&LAs that were used or that not enough 'fun' activities were being employed:

> …some was boring we could have learnt it in a better way eg (*sic*) group work and practicals (Y9, 17)

and 'we didn't do many fun activities' (Y9, 4).

In the post-teaching questionnaire pupils ticked which activities were completed during the F&HE topic, and then went on to choose their favourite and least favourite T&LAs and to explain their feelings (Table 5.9).

There was a *wide* distribution of favourite activities. In Y5, one-quarter of the pupils put graph work as their favourite activity, giving reasons such as liking Maths or enjoying colouring-in. One-quarter chose videos as their favourite activity, stating the videos were interesting and made things easier to understand. Graph work being the joint most favourite is surprising as it was one of the unpopular activities from the pre-teaching

Favourite teaching and learning activity	Y5 n=17 (%)	Y8 n=17 (%)	Y9 n=28 (%)
Graphs and charts	4 (24)	-	-
Videos	4 (24)	-	-
Poster work	-	6 (35)	-
Experiments	-	4 (24)	7 (25)
Group work	-	-	12 (43)
Least Favourite teaching and learning activity	Y5 n=14 (%)	Y8 n=15 (%)	Y9 n=24 (%)
Cutting out Food labels	4 (29)	-	-
Food adverts	3 (21)	-	-
Graphs	-	3 (20)	-
Bookwork	-	2 (13)	-
Project work	-	-	12 (50)
Quiz	-	-	3 (13)

Only the top two responses for each year are retained from the complete data set

Table 5.9 Pupils' responses to: Please pick your favourite activity from Q7a and explain why you like it. And please pick your least favourite activity from Q7a and explain why you dislike it

questionnaire. This suggests that graph work seems to polarise pupils' opinions and that they responded well to the activity during this topic on this occasion.

In Y8 the most popular activity was poster work, where around one-third of the pupils stated it was fun, creative and/or a chance to 'Show off' (Y8, 16). One-quarter of the pupils chose experiments because they were 'fun'. In Y9 nearly half of the pupils chose group work as their favourite activity and one-quarter chose experiments.

Regarding pupils' least favourite activity, in all academic years fewer pupils answered this part of the question, suggesting they were more unwilling to write about what they did not like. This may be due to a generally positive disposition, that is, they enjoy all activities and were not willing to pick one that they thought of negatively. Pupils' least favourite activities were also addressed during the focus groups in Section 5.3.2.

In Y5 all those who did not enjoy work with food packaging labels stated it was boring or took a long time. This is interesting because such work was a popular activity prior to the teaching of the topic. It could be that although it was popular when they completed it in Y3, the completion of a similar activity in Y5 was not well received. The Y5 pupils who disliked looking at food adverts stated that it was boring.

In Y8 one-fifth disliked graph work because it took too long to complete. The highest negative response was in Y9 where half of the pupils disliked the project activity, stating it was boring and involved too much writing. This is interesting as during the documentary analysis (Section 4.4) only one activity, the project, was observable in the Y9 classwork. From reviewing this data we can firstly conclude that not all activities completed in class were apparent in the books, for example a quiz, and secondly the project activity proved to be particularly unpopular with the pupils.

At this point it is important to highlight T&LAs that the pupils did not state in their responses to the question on what they had completed in class. In Chapter 4 I described how part of the progression in the SoWs was connected to the use of ICT. I further described how there was no evidence of ICT use in the exercise books. During the questionnaires the pupils only reported the use of ICT during fact-finding activities and did not mention it in any other situation. The list of optional activities included in the questionnaires only stated ICT as part of the option 'fact finding using computers, leaflets, DVD or books' because the range of activities had to be kept to a manageable size. ICT activities suggested by the schemes included: making pictograms, making a database, making a PowerPoint presentation, using a diet analyser, making spreadsheets, using DTP software, data logging and ICT simulations. The pupils were free to write these or any other additional activities in the 'other' section. None of the ICT activities suggested in the SoWs were stated by pupils in this section. This may mean that pupils did not experience progression in this area as described by the SoWs. Alternatively, it may not have occurred to the pupils to add such activities in the 'other' section.

Pupils mentioned T&LAs when answering questions relevant to other themes (Section 5.2.1). For example, when pupils were asked if they wanted to learn more about F&HE in the future a Y5 pupil stated:

> We have covered most of it now so it might be boring learning it over again, but if [you] include trips/poster etc [it] might be ok. (Y5, 13)

This seems to suggest that even 'boring' work can be acceptable if pupils' preferred T&LAs are employed.

In conclusion, pupils' views on T&LAs during the F&HE topic can be summarised as follows:

- Pupils enjoy a variety of activities and are generally positive or are at worst indifferent to them, and the activities they do not like are fewer in number.
- Poster work was popular with all age groups, and group work was popular with pupils in KS3.
- Project work was an unpopular activity in Y9.
- Graph work polarized opinions in Y5, and was generally unpopular with Y8 and Y9 pupils.

5.2.3 Pupils' 'views' on progression in the food and healthy eating topic: questionnaire findings

Pupils were not directly asked about progression because it was unlikely they would be familiar with the term. It was, however, possible to infer pupils' views by looking at their responses to other questions. For example, pupils' implied discontent with progression might be inferred from their responses to finding out that they were going to be learning about F&HE (Section 5.2.1). The four negative responses given by KS3 pupils all mentioned already knowing the material and highlighted repetition, despite the likelihood that they did not actually know what would be taught. For example:

> I've already learnt it already (*sic*) and don't think we need to go over [it] again and again' (Y8, 28)

and

> I know what's good and what's not and I don't need to keep being told about it over and over. (Y8, 25)

It may be that this initial concern expressed by the pupils is based on their perceived progression on prior revisits to the F&HE topic.

In addition to this, pupils giving the mid-range answer of 'OK' highlighted repetition of subject content, for example by stating:

> Sometimes we learn the same thing over and over again but I don't mind learning about it but it isn't interesting. (Y9, 20)

Another pupil stating 'OK' suggested a similar view regarding the repetition, but also that the topic could be interesting:

> …because some of it you already know and you just get taught the same stuff but sometimes it can be interesting. (Y9, 1)

Overall, looking at all the responses given to explain their views, two Y5 pupils, six Y8 pupils and five Y9 pupils gave responses suggesting they had prior knowledge of F&HE, and commented that the prospect of repeating such work negatively affected their feelings.

Another pupil possibly indicated how adequate progression makes material more interesting when they stated that they were both bored and interested:

> I already know lots about it so I get bored when I am told stuff I already know, I am interested in new things. (Y8, 5)

Other pupils also commented that they were 'interested' in learning about F&HE. Several in Y8 stated this interest was due to 'increasing knowledge', again possibly highlighting the positive aspects of progression. One pupil stated: 'I like hearing about new interesting things' (Y5, 6).

Pupils' 'views' of progression may have been inferred from their responses to being asked if they wanted to learn more about F&HE in the future (Section 5.2.1, Table 5.5):

> It's interesting to know some of the stuff, like about how the body uses food and the structure of the digestive system but other stuff is boring because I've done it before so I wouldn't be interested in doing the same topic again. (Y8, 13)

The majority of pupils responding 'no' to this question did so suggesting that either they had learnt enough already, or found covering concepts again boring, and in addition the content is repetitive in Science and other subjects: 'I find it boring to do things again' (Y5, 15);

> …it gets boring when you do it in food [DT: Food], science and Lifetracks [PSHE] (Y9, 5)

and

> …because we do it all the time, for revision it's ok but not for proper learning. (Y9, 23)

A second point, about the overlap with other school subjects, was raised in another question when pupils were asked pre- and post-teaching if they thought they should learn about F&HE in Science lessons (Section 5.2.1 and Table 5.6). Although the majority of pupils in all years thought they should learn about it in science lessons, by Y9, nearly half of the pupils thought learning about it in Science lessons was unnecessary because they learn about it in other school subjects such as PSHE and DT: Food. It could be inferred that pupils' perception of progression is limited in Science because concepts are also taught in the others school subjects.

When pupils were asked if they thought learning about F&HE was important two pupils in Y8 responded 'yes' and 'no' even though that was not a given option. The reasons they gave suggested discontent with progression. For example, a pupil stated ‘We need to learn it but not more than once’ (Y8, 6). The comments by the pupils seem to suggest a certain amount of repetition of, or unwanted revisiting of the content possibly indicating that they did not feel there is adequate progression in the F&HE topic.

Several questions in the post-teaching questionnaire were designed to explore elements of progression. The first of these asked: ‘How many *new* things have you found out about food during this topic (things that you have not learnt about before)?’(Table 5.10).

Response	Y5 n=17 (%)	Y8 n=20 (%)	Y9 n=30 (%)
Quite a lot/ Loads	10 (59)	14 (70)	11 (37)
A little/some	7 (41)	6 (30)	19 (63)
Nothing	0 (0)	0 (0)	0 (0)

Table 5.10 Pupils’ responses to: How many new things have you found out about food or healthy eating during this topic (things that you have not learnt about before)?

The purpose of this question was to evaluate if pupils perceived they were learning new things from which it might be inferred that progression, exemplified by an increase in breadth of knowledge, was experienced. The two categories indicating least new material were combined, as were the two categories indicating most new material. All responses showed pupils had learnt at least some new material during the F&HE topic. The highest positive response was in Y8, where nearly three-quarters of pupils (14 pupils) stated they had learnt ‘loads’/‘quite a lot’ of new things, thus suggesting that these pupils experience progression. The Y9 pupils professed to have learnt the least new material, with two-thirds stating ‘a little’ or ‘some’. Overall, if progression is exemplified by an increase in the amount of new material learnt, it would appear that Y9 experienced least progression.

When these data are compared with the data in Table 5.5 that detailed pupils’ responses to whether they would like to learn more about the F&HE topic in the future, they appear to show the same pattern, that is a peak in Y8. The pupils most likely to want to learn more in the future matched the group who professed to learning the most new things during the F&HE topic. Further, the group who expressed the most negative views about wanting to learn more in the future, Y9, was also the group that professed to learning the least new things. This suggests that if pupils feel they have experienced progression then their desire to learn more in the future increases.

A question in the post-teaching questionnaire asked pupils to respond to a number of keywords and concepts (content areas) by stating if the material was covered during the F&HE topic as well as indicating whether they had prior knowledge of it (Table 5.11).

	Not before, Not this time			Yes before, not this time			Completely new in this topic			Yes some before, but understand more now			Yes all before, but good revision			Yes all before and did not need to do again		
	Y5 (%)	Y8 (%)	Y9 (%)	Y5 (%)	Y8 (%)	Y9 (%)	Y5 (%)	Y8 (%)	Y9 (%)	Y5 (%)	Y8 (%)	Y9 (%)	Y5 (%)	Y8 (%)	Y9 (%)	Y5 (%)	Y8 (%)	Y9 (%)
1.Food groups, farts, carbohydrates and proteins	0 **(0)**	0 **(0)**	0 **(0)**	6 **(35)**	1 **(5)**	9 **(32)**	1 **(6)**	1 **(5)**	0 **(0)**	7 **(41)**	11 **(55)**	13 **(46)**	3 **(18)**	6 **(30)**	4 **(14)**	0 **(0)**	1 **(5)**	2 **(7)**
2. Uses	1 **(6)**	1 **(5)**	2 **(7)**	4 **(24)**	0 **(0)**	5 **(18)**	4 **(24)**	5 **(25)**	1 **(4)**	7 **(41)**	10 **(50)**	12 **(43)**	1 **(6)**	4 **(20)**	8 **(29)**	0 **(0)**	0 **(0)**	0 **(0)**
3. Need for exercise	2 **(12)**	0 **(0)**	0 **(0)**	1 **(6)**	2 **(10)**	8 **(29)**	2 **(12)**	0 **(0)**	1 **(4)**	5 **(29)**	5 **(25)**	7 **(25)**	7 **(41)**	7 **(35)**	9 **(32)**	0 **(0)**	6 **(30)**	3 **(11)**
4. Poor diet/disease	1 **(6)**	3 **(15)**	3 **(11)**	3 **(18)**	3 **(15)**	6 **(21)**	4 **(24)**	2 **(10)**	2 **(7)**	7 **(41)**	4 **(20)**	9 **(32)**	2 **(12)**	6 **(30)**	6 **(21)**	0 **(0)**	2 **(10)**	2 **(7)**
5. Function of Circ. sys	2 **(12)**	0 **(0)**	0 **(0)**	1 **(6)**	0 **(0)**	4 **(14)**	8 **(47)**	4 **(20)**	4 **(14)**	4 **(24)**	11 **(55)**	10 **(36)**	2 **(12)**	5 **(25)**	8 **(29)**	0 **(0)**	0 **(0)**	1 **(4)**
6. Pulse rate	0 **(0)**	0 **(0)**	3 **(11)**	2 **(12)**	3 **(15)**	10 **(36)**	9 **(53)**	1 **(5)**	0 **(0)**	4 **(24)**	10 **(50)**	9 **(32)**	2 **(12)**	5 **(25)**	5 **(18)**	0 **(0)**	1 **(5)**	1 **(4)**
7. Names and functions of teeth	1 **(6)**	1 **(5)**	3 **(11)**	3 **(18)**	12 **(60)**	14 **(50)**	0 **(0)**	1 **(5)**	2 **(7)**	3 **(18)**	2 **(10)**	4 **(14)**	9 **(53)**	1 **(5)**	3 **(11)**	3 **(18)**	3 **(15)**	1 **(4)**
8. Structure of dig. system	1 **(6)**	0 **(0)**	2 **(7)**	2 **(12)**	0 **(0)**	4 **(14)**	11 **(65)**	8 **(40)**	3 **(11)**	3 **(18)**	7 **(35)**	8 **(29)**	0 **(0)**	5 **(25)**	10 **(36)**	0 **(0)**	0 **(0)**	1 **(4)**
9. Function: parts of the digestive system	2 **(12)**	0 **(0)**	3 **(11)**	0 **(0)**	0 **(0)**	5 **(18)**	11 **(65)**	5 **(5)**	3 **(11)**	4 **(24)**	11 **(55)**	9 **(32)**	0 **(0)**	4 **(20)**	8 **(29)**	0 **(0)**	0 **(0)**	0 **(0)**
10. Food tests	8 **(47)**	5 **(25)**	5 **(18)**	1 **(6)**	4 **(20)**	9 **(32)**	7 **(41)**	7 **(35)**	3 **(11)**	1 **(6)**	3 **(15)**	8 **(29)**	0 **(0)**	1 **(5)**	3 **(11)**	0 **(0)**	0 **(0)**	0 **(0)**
11. Enzymes	10 **(59)**	0 **(0)**	3 **(11)**	2 **(12)**	0 **(0)**	5 **(18)**	3 **(18)**	10 **(50)**	7 **(25)**	1 **(6)**	6 **(30)**	8 **(29)**	0 **(0)**	4 **(20)**	5 **(18)**	0 **(0)**	0 **(0)**	0 **(0)**

Y5: n=17
Y8: n=20
Y9: n=28

Table 5.11 Pupils' responses to: Here is a list of information that you may have learnt during this food and healthy eating topic. Please tick ONE statement that best describes how you feel about it

This was an attempt to gauge *when* key concepts were introduced. The first column is titled ‘not before, not this time’. It might be expected that this column be ticked if the concept/keyword stated was intended for a later age group. The second column, ‘yes before, but not this time’ might be expected to be ticked if the concept/keyword was basic and relevant to a prior age group. The third column, ‘completely new to me this topic’ might be expected to be ticked on the introduction of age appropriate concepts/keywords (as defined in key stages by the NC or years by the QCA) or on the early introduction of harder concepts/keywords (concepts or key words identified in later key stages in the NC PoS or later years in the QCA SoWs). The fourth column, ‘yes some before, but understand more now’ might be expected to be ticked if the concepts/keywords were revisited but the pupils had experienced progression in some way, for example, in depth of knowledge. The fifth column, ‘yes all before, but it was good revision’ might suggest a pupil for whom there was no progression but where they gained greater confidence from revisiting the material, that is, their views on the repetition were not negative. The final column, ‘yes all before and did not need to do it again’ possibly indicate a pupil who did not experience progression on this occasion and may hold negative views about the revisiting or repetition.

The columns have been colour coded: the green columns indicate pupils whose responses might imply progression in this area of the F&HE topic; the yellow column indicates pupils whom may not have perceived progression in this area but valued the revision; and the red column indicates pupils who did not experience progression on this occasion and may hold negative views about the revisiting or repetition.

The content area of ‘food groups’ is not included in the curriculum before KS3 (Section 4.2) yet nearly all of Y5 pupils stated they had some prior knowledge of it, and one-fifth said they knew it all before, possibly implying they did not cover new concepts/keywords in this area. This confirms data discussed in Section 4.4 of the documentary analysis that detailed how these concepts were observable in Y2 and Y3 exercise books.

When considering the content area of ‘teeth’ it appeared that in Y5 pupils experience limited progression, because nearly three-quarters of pupils gave responses that fell in either the red or the yellow columns. This is in agreement with the data discussed in Section 4.4 of the documentary analysis that indicated this content was taught in Y3 and Y5, despite it not actually appearing in the SoW for Y5.

The content area where most responses indicated limited progression was ‘poor diet leads to disease’ (highest score in red column) in Y8, where more than one-quarter of pupils ticked that statement. This was not in direct agreement with data from the documentary analysis (Section 4.4) as there did not appear to be as much repetition of this content in the exercise books as other areas. However, this concept does feature in external sources of information such as on television and on poster displays. Pupils’ belief that they did not need to do it again may therefore be based on experience gained both within and outside the classroom.

The areas showing the best indication of possible progression (the highest combined scores in the green columns) were ‘structure and function of the digestive system’ in Y5 and ‘enzymes’ in Y8. This is in direct agreement with the documentary analysis in these areas (Section 4.4 and 4.5) which highlighted these as exhibiting progression during the exercise books analysis. However, as outlined in Section 4.3, the ‘structure and function of the digestive system’ did not appear in the SoW for Y5.

The analysis of the qualitative responses expressed by pupils about the current and prior school also uncovered views that might be interpreted as connected to progression. For example, a Y8 pupil, whilst describing their feelings about senior school Science as ‘it’s exciting’ and ‘I know it already’, went on to explain:

> …because we can broaden our knowledge, but the stuff I know helps me learn more. (Y8, 2)

Pupils who ticked ‘it’s important’ and ‘know it already’ explained: ‘I know most of it but we go into more depth’ (Y8, 19); and ‘It’s important because it’s more complex’ (Y8, 13). Another pupil ticked ‘it’s exciting’, ‘important’ and ‘know it already’ because:

> …sometimes you know things already from primary school but you do more advanced experiments here so its exciting. (Y8, 17)

Finally, a pupil who ticked ‘know it already’ also added the proviso ‘lots’ and later went on to explain:

> …but it is good to learn new things but I get bored of repeating what we have learnt before. (Y8, 3)

In conclusion, pupils’ ‘views’ on progression in the F&HE topic can be summarised as follows:

- Pupils’ feel that progression in different areas of the F&HE topic is variable.

- Pupils' views are more positive about revisiting areas if their knowledge is extended, and/or they cover things in more exciting ways.
- Pupils' responses suggest that perceived progression was highest in Y8 and least in Y9.

The next section will address pupils' views on the F&HE topic as expressed during the focus groups.

5.3 Pupils' Views on the Food and Healthy Eating Topic: Focus Group Findings

The focus groups were designed to follow up data from the questionnaires by progressive focusing, to provide triangulation and to gather data in additional areas. The focus groups were designed to gather data in a number of ways. Questions were included, but also activities such as pupils constructing a spidergram, an ideas-generating activity and the novel inclusion of a role-play activity (Section 3.3.2).

In Section 5.3.1 and 5.3.2 I analyse pupils' views on the content and T&LAs in relation to the F&HE topic respectively. In Section 5.3.3 I report on pupils' 'views' on progression inferred from their responses during the focus groups, and Section 5.3.4 considers the role plays.

In the following paragraphs the bracketed information following quotes e.g. (Y8 FG1 3) is firstly the pupil's year, then the focus group number and finally the pupil number (1, 2, etc.). These numbers are only consistent for each individual question, that is, the first pupil to answer is given 1, and the second 2. So pupil 1 for question x may not be the same as pupil 1 for question y. This is because the pupils were not known to me and therefore it proved too difficult to identify individual pupils from recordings. I did not include gender because I am not exploring gender differences in this research.

5.3.1 Pupils' views on content of the food and healthy eating topic: focus group findings

The focus groups identified that pupils learn about F&HE outside of school, for example from family, posters at the doctor's surgery and TV/radio programmes. These sources matched those given as responses in the questionnaires. Employing progressive focusing, pupils were asked to clarify what type of information they found out from these sources. The concepts or keywords, stated by *all* age groups, included: 'healthy and unhealthy food'; 'balanced diet' and/or the 'food pyramid' or 'food pie chart'.

Pupils also stated that they learnt about F&HE in other lessons in school and, in some cases, covered the same subject content as Science lessons. A summary of school subjects and food content covered that were identified by pupils is shown in Table 5.12.

Subject	Confirmed by Year	Subject concepts or keywords
Design technology: Food	5, 6, 8 and 9	Healthy/unhealthy Food Groups Balanced Diet Meal Planning Types of food Food Preparation
PSHE	5, 6, 8 and 9	Healthy/unhealthy Food Groups Balanced Diet Meal Planning Types of food Health effects of poor diet (Y8 and 9)
PE	6, 8 and 9	Healthy/unhealthy Keeping fit Food Groups as part of a Balanced Diet Exercise Importance of water
Languages	5 and 6	Food eaten in different countries
Religious Studies	5 and 6	Foods consumed by followers of different religions (Halal, Kosher, etc.)
Geography	5	Food Production

Key:
Covered in Science lessons (Section 4.3 and 4.4)
Not Covered in Science lessons (Section 4.3 and 4.4)
May be covered in science lessons

Table 5.12 School subjects suggested by pupils that cover food and pupils' description of concepts or keywords that are covered

Concepts highlighted in red show the overlap of Science concepts with other school subjects. Some concepts appear in as many as four school subjects (including Science), for example, 'healthy or unhealthy foods', 'food groups' and 'balanced diet'. A green highlight shows concepts that are unique to that school subject. The wider implications of this overlap will be discussed in Section 7.2.

Y6 were asked if they thought that learning about F&HE was important and whether they thought it should be taught in Science lessons. All pupils felt it was important to learn about F&HE and suggested reasons that included 'health benefits'. Although the majority of pupils felt that it should be taught in Science, several stated that there was no need to keep doing it. Several pupils from the second Y6 focus group felt it would be more suitably taught in DT: Food. These sentiments are similar to those expressed by the other age groups in the questionnaires.

When asked what they found most interesting about the F&HE topic, all of the pupils from one of the Y9 focus groups were unable to state content or activities that they found interesting about the F&HE topic. It may be that pupils in the focus group felt under peer pressure (Section 3.3.2). However, up until this point all the questions were factual and this was the first that required them to give an opinion. It was therefore unlikely that they would know the opinions of the others at this stage, although it remains a possibility. With the exception of this group, pupils from all years (including pupils from the second Y9 focus group), stated that they found the potential health consequences of an unhealthy diet (in particular obesity) to be of interest to them. The majority of pupils thus appeared to be interested in the negative aspects of F&HE. For example, in the first Y8 focus group the pupils responded to the question with: 'the consequences of unhealthy eating' (Y8 FG1 1) and 'when you see all those disgusting pictures [of obese people during the lesson]' (Y8 FG1 2) .The pupils then burst out laughing whilst discussing the pictures shown to them during the lesson. The pupils' discussion then turned to a TV programme on the world's fattest man, again using words such as 'disgusting' to describe the content.

This led in turn to a further discussion about another TV programme on liposuction in which a woman died due to complications following surgery. Pupils commented:

> Its kinda good for the doctor to say I told you so (Y8 FG1 1)
>
> Yeah you look at that and think I don't want to end up like that. (Y8 FG1 3)

It can be inferred from these quotes that these pupils are viewing the material shown during lessons and outside of school as a cautionary tale. However, there was also a certain amount of 'Schadenfreude' as was inferred from their amusement of the material and an apparent lack of empathy with the people in the pictures or featured in the TV programmes. That is, there were no comments from pupils regarding the back story of the subjects given in these documentaries regarding psychological issues leading to the extreme weight gain or the on-going health and psychological issues they were inevitably experiencing.

When asked what they did not find interesting about the F&HE topic, some pupils from all years stated that some subject content was already known to them and therefore was not interesting. Key concepts that they described as 'already knowing' about included: 'food groups' in Y5, Y6, Y8 and Y9; 'balanced diet' in Y5, Y6 and Y8; and 'exercise' in Y9. The majority of pupils from all years stated that they already knew the content because they had learnt it in previous school years. Two Y9 pupils from different focus groups made very similar statements:

> Food groups we already did at primary school, we spent whole lessons covering what we already know (Y9 FG1 2)
>
> We spent whole lessons on things that we've done already. I mean they could have just set us a small task or sumut [slang]. (Y9 FG2 1)

Pupils in Y6 highlighted that they not only learnt about it in school but also outside of school and stated, for example, ‘If you keep hearing something eventually it gets boring’ (Y6 FG1 1).

Pupils in both Y6 and Y9 made reference to exam pressure during the focus groups. For example, when referring to the differences between KS1 and KS2, pupils in Y6 stated that:

> Now we have scarier teachers and they press you more, it’s all about exams (Y6 FG1 1)
>
> Miss … is always blabbing on about exams (Y6 FG1 1)
>
> It’s more serious [because of the exam focus]. (Y6 FG1 2 and 3)

Y9 pupils, when asked why in the post-teaching questionnaire Science in general was less popular, they stated:

> …the exams are getting closer. (Y9 FG1 1)
>
> …because of the exams - it’s less practical. (Y9 FG1 2)
>
> …because [they announced] the module tests it’s more serious. (Y9 FG2 1)

This sentiment was confirmed by other pupils within the group. Furthermore, pupils from both Y9 focus groups included words connected to exam pressure in the mind mapping activity about the current year. Pupils from the first Y9 focus group included the word ‘scary’ and others included the word ‘worried’. When they were asked to explain these words pupils stated that they felt pressurised due to the impending exams and that the work was harder.

In conclusion, findings from the focus groups regarding the content of the F&HE topic confirmed those from the pupil questionnaires in that:

- Pupils learnt about food both inside and outside of school.
- Pupils suggested that part of the content of the Science curriculum was replicated in other school subjects such as DT: Food and PSHE.
- All years highlighted 'food groups' as an area frequently revisited, as well as 'balanced diet' in relation to years 5, 6 and 8 and 'exercise' in Y9.
- Some pupils felt that covering any material that they viewed as having been taught before was not interesting.

In addition to these points, findings solely from the focus groups suggest that pupils from all years found the health implications of poor diet to be of interest. Further, pupils from the year groups at the end of the key stage (Y6 and Y9) felt Science lessons were being influenced in some ways by impending examinations.

In summary, pupils learn about F&HE from a wide range of sources. As a consequence, the content of lessons can be seen to be repetitive and pupils do not find repetitive material interesting.

5.3.2 Pupils' views on teaching and learning activities in the food and healthy eating topic: focus group findings

Data from the questionnaires indicated that Science, DT and Physical Education (PE) were consistently popular subjects for all the years (Appendix 5.3). Using some probe questions pupils were asked to elaborate on the popularity of these subjects within the focus groups. Pupils indicated that they enjoyed practical work, being able to get up and move around, leaving the classroom and making things they could take home (in DT). Also important was the lack of writing activities during these lessons.

When pupils were asked about what was interesting or not about the F&HE topic, all of them stated that practical work made the topic more interesting. Pupils in Y8 and Y9 stated that copying from the board and book work made the topic uninteresting. Further, some in Y8 stated that if content was covered using video clips and/or a SMART board, they would find it more interesting (compared to standard board work). Comments supporting the notion that practical work made Science 'fun' arose in several lines of discussion. For example, pupils in the second Y9 focus group suggested that Science was more 'fun' in Y8 because they had completed more experiments in that year compared to their current year. They then went on to say:

> …sometimes we learn what would happen in an experiment, but last year we would actually do the experiment. (Y9 FG2 2)

This statement was agreed upon by all other members of the group. The discussion then continued:

> When you are learning about an experiment are you seeing it on a DVD? Or SMART board? (Researcher)
>
> Yeah sometimes (pronounced very slowly). (Y9 FG2 1)
>
> But others [we] do in different forms of it like equations and that sort of thing. (Y9 FG2 2)
>
> Yeah, I think we'd understand the equations more if we did do actually what is happening. (Y9 FG2 1)

Again the rest of the group said they were in complete agreement with these statements. Some members of the first Y9 focus group also indicated through the mind mapping activity, that there were not enough experiments (in Y9) and further stated 'in Y7 and Y8 we got loads of practicals' (Y9 FG1 1). Pupils in the second Y9 focus group described how content of lessons was 'rushed' due to the need to cover content quickly before the imminent GCSE module tests. This discontent mirrors sentiments expressed about T&LAs by Y9 pupils in the questionnaires (Section 5.2.2).

Data collected via the questionnaires were used within the focus groups to draw further information from pupils about factors influencing their enjoyment of Science generally. For example, in the questionnaires, pupils were asked to rate thirteen science topics for enjoyment. Through progressive focusing, the two most popular topics identified in the questionnaire were used in the focus groups to explore reasons for their popularity. Pupils from all age groups linked the most popular topics (chemical reactions and solids, liquids and gases) to the T&LAs used to cover the content. All age groups agreed that experiments and practical work made these topics more fun. Pupils in Y9 stated that they liked to get 'stuck in' and that they enjoyed experiments with chemicals because it was like 'Brainiacs', a popular Chemistry/Science-based television programme. An example of a popular role-play activity, suggested by Y5, was when pupils pretended to be 'particles' and acted out the different states of matter.

Pupils in Y5 were then asked about the least popular topics from the questionnaires: these were light, forces and plants. Most Y5 pupils found the light topic boring, but others said they did enjoy the work on shadows because it was conducted in the playground. Pupils in Y6, Y8 and Y9 identified within their answers that the topics (plants, forces, rocks) were boring due to the lack of practical work and the inclusion of writing tasks, or the learning of dry or boring facts.

Progressive focusing identified the specific writing task of ‘copying’ as particularly unpopular. Pupils from focus groups of all years stated, on multiple occasions that they did not like ‘copying’ material from the board or text books as it made them bored or uninterested. This suggests an additional reason as to why subjects such as PE and DT are popular, because they lack or contain small amounts of this type of T&LA.

In conclusion, findings from the focus groups regarding the T&LAs during the F&HE topic confirmed those from the pupil questionnaires in that:

- Pupils enjoyed activities that did not involve writing, and pupils did not like lessons lacking in activities.
- Pupils in Y9 were unhappy with the activities so far in the academic year.

Further, findings from the focus groups pupils also showed that:

- Pupils did not enjoy ‘copying’ activities.

5.3.3 Pupils’ ‘views’ on progression in the food and healthy eating topic and following the key stage transition: focus group findings

Comments made by pupils from all years suggested that they hold some awareness of progression in the curriculum as they recognise doing similar topics throughout their schooling and that these topics: gain ‘more details’ (Y5); ‘get more advanced’ (Y6); moved from ‘little to more detail’; or are ‘more complicated’ (Y9). Y5, Y6 and Y9 pupils also used the terms ‘revise’ (Y5), ‘refresh’ (Y5 and Y6) and ‘remind’ (Y9), all words suggesting a revisiting of some of the material. Pupils were asked how they felt when they learnt about something they had learnt a little about before. Years 5, 8 and 9 expressed a mix of views, indicating both positive and negative sentiments. The most detailed explanation was given by Y5 pupils, whilst some pupils said it made them feel more confident because they already had some understanding of the material; others said it made them feel bored. Some also expressed a feeling of confusion:

> Sometimes I get confused in [KS1] or say or say year 3 we learnt something then say in year 5 we learn something different about the same thing so I get confused sometimes (Y5 FG2 1)
>
> Yes. (Researcher)
>
> And I’m surprised, so why are they different? (Y5 FG2 1)
>
> Can you think of an example? (Researcher)
>
> Yes early on we learnt only about molars then suddenly we find out there are premolars. (Y5 FG2 1)
>
> Yes. (Y5 FG2 2 in agreement with 1)

The group then went on to discuss how things ‘suddenly’ change. The example raised was that ‘really early’ (potentially meaning KS1/Y1) the fat group was known as the dairy group and then, when the name of the group changed in KS2, some pupils became confused:

> I remember I had a sheet in year 5 and it said name them so I put the dairy group but it was fat and I got it wrong. (Y5 FG2 2)
>
> Yes I did that as well and my mum got cross. (Y5 FG2 1)

When Y6 were asked how they felt when they learnt about something they had learnt a little about before, their comments were less detailed than the Y5 pupils, stating they felt: 'A bit happy because it's easier 'cos you remember it' (Y6 FG1 1). Y8 gave varied responses ranging from feeling comfortable, through feeling disappointed because 'I kinda hoped it gets more challenging' (Y8 FG1 1) to a disappointment that 'sometimes it's exactly the same' (Y8 FG1 2). Others stated that it depended on the topic. For example, they did not mind going over material again in space and the solar system (a favoured topic) because it was often covered using favoured activities such as poster work and the topic in general was interesting due to there being fresh discoveries in the field. They also felt strongly against covering material again in forces and magnets (least favoured topics) because, although it was covered using practical work, these tasks were often the same experiments they had completed in KS2 (Y6). Similar views were expressed by Y9 pupils whose feelings ranged from 'less daunted' (Y9 FG11) to 'bored' (Y9 FG2 1), 'annoyed' (Y9 FG2 2), and a feeling that the balance of new to revised is wrong:

> It seems that when we do something new we spend only a day on it, but when we do something we know, we spend ages on it. (Y9 FG2 1)

Pupils were asked when they could remember learning about food before their current year in school. All pupils could remember doing the F&HE topic before and identified the years. Pupils in Y8 and Y9 also stated that they covered it in Y6 as part of their SATs preparation. Those pupils who did not identify individual years made statements such as 'nearly every year' (Y9 FG2 1) or 'all years really' (Y8 FG2 1).

In an attempt to assess progression, pupils were asked what they had learnt in the earlier years of school (Table 5.13).

<table>
<tr><th rowspan="2">Year Identified</th><th colspan="3">Concepts that were recalled to be covered identified by:</th></tr>
<tr><th>Year 5</th><th>Year 8</th><th>Year 9</th></tr>
<tr><td>1</td><td rowspan="2">Sweets, fruit and vegetables, food groups and what they did/how they affect you, energy, pie chart, balanced diet, food pyramid, posters, fats carbohydrates, proteins</td><td>Dairy group, food groups, and protein, fat, carbohydrate, etc.</td><td rowspan="2">an overview, dairy, fruits and vegetables fats carbohydrates, protein, sugar (but not starch), uses of food groups, plate portions (pie chart to look like a plate), healthy</td></tr>
<tr><td>2</td><td>Food groups fats, carbohydrates, proteins</td></tr>
<tr><td>3</td><td>Digestion, balanced diet, we do balanced diet nearly every year, food pyramid, teeth, shape, different parts root, crown</td><td>Food groups fats, carbohydrates, proteins</td><td>Exercise, balanced diet, same things as before going over it again</td></tr>
<tr><td>4</td><td>a bit, exercise</td><td>Food groups fats, carbohydrates, proteins</td><td rowspan="2">Five a day, balanced diet.</td></tr>
<tr><td>5</td><td>N/A</td><td>Food groups fats, carbohydrates, proteins Pulse and exercise, protein for growth, etc.</td></tr>
<tr><td>6</td><td>N/A</td><td>Revision/everything</td><td>Revision, everything</td></tr>
<tr><td>8</td><td>N/A</td><td>N/A</td><td>Food group uses in depth, nutrients, amounts needed</td></tr>
</table>

Table 5.13 Pupils' responses to: Most of you said that you had learnt about food before year x (current year). Can you remember when? And, Can you remember what you learnt about in year y?

All pupils in all years identified using the scientific terms for the 'food groups' in junior school (KS2), and some pupils in all years identified using them in primary school (KS1) and junior school (KS2).

Pupils were also asked what they had learnt in their current school year. In answering this question, Y5 appeared to be the most dissatisfied age group with the content of lessons, expressing only negative views. They stated that they had covered 'teeth' again and that it was 'revision', and that material was the 'same stuff as year 3' (Y5 FG2 1) and that it was all 'kinda boring 'cos we already knew all about it' (Y5 FG2 2). This is in full agreement with data collected in the questionnaires and Section 5.2.3 (Table 5.11), where it was found that the highest proportion of pupils indicating a possible lack of progression was in Y5. Nearly three-quarters of these pupils perceived limited progression in the area of teeth. This supported data from the document analysis (Section 4.4.1, Table 4.13) that observed exactly the same content in both the Y3 and the Y5 books. Further, the concept of 'teeth' did not appear in the SoW for Y5 (Section 4.3). It did, however, appear in the SoW for Y2 and Y3.

The Y8 pupils stated that they had covered similar work before, but identified that it was now more detailed or 'in more depth' (Y8 FG2 1), repeating work on the food group uses. They also identified 'digestion' in detail, 'enzymes' and 'enzyme specificity to individual substrates'. Pupils in Y9 identified some of the content as being the 'same' as previous years and highlighted 'balanced diet' as an example. They went on to identify areas that were covered in more depth such as work on fats known as polyunsaturated, diet links to disease and high blood pressure and new content such as cholesterol. This supports and confirms the data collected during the exercise book analysis (Section 4.4).

In summary, Y5 pupils appeared to be suggesting that there had been repetition in what they were learning about F&HE since Y3 in some areas, because they knew the material and that they felt it was therefore revision. Y8 and 9 identified areas of limited progression by suggesting some concepts were repeated in the same manner as previous years, but also stated areas where progression was experienced.

At this point it seems to be prudent to state that although Y5 pupils seemed to be dissatisfied, they did not, in the focus groups, identify the same content areas which the pupils' responses to the questionnaires suggested as an area of good progression e.g. 'the structure of the digestive system'. This could be because they were only focusing on the content of the F&HE topic directly connected to food, such as, 'food groups' or 'teeth'. It may be that if I had asked them directly about the digestive system then more positive views may have been expressed.

A lack of progression could be inferred from the Y8 pupils' expression of dissatisfaction in response to the question 'what did you not find interesting?' In the first focus group a pupil commented 'stuff we already know' (Y8 FG1 1). In the second focus group pupils commented, '…sometimes it's exactly the same, but then you move on' (Y8 FG2 2) and, 'some bits are interesting, but sometimes we find parts we already know' (Y8 FG2 1).
In order to clarify this point I asked:

> When you say you 'know it already and you are learning it again' where do you know it from? (Researcher)
>
> Junior school (Y8 FG2 1)
>
> Primary school (Y8 FG2 2)

…and what in particular would that be [about]? (Researcher)

Food groups (Y8 FG2 2)

Healthy eating and balanced diet (Y8 FG2 1)

Just learn it again and again from Y1 and reception. (Y8 FG2 2)

These general sentiments are in agreement with data collected during the questionnaires and discussed in Section 5.2.3.

Pupils were also asked about how their views of Science lessons in their current and previous key stage (Table 5.14) in an attempt to gain some insight into aspects linked to continuity and progression following transition.

Age Group	Views on Previous Key stage	Views on current Key Stage
Y5	More exciting and fun, more experiments, got to go out of school to look at habitats, look for bugs	More serious, writing paragraphs, text books, tests, SATs,
Y6	No direct comment about earlier	Scarier teachers, all about exams, more serious
Y8	Knew everything already, easy, simple	Expected it to be harder (but not), is more detailed and interesting
Y9	More fun, less pressure until the SATs, easy, fun experiments, more like playing with things, good because you did not have to carry books around	Y7 and Y8 were good too as more practicals, but now we have GCSE pressure and separate sciences

Table 5.14 Pupils' responses: Is there any difference in how you feel about learning about science, since leaving primary/junior school?

Pupils in Y5 (KS2) were in agreement that KS1 had been more 'fun' due to the T&LAs employed. Further, Y5 and Y6 pupils also felt KS2 was more serious because of the T&LAs employed (less relaxed/more formal) and the prospects of exams. Pupils in Y8 linked their answers, not to T&LAs or how ‘fun’ something was, but to how ‘challenging’ the material was. They thought that secondary school was going to be harder than it was, and also that the work would be more detailed and interesting. Finally, Y9 pupils linked their answers to T&LAs suggesting that more practical work increased their enjoyment. They also highlighted the pressure they felt in Y6 with the SATs and the pressure were currently feeling with the GCSE exams.

In conclusion, pupils’ ‘views’ on progression during the F&HE topic can be summarised as follows:

- Pupils in Y8 and Y9 identified areas of providing progression and repetition in the curriculum, whereas pupils in Y5 focused on repetitive areas of the curriculum.
- Some pupils will tolerate areas of apparent limited progression or repetition because it makes them feel more confident, while other pupils respond by stating disappointment or boredom.
- Sometimes when content is progressed to including scientific terms it creates confusion in some pupils as to why the more basic terms are no longer acceptable.
- Pupils’ general enjoyment of the key stages seems to be influenced by activities, the level of challenge and pressure from exams.

In order to explore the pupils’ views on any similarities or differences in the teaching experienced in their previous and current key stage, role plays were employed as a tool. The next section explores the inferred views arising from this exercise.

5.3.4 Pupils views' inferred from the role plays

The role plays focused on some of the areas already explored during the focus groups. The tool was used to elicit further data on how pupils perceived the differences in teaching and learning styles in their current and previous key stage. The role-play section of the focus groups was the last activity to be completed, and they were informed of this. Pupils were asked to form two groups with one group acting out what Science lessons were like in their previous key stage (primary school or junior school) and the other group acting out what Science lessons are like in their current key stage (junior school or secondary school). The pupils were given time to decide and practise what they wanted to portray. They were not directed as to what the plays should include beyond the basic statements on the flashcard, of either 'this is what Science lessons were like in junior/primary school' or 'this is what Science lessons are like in secondary/junior school'. Plays were short, usually around a minute for each of the two scenes. As an example the role plays an excerpt from the Y8 play has been transcribed below.

This was a mixed gender group performing: 'this is what Science lessons are like in secondary school'. As part of their preparation they used a piece of paper left over from a prior activity and wrote on it: 'essay', 'homework', 'the heart', 'veins' and 'copy this'. These were, presumably, the key issues/concepts they wanted to portray. During the play the 'pupils' are first invited into the classroom by the 'teacher' before they take their seats. For the remainder of the play the 'teacher' stands in front of the seated 'pupils'.

The play began:

Teacher: Right 8L come in and stand behind your places in Silence.

(Pupils whisper to each other)

Teacher: THAT'S NOT SILENCE! (Shouting)

(Pupils shuffle in and take seats)

Teacher: Today we are going to do the heart and stuff, the arteries. And all the rest of it.

Pupil 1: Oh (sounding disappointed)

Teacher: So I'm going to talk. The heart has many things like arteries and veins. You need to write it down in your books. For your homework I want you to do an essay on the heart and stuff.

Pupil 1: Oh (sounding disappointed)

Pupil 2: Oh (sounding disappointed)

Teacher: OK, we are going to do a practical tomorrow

Pupil 2: Yeah! (Sounding excited)

(Teacher then interrupts)

Teacher: So I want you to find out about it and do a report on it, and I want you to do graphs and lines of best fit, NEVER do dot to dot, and you have to do the line of best fit and you have to get your ruler and stuff.

The play then ended with all the pupils in the room laughing.

The role plays were all transcribed before being condensed into detailed notes so that a comparison could be made. The detailed notes can be found in Appendix 5.4. These detailed notes were also used to produce the summary appearing in Table 5.15.

In general, the data gained from the role plays fell mainly in the areas of T&LAs, disciplinary techniques employed by the teacher, and pupil behaviour. The majority of

Year Group	Depicting	Position of pupils/ teacher	Discipline	Pupil behaviour and/or attitude	Practical work	Main activity	Other activity
Y5	KS1	All sitting close together	No poor behaviour and no threats by teacher	Happy, calm	Yes	Question and answer	Discussion
	KS2	Teacher stand pupils sit	Teacher appears strict but no threats	Pupils appear scared/ do not talk	None	Teacher talk	Pupils copy out of text book
Y6	KS1	Mix of either all sitting, all standing or teacher stand	Strict only in use of the toilet and noise making	Mixed calm, some cheers happy some noisy	None	Drawing	Colouring
	KS2	Teacher stands pupils sit	Strict, shouting, threats	Scared, no completing homework	Mixed yes and no	Teacher talk	None
Y8	KS2	All standing	Not strict	Happy enthusiastic, cheering	Mixed yes and no and a demonstration	Question and answer	Repeat after me
	KS3	Teacher stands pupils sit	Strict, Shouting, detention	Mix of happy and disappointed	None (only promised in future)	Question and answer	Write in books
Y9	KS2	Mix either all sitting or teacher stands	Not strict	Happy enthusiastic	Yes	Question and answer	Pupil draw on board and write in books
	KS3	Teacher stands pupils sit	Range from mild rebuke to strict, detention	Mild misbehaviour	No	Question and answer	Copying from text book or off board

Table 5.15 Comparison of the role plays

groups portrayed the earlier key stage with all participants being on the same level, that is, all sitting or all standing. This was possibly due to the practice of ‘circle time’ or ‘carpet time’ where the whole class sits together for a period of discussion, although the teacher is usually sitting on a chair. The older pupils clearly have lessons of more formal teaching where the teacher is standing at the front and the pupils are sitting. There also seems to be an increase in discipline in the older key stage. This was shown by general threats and those of potential detentions. The majority of groups portrayed the earlier key stage with pupils who were happy, calm and enthusiastic, and portrayed the later key stage as being dominated by ‘strict’ or in some cases even ‘scary’ teachers. A ‘strict’ teacher would be portrayed by threatening detentions even for mild misbehaviour, such as whispering or in the case of one Y8 scene (Y8 FG1) for simply asking ‘Are we doing practical work now?’ to which the teacher replied ‘Detention!’

A scary teacher was identified in the Y5 FG2, for example, because a pupil appeared scared and leant back and pulled a face when the teacher spoke to her. Following the end of this scene I commented to the pupils:

> OK, that’s it. Thank you very much! Well done, (pause) very quiet pupils!

One of the pupils responded: ‘She’s scary’. The data expressed here regarding ‘scary’ or ‘strict’ teachers reinforces data collected during other parts of the focus groups.

No pupils in Y8 or Y9 depicted a lesson in KS3 as including practical work. The plays seemed to suggest a desire to do practical work, shown by pupils requesting it and by their excitement when being told they were going to do some ‘tomorrow’. Yet this desire was not fulfilled. Practical work was observed in plays depicting lessons in KS1 and KS2, however. This appears to confirm comments expressed earlier in the focus groups by Y9 pupils that they complete less practical work than they did in their previous years (Section 5.3.2).

One of the limitations of the role plays was that there was not time to follow up on the pupils' reasoning behind the portrayals due to the time parameters set by the schools. This could be improved if future work is to be completed in this area by including a period of discussion following the plays, allowing pupils to explain why they included certain aspects and not others.

In conclusion, pupils' views, inferred from the role plays, can be summarised as follows:

- As pupils get older their teaching becomes more formal
- Discipline issues were more apparent in the older key stages
- Pupils' desire in KS3 to do lots of practical work is not being fulfilled.

Views inferred from the role plays seem to confirm attitudes suggested by the questionnaires and focus groups in the area of T&LAs in that pupils' desire to do practical work in KS3 is not fulfilled to the extent they would like. This may also support data from the exercise book analysis (Section 4.4) which appeared to show that fewer T&LAs were completed with the pupils than appeared in the SoWs.

5.4 Pupil Consultation Summary

Addressing RQ2, the tools used during the pupil consultation of questionnaires, focus groups and role plays provided much agreement in pupils' views on the content, T&LAs, and inferred progression in the F&HE topic. Pupils believed learning about F&HE to be important due to the perceived health benefits. They did express the view, however, that they learnt about it from a wide range of sources both inside and outside of school and that this led to some repetitive content or to what may be inferred as limited progression, for example, in the content areas of 'food groups' and 'balanced diet'. Pupils felt that they should learn about F&HE in Science lessons, although some believed it was unnecessary to learn about it repeatedly in Science and other school subjects such as PSHE. Others found the revisiting of content helped them gain confidence. It was also noted that the types of T&LAs used during lessons influenced how interesting pupils found the topic. Pupils stated that they enjoyed lessons that included practical and/or creative work and did not enjoy writing tasks.

In general pupils were interested in content areas that provided progression or those which were 'new' to them. Pupils were less interested in areas that provided limited progression due to repetition although some pupils did gain greater confidence when areas were revisited.

CHAPTER 6

TEACHER CONSULTATION

6.1 Introduction

This chapter presents data dealing with RQ3: What are teachers' perceptions of the content, teaching and learning activities and progression in the food and healthy eating topic? Teachers' perceptions were sought through one-to-one semi-structured interviews. The analysis was undertaken in a similar manner to the pupils' focus group data analysis, using coding, clustering and presenting in themes. I first highlighted key text on a paper copy of the transcript, and then entered this along with time markers into compacted recording sheets. Answers were kept as succinct as possible without losing the meaning by restricting them to single words or short phrases. The time markers allowed me to return to key points of the interview for the transcription of key quotes. Finally the data were entered into a single summary table (Appendix 6.2) that included responses from all participants.

Four teachers, two from each school, were interviewed for the study. A late withdrawal by a potential participant led to data from the pilot interview, with a KS2 teacher, being included in the main findings. This allowed the research design to be maintained with a sample comprising a class teacher and a head of department from each school. The justification for this approach was given in Section 3.4.

All the teachers were specialists with degrees in a Science subject and had considerable experience with the F&HE topic, teaching it at least twice yearly. The KS2 teachers had more than one class per year group from each of Y3 and Y5. The KS3 teachers had two different age groups per year, that is, they taught the F&HE topic to a Y8 and a Y9 class. The heads of department had more than seventeen, and the class teachers had more than five years of teaching experience.

For the purpose of attributing evidence in this section, the teachers are identified as follows: Malcolm was the class teacher of KS2 pupils (CT KS2), Amanda was the primary school HoD and the teacher of Y5 (HoD Y5), Derek was the secondary school HoD and the teacher of Y8 (HoD Y8), and Natalie was the class teacher of Y9 (CT Y9). The names given here are not their real names, but do indicate gender.

The interview protocol was divided into seven sections. Sections 1-5 contained direct and open questions with a selection of possible prompts and probes (Section 3.4). On occasion, additional probes, not appearing in the protocol, were included due to the open nature of the teachers' responses; that is, responses were not always predictable and therefore a suitable probe may not have been entered in the protocol. During this part of the interview, the teachers were encouraged to use the two *aide-mémoire* sheets. The sheets detailed possible T&LAs and potential concepts covered during the F&HE topic. They were provided to the teachers prior to interview. These aids were necessary because of the time lapse between the completion of the topic and the interview, the length of which varied due to the teachers' availability for interview.

Sections 6 and 7 of the interview included sequencing activities with supporting questions designed to explore teachers' perceptions of progression. The interview protocol and *aide-mémoire* sheets are reproduced in Appendix 3.5 and 6.1 respectively.

This chapter presents and discusses teachers' perceptions of the content of the F&HE topic (Section 6.2), T&LAs (Section 6.3), and progression in the curriculum (Section 6.4) and ends with a summary and discussion (Section 6.5).

6.2 Teachers' Perception of the Content of the Food and Healthy Eating Topic

6.2.1 Teachers' perceptions of the content they teach

This section addresses the teachers' perceptions of the content of the curriculum. The teachers were asked: What aspects of F&HE do you teach in year 5, 8 or 9? The data are presented in Table 6.1.

All the teachers identified some concepts and keywords from their school's SoW for the academic year they were teaching. In addition, concepts stated by teachers also matched some of the concepts and keywords identified in pupils' exercise books during the documentary analysis (Section 4.4). As the number of concepts and keywords shown in the exercise books for an individual academic year might be as many as 50, the teachers' responses were not expected to be exhaustive and would therefore give a general guide (that is, they indicate a general theme of content).

Keyword or concept	Relevant key stage of the National Curriculum or GCSE	CT KS2	HoD Y5	HoD Y8	CT Y9
The need for exercise	KS1	*	*		
Healthy/unhealthy	KS1	*		*	
Names and functions of different types of teeth	KS2		*		
Pulse rate	N/A	*	*		
Food groups: Fats, carbohydrates and proteins	KS3	*	*	*	+
How different types of food used by the body, for example, proteins for growth	KS3		*		
The structure of the digestive system	KS3		*	*	
The function of the different parts of the digestive system	KS3		*	*	
That a poor diet leads to disease	N/A		*		
Food tests (using chemicals to find out what is in food)	N/A			*	
Enzymes	KS3			*	
Balanced diet	KS3	*		*	+
The function of the heart, lungs and blood vessels	KS3		*		
Cholesterol	GCSE (KS4)				*
Blood pressure	GCSE (KS4)				*
Weight loss diets	GCSE (KS4)				*

Key:
* = Directly mentioned as taught
+ = Identified as a 'recap' in lessons
N/A = Not specifically appearing in NC in the F&HE section although may appear in other sections

Table 6.1 Teachers' responses to: What aspects of food and healthy eating do you teach in year 5/8/9?

The concepts and keywords identified appear to partly match the PoS for the relevant key stage. However, three teachers, both KS2 teachers and Natalie (CT Y9), also identified concepts that pertain to a later key stage in the NC (KS3 and KS4 respectively). For example, Malcolm (CT KS2) and Amanda (HoD Y5) identified food groups and the function of the different parts of the digestive system, even though these concepts appear in KS3 of the NC PoS and do not form part of the KS2 PoS. Further, Natalie (CT Y9) reported on the inclusion of several GCSE (KS4) concepts including cholesterol and blood pressure. This evidence suggests that the teachers involved with the study were teaching keywords and concepts before the stage at which the NC intended then to be taught. This confirms data collected during the exercise book analysis (Section 4.4).

Further, the responses given by Malcolm and Amanda, the two KS2 teachers, contained a single KS2 concept (teeth), yet a total of six KS3 concepts were stated. This finding may indicate that their focus was on KS3 material and appears to support and confirm evidence found in the documentary analysis, where the pupil exercise books had a greater percentage agreement with the KS3 SoW than the KS2 SoW (Section 4.4).

In addition, there is some evidence in Table 6.1 that the KS2 teachers Malcolm and Amanda in particular, were including more basic concepts in their lessons. Their responses included two KS1 NC concepts and, further, a concept that appeared only in the Y3 SoW (teeth), despite them teaching the later years of the key stage. Although the teachers did not elaborate on how these concepts were covered, the exercise book analysis (Section 4.4) showed that the same concepts were taught in Y3 and Y5. Further, during the pupil consultation, pupils from Y5 stated that the concept of 'teeth' was repetitive from Y3, and some deemed it revision (Section 5.3.3).

In summary, these data suggest that, in addition to age-appropriate curriculum content, there was a tendency for teachers from both KS2 and KS3 to teach content from the following key stage and 'retain' concepts from earlier key stages. The consequences of such an approach might impact on potential progression and are discussed in Section 6.4.

6.2.2 Teachers' perceptions of pupils' earlier experiences of the food and healthy eating topic

The teachers were asked if they knew what aspects of F&HE were covered **before** the current academic year. This question was included to assess whether teachers were aware of pupils' prior experience of the F&HE topic, knowledge that could potentially aid them in planning the level at which to pitch lesson content (concepts and keywords). Though the teachers had the *aide-mémoire* to hand, none referred to it during this section of the interview and were not directed to do so. Three out of four the teachers started their responses by describing what pupils were likely to cover earlier in the **current** key stage. For example, both KS2 teachers identified aspects covered in Y3, and Natalie (CT Y9) was able to identify aspects covered in Y8. As the topic was not taught in Y7 Derek (HoD Y8), referring to KS2, stated that pupils may have possibly covered F&HE in DT: Food or PSHE. He went on to show that his expectation of the prior knowledge held by pupils was at a very basic level. For example, he thought that KS2 pupils would know:

> …an apple a day is better for you than a toffee apple… [that] sweets are bad for you' and 'they should have, I would have thought, from KS2, a fairly clear concept of good and bad [food].

His response appears to match the KS1 concept of healthy and unhealthy food. He was therefore describing content that was more basic than the concepts pupils cover in KS2, that is, his expectation of pupils' knowledge was lower than the concepts outlined in the KS2 PoS. Derek (HoD Y8) also stated that, possibly, they might be able to label the major organs like stomach and liver, but he would:

> …not expect them to have an idea as far as function [of the major organs] was concerned.

While Derek did not believe his pupils would know the functions of the organs, we know from the documentary analysis (Section 4.4) and earlier this chapter that this content was covered in KS2, despite being NC PoS KS3 concepts. He was therefore not expecting them to have the knowledge they actually had. If he was not aware of this, then repetition could occur when pupils were taught the functions of major organs in KS3. This could limit progression.

As the teachers from KS2 and Y9 did not directly identify the prior key stage during their responses, they were given a probe question that asked them to identify aspects pupils might have covered during the **prior key stage**. None of them were able to do so. Neither KS2 teacher could state concepts directly, with Malcolm (CT KS2) saying [I have] 'no idea'. Amanda (HoD Y5) did not directly state concepts, but mentioned that they were trying to make planning links stronger in Y2 and Y3 to 'avoid repetition'. Natalie (CT Y9) was equally unclear about the previous key stage content and commented 'I think they vaguely cover healthy eating'.

This evidence suggests that although teachers were aware of pupils' background knowledge of concepts arising from the topic earlier in the **current** key stage, they were unaware of concepts from the **prior** key stage. This is of concern because if teachers were unaware of pupils' earlier experience of the topic, then they can not have taken this into account when deciding what concepts to include in their lessons. This may impact on pupils' progression if the concepts were repeated or revisited without development.

Teachers were asked if they assessed pupils' knowledge and/or understanding of F&HE **before** beginning to teach the topic. All the teachers replied in the affirmative. Although they claimed to assess pupils' knowledge and understanding, their responses to the previous question suggests they are not doing this effectively. That is, if they were thoroughly assessing pupils' knowledge they should have at least some awareness of which concepts had been covered in the previous key stage. Further, their knowledge of concepts taught earlier in the same key stage could be due to them actually teaching earlier year groups; that is, both KS2 teachers also taught Y3 groups and the Y9 teacher also taught a Y8 group. Teachers would be able at least to get an idea of the content that was included in the prior key stage by referring to the NC PoS. Also, the QCA SoWs (QCA, 1998b), used by the primary school, actually includes the links to earlier topics in the section entitled 'where the topic fits in' (Section 4.3). This could be an area where teachers would benefit from Continuing Professional Development (CPD).

When the teachers were asked what methods they used to assess pupils' knowledge and/or understanding during the academic year, a range of approaches was identified including 'question and answer sessions' (HoD Y8), 'mind mapping' (CT KS2), 'brain storming' (CT Y9), and 'orally…, quiz… true or false' (HoD Y5). Amanda (HoD Y5) also stated that she did not assess pupils' prior knowledge before every topic saying it was 'time dependent', though she maintained that she had done an assessment for this F&HE topic. (The effect of 'time' on teachers' chosen T&LAs is further discussed in Section 6.3). This is an interesting approach to take as it may prove to be counterproductive. For example, if she took the time to thoroughly assess the pupils she might find that she did not need to cover particular aspects in class, thus saving time. A further probe question asked the teachers if they assessed pupils' knowledge and understanding on entry into the key stage. All the teachers stated this was based on SATs results. Although this information is likely to suggest to teachers the pupils' attainment level it is unlikely to inform them about an individual's knowledge and understanding of the F&HE topic.

In summary, teachers have a good awareness of content taught during the key stage they teach. As all the teachers involved in the study taught both year groups revisiting the F&HE topic during their key stage this was to be expected. The teachers were less clear about concepts pupils had encountered during the prior key stage. This appears to show that the methods used by teachers to assess pupils' current knowledge and/or understanding were not effective. For example, the QCA SoWs were available to KS2 teachers to allow them to gain such information about the KS1 curriculum, but they appeared not to use them in this manner.

6.2.3 Teachers' perceptions of the development and implementation of the schemes of work

Teachers were asked how the school SoW was developed and used. Malcolm and Amanda, the KS2 teachers, outlined how in Y5 the SoW was based on the QCA SoW but extended due to the pupils' capabilities. Though not directly stated by Malcolm (CT KS2) and Amanda (HoD Y5), evidence from the documentary analysis of the pupils' exercise book analysis (Section 4.4) suggested that this extension included material from the KS3 QCA SoW. In addition, during the interview Amanda produced the QCA KS3 SoW, thus showing that the SoW, intended for use in secondary schools, was also utilised by teachers during the earlier key stage. In the secondary school, Derek (HoD Y8) described how the SoW for Y8 was based solely on the NC PoS for KS3, while Natalie (CT Y9) stated that the SoW for Y9 was based on the GCSE specification. This showed that pupils in Y9 were embarking on the KS4 curriculum in common with other schools in the area. The evidence on SoW development and use supported data from the documentary analysis (Section 4.4), and indicated that in both schools pupils were taught material intended for the following key stage.

The interviews indicated that the use of SoWs varies between schools and individual teachers. Both Malcolm and Amanda, the KS2 teachers, stated that their lessons were based on the SoW. In contrast, Derek (HoD Y8) said his lessons were based on 'experience', while Natalie (CT Y9) expressed how she 'sized up' the school SoW and then did her own plans. This evidence suggests that the KS2 teachers more closely adhere to the school SoW than the KS3 teachers. There was nothing to suggest that Derek was teaching outside the curriculum, only that he preferred to do his own plans. This was confirmed by the documentary analysis, where the exercise books of the class taught by him showed the highest percentage agreement with both the QCA and the school's SoW (Section 4.4).

Teachers were also asked, 'How much flexibility do you have as an individual to decide how you want to approach this topic?' The KS2 teachers stated they had some flexibility with lesson planning, but Amanda (HoD Y5) stressed that all the teachers needed to use the same lesson objectives. Malcolm (CT KS2), clarified his position by stating that the flexibility was with **how** to teach not **what** to teach. This suggested that the concepts and keywords covered in the lessons were those identified in the QCA SoW, leaving teachers with flexibility in the methods and activities they use during lessons. The KS3 teachers indicated that they were given a lot of flexibility when deciding how to approach teaching the topic. This suggests that they could teach concepts outside the curriculum if they wanted to. These levels of flexibility seem to reflect how teachers use the SoW; that is, the KS2 teachers appeared to adhere more closely, whereas the KS3 teachers suggested they did not use the SoW or simply 'sized [them] up'. The views on SoWs and flexibility outlined in both schools were consistent within the school in that similar responses were given by both teachers.

In summarising sub-section 6.2,

- Teachers could identify some F&HE concepts taught in the current academic year as well as concepts likely to have been covered earlier in the same key stage.
- Three of the four teachers taught concepts located in a later key stage of the NC PoS
- The teachers were largely unable to identify concepts located in the NC PoS for the prior key stage.
- The KS2 teachers taught the topic according to the QCA SoW before extending the children into other areas and also have some flexibility in **how** to teach but not **what** to teach. This suggests that the teachers on the same topic will be teaching the same objectives.
- The KS3 teachers were aware of the school's SoW but taught the content according to their own preferences and had 'complete flexibility'; they nevertheless do cover content according to the NC or GCSE specification (Section 4.4). This suggests that the KS3 teachers, Derek and Natalie, set their own objectives.

6.3 Teachers' Perceptions of Teaching and Learning Activities Employed During the Food and Healthy Eating Topic

In this section I discuss teachers' perceptions of pupils' views of T&LAs employed during the F&HE topic and their own perceptions of the range of T&LAs completed in class.

6.3.1 Teachers’ perceptions of pupils’ enjoyment of teaching and learning activities

This section addresses teachers’ perceptions of which T&LAs were most and least enjoyed by pupils during the F&HE topic. During this part of the interview teachers were encouraged to use their *aide-mémoire* regarding activities completed in class. The teachers’ perceptions of pupils’ most and least favoured T&LAs during the F&HE topic are shown in Table 6.2.

	Malcolm CT KS2	Amanda HoD Y5	Derek HoD Y8	Natalie CT Y9
Most Favoured activities	Modelling	Food packets and labels	Practical work	Don’t know as it was largely a project
	Experiments with pulse rate	Graph work		
Least Favoured Activities	Graph work	Food diary	Graph work	Don’t know as it was a project but in general they do not like Graph Work

Table 6.2 Teachers’ perceptions of pupils most and least favoured teaching and learning activities during the food and healthy eating topic

The favoured activities during the F&HE topic varied across the years, although pupil-centred, hands-on activities such as experiments, practical work and modelling appeared to be popular. These activities were characterised by pupils being able to move around the classroom to collect equipment such as craft materials, scissors and scientific equipment before the completion of the activity.

There was also some consistency in pupils’ least favoured activities where three out of the four teachers identified graph work. This was in agreement with the views expressed by the pupils themselves (Section 5.2.2). Amanda (HoD Y5), however, stated this to be a favoured activity. This was in partial agreement with the data from the pupils consultation for her year group (Y5) which indicated polarised views on graph work (some picking it as their most favoured, some their least favoured activity, see Section 5.2.2). Additionally, the favoured activities all appeared to be hands-on tasks and did not include the use of additional equipment outside of paper, pen/pencil and ruler.

This general pattern of pupils enjoying hands-on activities was mirrored during responses given in another part of the interview. Here teachers were asked about what *other topics* the pupils enjoyed or did not enjoy during the academic year. Both KS2 teachers stated that pupils enjoyed the more practical topics (those containing most experiments). Derek (HoD Y8) stated that pupils were 'on cloud 9' during the practical aspects of topics and as 'miserable as sin' during written work. Further, when discussing the topics pupils disliked, Malcolm (CT KS2) and both KS3 teachers mentioned that pupils disliked topics lacking practical activities. The general conclusion regarding teachers' perceptions of pupils' most and least favoured activities is in agreement with the views expressed by the pupils themselves during the focus groups (Section 5.3.2).

6.3.2 Teachers' perceptions of the range of teaching and learning activities they completed in class

The teachers were asked if they were happy with the range of activities they were able to complete in class during the F&HE topic. The teachers were generally happy with the range of T&LAs used in lessons although three of the four also alluded to time constraints in their responses. For example, Amanda (HoD Y5) responded: 'Yes [happy] for the time we have'. She had already mentioned activities and time constraints prior to the beginning of the interview, when commenting on the list of activities she had completed in class, she said:

> It would be really lovely to do all those things but we simply do not have the time.

Derek (HoD Y8) also mentioned time constraints on three occasions during his interview. For example, in response to the question 'How often are you able to use this type of activity (pupils' most favoured activity: practical work) in your lessons?' he stated:

> …well I am able, I could carry out practical work every lesson…the practical diet is determined by how much time I have.

He went on to describe the preparation needed for practical lessons before outlining how his time was restricted by his commitments:

> Unfortunately with student commitments [trainee teachers] and departmental commitments, as I say, the role of HoD is a nightmare.

This statement implies that he was unable to complete as much practical work as he would have liked. This was later confirmed when Derek was asked if he was happy with the range of activities he was able to complete in class, when he stated: 'Yes [happy] …would like to do more practical work'. These comments suggest that if he had more time he would have completed more practical work in class. Finally, Natalie (CT Y9), referring to how happy she was with the range of activities completed in class, responded: 'Possibly not on that particular topic [F&HE]'. She then went on to explain that she could not complete more activities because of the time pressure she was under (as the class had started a GCSE separate sciences course). This was in agreement with data collected during the pupil focus groups where Y9 pupils expressed discontent at the range of activities they completed in class during the F&HE topic and in general (Section

5.3.2). They also acknowledged that there was time pressure due to the separate Science course (Section 5.3.2), and described content as being somewhat ‘rushed’.

Whilst commenting upon the range of activities completed in class Amanda (HoD Y5) and Natalie (CT Y9), both stated they would have liked to have done food tasting but they were worried about completing the activity, or were not allowed to due to health and safety concerns such as pupil allergies and/or rules against eating in the laboratories.

Malcolm (CT KS2) initially indicated he was happy with the range of activities he completed in class, although he later used the opportunity when discussing the QCA SoW, to provide an additional opinion:

> I feel they [SoWs] are OK. What worries me sometimes is that that they over focus on [the] practical side … I think there needs to be more about (pause) you know them understanding quite specific targets [concepts] … I think you can move children on at a different pace, if you want. If you kind of give them a creative environment, that’s all good and well, but actually (pause) their pace of learning I think is reduced if you over emphasise that [the practical work]. There is an important place for it.

One interpretation of Malcolm’s comments could be that, although he believed that practical activities were important, he also felt that pupils’ pace of learning was reduced when they were included. That is, they could learn things more quickly if they were not spending large amounts of time on practical activities. As he said he was happy with the activities he completed in class, it seems to suggest that he did not complete as many practical activities as suggested in the SoW, thus increasing their pace of learning by concentrating on concepts. This supports findings from the documentary analysis where it was shown that far fewer activities were completed in class than appear in the SoWs

(Section 4.4). In addition, a far greater number of concepts were covered in the exercise books than appeared in the SoWs (Section 4.4). The wider implications of this may be an impact on pupil enjoyment and enthusiasm, because the pupils prefer work completed with practical activities. Further, understanding how to design and undertake experiments is a key skill in Science, and if pupils are not completing the process themselves they may not develop adequately in this area.

In summary,

- Teachers perceived that pupils enjoy pupil-centred, hands-on activities.
- Three teachers perceived that pupils did not enjoy graph work.
- Although teachers were largely happy with the range of activities they completed in class they also felt that constraints in the form of time or health and safety influenced the amount and type of activities they were able to complete.
- One teacher stated a desire to increase pupils' pace of learning by not focusing on practical work.

During this section I have reported on how the teachers outlined that a lack of time, the desire to increase pupils' pace of learning and concerns over health and safety led them to focus on the theory (content) of the topic. In the next section I discuss how the teachers' lack of awareness of pupils' prior knowledge and teachers' willingness to teach concepts from later key stages may impact progression.

6.4 Teachers' Perceptions of Progression in the Food and Healthy Eating Topic

This section addresses teachers' perceptions of progression in the curriculum. Data were gathered in two ways: firstly, through questions on their understanding of the term 'progression' and how this concept was expressed in the SoW and the NC POS; and secondly, through two sequencing activities involving statements drawn from the QCA SoW.

6.4.1 Teachers' perceptions of progression

The teachers were asked to outline their understanding of the term progression. Some responded by giving examples, and all responses matched the definition outlined by this study and discussed in Section 2.2. For example, the teachers suggested various examples of progression that included: 'the development of language' (HoD Y5); 'layer by layer of complexity' or 'moving from organ names to organ functions' (HoD Y8); and the 'widening of knowledge' (CT Y9).

The teachers were also asked to comment on how progression was expressed in their SoW during the F&HE topic. Malcolm (CT KS2), commenting on the QCA SoW, stated that the differentiated objectives aided progression, although he went on to outline a concern:

> …I know that some children are going to know a lot about certain topics and I would want to try and progress them from where they're at which could easily be beyond what the scheme of work is telling me.

This suggests that he believed the progression built into the QCA SoW was not enough for his pupils, or if he taught according to the QCA SoW for that academic year then repetition may occur. In other words, if pupils already know a concept yet the QCA SoW states that teachers should cover it, repetition would be inevitable. Thus to ensure progression he therefore ventured into more complex material that was not covered by the QCA SoW for that year. This notion is in agreement with his responses in Section 6.2 where he stated several KS3 concepts were covered. What he did not acknowledge, however, was the concatenation of events. That is, if KS2 pupils cover KS3 concepts, then when they reach KS3, limited progression may occur, especially, as was shown in Section 6.2, where teachers do not always appear to accurately gauge pupils' prior knowledge.

This view of the need to progress pupils beyond the QCA SoW was similar to that expressed by the other KS2 teacher. When discussing the planning and teaching of the F&HE topic, Amanda (HoD Y5) stated:

> With the actual aspects on food I need to be very careful that they are not repeating what they have done in Year 3. Which is why I probably focus more on the digestion, the exercise and the heart and lungs, circulation. And in a way I probably try to skip over, over the actual food group bit by just playing games.

Here she has recognised that if she taught according to her interpretation of the QCA SoW, then there may not be adequate progression for her pupils. Consequently, she tries to 'skip over' repetitive concepts and focuses the lessons on digestion and circulation, which have been identified as KS3 NC concepts. She does not appear to realise that 'food groups' as a concept is also KS3 material, though she does acknowledge these may be repetitive. Amanda's motivation for this may have been suggested by one of her earlier comments when describing how much her pupils enjoyed the F&HE topic she stated:

> They find some interesting, some boring because they have done it before, but then some [things] they don't know.

This suggests that Amanda was aware that some of the taught material was repetitious and that this material can cause pupils to become bored. She therefore found it necessary to include KS3 concepts in order to alleviate boredom. She also admitted to knowingly teaching KS3 concepts when she commented on depth versus breadth:

> We tend to do things in depth because we have bright kids but we are aware that we cover some material from secondary school, [we may have] trodden on [the] toes [of secondary school teachers], but we like to extend the children. Personally I'm more for breadth - add in more areas not already covered. [You] don't necessarily help the child by pushing them on and on because they then get bored in year 7 and 8.

This statement appears to contradict itself. On the one hand she was saying that they have bright kids so they want to push them on, before recognising the potential outcome of boredom at secondary school. On the other hand, she felt as though she would like to venture into areas 'not already covered', yet she actually chose the route likely to result in boredom in the future caused by limited progression. It seems her main concern was that progression should be achieved in her key stage, and she was effectively leaving it to the KS3 teachers to deal with the consequences.

In the preceding paragraphs it was shown that the KS2 teachers have concerns with the QCA SoW in its lack of progression from earlier in the key stage. They tried to overcome these concerns by teaching the pupils KS3 content. The KS3 teachers, also have concerns with their SoW. Regarding progression Natalie (CT Y9) stated:

> I think there is room for every pupil (pause). [Every pupil] could be able to get [the] best route available for them to progress and to get the best out of them, especially, (pause) well in this school over the next few years there is going to be anyway. We haven't quite got it right at the moment.

Analysing this statement, she started by making a very positive statement about 'every pupil' having room to get the best route, but then rapidly changed it to 'could', before eventually making the statement that they have not got it quite right at the moment.

Derek (HoD Y8) stated, in regards to the school's own SoW:

> …[Progression is expressed] not as explicitly as it should be…there is not anywhere in the schemes of work that says specifically progression from so and so to so and so…but if you look at the same content from key stage 3 to key stage 4 it definitely adds.

Here he outlined that, in order to properly understand the progression in the KS3 and KS4 SoWs, you would have to compare the SoWs. He was also suggesting that the SoW does not indicate pupils' likely current knowledge ('from so and so'). If teachers were adequately assessing pupils' current knowledge then this may not be a cause for concern. However, if this was not the case, as implied by the teachers' responses to the earlier question, then teachers may effectively assume little or no current knowledge, thus causing them to pitch lesson material too low. The outcome of this may be limited progression. Derek made further comments regarding primary schools:

> In my view for primary schools to make their experience more pleasant they are nicking all the KS3 practicals [experiments]. So when the kids get here they find it dead boring, and we are up a gum tree. You see this is where prescription would be (pause) IS essential.

Here he was suggesting that the primary schools taught practicals that are part of the KS3 SoW therefore creating boredom when those pupils reach secondary school when the same practicals were repeated. Although the primary school in this study was not a feeder to the secondary school, Amanda (HoD Y5) openly admitted covering material from KS3. This seems to suggest that it may also occur in other school partnerships. Although both HoDs were aware of the situation of KS3 material being taught early, neither suggested approaches that were being undertaken to remedy the situation. However, Derek (HoD Y8) did suggest the need for greater prescription in the curriculum perhaps implying it was curriculum planners who needed to address this. As this has not yet been undertaken by curriculum planners, KS3 teachers repeat the process by moving KS3 pupils on to content intended for KS4.

Following these general comments regarding the SoW and the NC, the teachers were then asked, 'What do you think about the structure of the National Curriculum?'. Malcolm (CT KS2) stated:

> I think it's good. One of its strengths is that it does repeat itself a bit, so as we've picked up already there's [the] teeth thing [concepts connected to teeth] going on in year 3 and then it's picked up again in year 5 and built on.

The first point to be noted here is that the NC PoS only specifies content to be taught in a key stage and not what should be taught in a particular year. He appears to be referring to the QCA SoW which takes the PoS and divides it into content to be taught in the different years within the key stages. Further, the concept of 'teeth' does not appear in SoW for Y5. This, however, may be explained by the document analysis (Section 4.2, 4.3 and 4.4) and pupils' responses (Section 5.2.3 and 5.3.3) which showed that this content was taught in Y5 in his school. Finally, although he stated that the content was 'built on' in Y5, the document analysis (Section 4.4) and pupil consultation (Section 5.2.3 and 5.3.3) contradicted this assertion, as this content was identified as a key area of limited progression. It is possible, however, that the teacher may just have picked an unsuitable example to explain his point because other content areas are built on in the manner that he describes.

When Malcolm (CT KS2) was asked the probe question, 'Some people describe the National Curriculum as a spiral curriculum where the topics are revisited several times. How do you feel about this structure?' he said:

> I think it's good … it helps everybody but it particularly helps the, the weaker ones. But I think it is good. It really does reinforce, amazing what a bit of time off can actually do, for, for learning, when you revisit something a second time I think it has a big impact especially when it is revisited in a slightly different way.

The last two quotations highlight some important points. Firstly, that the spiral curriculum should be built on in later years, that is, provide progression. Secondly, he highlights that those who benefit most from the revisiting were the 'weaker' (less able) pupils. Thirdly, he suggests that revisiting should occur in a 'slightly different way'.

Amanda (HoD Y5), regarding the structure of the curriculum, stated:

> I do feel a two year gap is beneficial. So if they do something in year 1, year 3, year 5 that allows them to experience life and develop language before they meet it again. I think year-on-year is not my choice.

Here she was suggesting there was too much revisiting a topic. For example, the F&HE topic was revisited in Y1, Y2 and Y3, that is, 'year-on-year' [yearly].

Derek (HoD Y8) made the following comments:

> Although repetition is not a bad thing for those pupils who benefit from those sorts of things [lower ability] (pause) there are invariably the more capable/able pupils who say 'we've done this sir, we've done this [before]'…I think for higher ability kids [the spiral curriculum] is detrimental … to try and deliver a suitable

> curriculum for all…we try our very best to deliver separate sciences… [a] BTEC [course]... we've got literally a different examination for each set…it's a very good thing but from a managerial point of view it's a nightmare.

Here he implies that they have recognised that pupils with different abilities effectively need different courses at KS4. In order to get the curriculum that matches their abilities they have taken the action that the top sets receive separate Science courses leading to three GCSEs.

Natalie (CT Y9) made the following statement regarding the structure of the curriculum:

> I have no problem [with the structure] as long as when they [the topics] are revisited, they are revisited for a reason other than just a recap it…When I re-jigged the key stage 3 a couple of years ago I got rid of quite a lot of topics that we repeated for no reason other than they were repeated from year 7 to 9.
>
> When you say for a 'reason' what do you mean? (Researcher)
>
> So that they are building on the information rather than just go over the same stuff again.
>
> Why are you against the repeating in particular? (Researcher)
>
> I think, especially the high ability kids, they switch off because when they've done things before, it becomes too easy and they get bored.

Again the phrase 'building on' was highlighted, suggesting that pupils were being progressed from where they were and, further, that repetition can be detrimental to higher-ability children. Natalie also highlighted that she did not approve of a 'recap' *per se*; yet she had stated earlier (Section 6.2) that she covered food groups in lessons as part of a 'recap'. She also recognised how beneficial some understanding of a topic could be when responding to a question discussing the sort of topics pupils enjoyed, she stated that pupils enjoyed the Biology topics because:

> …[Pupils are] more confident with it…, because people know little bits of [knowledge] before they start…its like [other topics without the little bit of knowledge have] a psychological barrier.

This comment suggests that when pupils have some background knowledge they are more confident and therefore enjoy the topic more. This is in agreement with Piaget's schema (Section 2.3.1); the reasoning behind the design of the spiral curriculum (Section 2.4.1); and some of the pupils' own opinions where they say they feel more confident about a topic if they have some knowledge already (Section 5.3.3).

It seems clear that the teachers recognise the benefits of some prior knowledge when pupils begin a topic. However, there seems to be a delicate balance between a **recap followed by new material**, which is aimed at helping pupils build on their current knowledge, and **repetition** caused by frequent topic revision without further development, which may be detrimental to the enjoyment of some pupils.

Though opinions on the new KS3 curriculum were not directly sought, the secondary school HoD used the opportunity of the interview to outline some of his concerns. As these fall in the area of progression they have been included. Firstly, Derek (HoD Y8) outlined his concerns over a lack of prescription in the then new 2007 KS3 NC PoS:

> …[progression in the curriculum] should be a lot more explicit than it is, again, the way the government acts towards the curriculum as if it is top secret, 'Well we are not giving you any of the information, you make it up as you go along' which I think is mad.

And when further describing the content across the key stages he went on to say:

> It should be a progressive thing where such-and-such is taught at key stage 2, then progression is made at key stage 3, then further progression is made at key stage 4. But it seems now we are not going to prescribe what's at key stage 2 we are not

> going to prescribe what is at key stage 3. And we are going to give you an exam at the end of key stage 4 that could be on absolutely anything.

The key point made in these statements is that he would like the new curriculum to be more prescribed because he has a particular concern in not knowing what will be examined. A more ‘prescribed’ curriculum on the other hand would indicate more clearly what is expected to be taught. A potential outcome of the vague nature of the 2007 NC PoS and the feeling that ‘absolutely anything’ could come up in exams might be a focus on increasing the amounts of keywords and concepts being addressed in lessons so that nothing is ‘missed out’. If this were to occur there could be potential for repetition within those concepts, and the lessons may become content-dominated. This supports the comments made in Section 4.5.1 where I described the new PoS as less detailed than the 1999 PoS, lacking scientific vocabulary, and underlines my concerns about increasing the likely number of concepts being addressed in lessons.

In summary,

- Teachers understood the concept of progression and could give examples.
- Teachers were concerned that the content in the SoWs did not offer progression for the pupils.
- Three teachers were concerned about the structure of the curriculum in particular the revisiting of topics. Some also believed that revisiting a topic was beneficial to lower ability pupils but they had concerns about the effect of revisiting on higher-ability pupils.
- Teachers believed that revisiting should allow the topic to be built on and not be repetitious.

6.4.2 The sequencing activities

Chapter 4 described how progression was observable in the NC PoS (1999 version) and, to some extent, in the QCA SoW, when they were considered at the key stage level. In order to assess if teachers could identify progression in the QCA SoW, across and within key stages, two sequencing activities based on the learning objectives were designed.

Firstly the teachers were shown the following three objectives taken from the QCA SoW:

[Y1] that we need to eat and drink to stay alive

[Y2] that humans need water and food to stay alive

[Y3] that all animals, including humans, need to feed.

They were placed before them in a random arrangement, without the year indicators, and teachers were asked for their general comments on them.

The teachers agreed that some objectives were basic (as one would expect for KS1 and KS2) and also commented upon the similarity between all three. Natalie (CT Y9) stated: ‘They are really quite repetitive. All three of them mean the same thing’.

The teachers were then asked to put them in order to illustrate progression (Table 6.3).

QCA	Malcolm (CT KS2)		Amanda (HoD Y5)		Derek (HoD Y8)		Natalie (CT Y9)	
Order/ Year	Order	Year	Order	Year	Order	Year	Order	Year
Y1	Y2	Reception	Y1	Y2	Y3	Y7	Y1 , Y2 on the same level	Y7, Y8 on the same level
Y2	Y1	Y1	Y3	Y3	Y1	Y8		
Y3	Y3	Y2	Y2	Y5	Y2	Y9	Y3	Y9

Table 6.3 Teachers' QCA objective sequence and allocation to academic year

All the teachers found this part of the activity hard, with no teacher identifying the order suggested by the QCA. The reasons given for the difficulty included the similarity of the statements. Derek (HoD Y8) commented:

> It's so ridiculously nit-picky…its like I'm going to give you a full stop now and maybe next week I will give you a comma…**I would think this is wasting my time just tell me the whole damn lot in one go**…I feel like a member of MI5 rather than a school teacher.

This is a key point. He believed that they were so similar that they could be taught together. The outcome of this might be that, if the whole were to be taught in 'one go' in Y1, repetition could easily occur when the concept was revisited in Y2 and Y3.

Malcolm (CT KS2) commented:

> It's quite difficult 'cos (*sic*) they are so similar…I'm not even sure they demonstrate progression.

These comments suggest that on first consideration these teachers did not believe these objectives demonstrated progression.

The teachers were then asked to identify which academic years they might be applicable to (Table 6.3). The teachers from KS2 identified years in KS1 and KS2, whilst teachers from the secondary school identified years in KS3. It is clear, therefore, that the teachers from the secondary school feel these objectives might be interpreted in a way that makes them applicable to KS3 pupils. In other words, they might be interpreted in a way where material of a more complex nature might be taught.

The years suggested by the QCA for the objectives were then revealed. Malcolm (CT KS2) commented:

> …just identifying distinctions between (pause) us needing to eat and drink and humans needing water and food I don't think I really see how that is progressive… you could do that in one lesson couldn't you.

And Natalie (CT Y9) stated that:

> All mean the same thing, nothing to stop a kid in year 1 understanding the objective for year 3.

The two class teachers were repeating the point made by Derek (HoD Y8).

The teachers were asked to explain how the objectives show progression, in the order suggested by the QCA. Malcolm (CT KS2), Amanda (HoD Y5) and Natalie (CT Y9) identified progression by the pupils thinking about themselves in the first instance, then as humans and finally in a group with all animals. Derek (HoD Y8) also touched on this but commented that this was nothing to do with food. This sentiment reinforces the discussion in Section 4.3.1. where I outlined that Y1 pupils were actually introduced to the concept that 'humans are animals', and therefore when they cover this objective in Y3 it offers no progression. Further, if you remove this focus of the objectives, then the task of identifying progression, related to food only aspects, is near-impossible.

The teachers were asked if they could suggest lesson material that would show progression based on these objectives. Only Malcolm (CT KS2) was willing to make suggestions with the others responding that it would ‘not be easy’ or it was ‘too hard’. This clearly showed that teachers did sometimes find it difficult to translate these objectives into lessons that provide progression for pupils. The final section of the interview involved a further sequencing activity using objectives from later years. The objectives shown were:

> [Y5] that to stay healthy we need an adequate and varied diet
>
> [Y8] that a healthy diet contains a balance of foodstuffs
>
> [Y9] that a balanced diet requires nutrients, including vitamins, in the correct quantities.

Malcolm (CT KS2) was convinced that the objectives pertained to the years he taught (Y3 to Y6). In particular, he identified the QCA Y9 objective as being covered in his Y5 lessons. He correctly identified the QCA Y5 objective as the most basic, but suggested it pertained to Y3. He then commented that the QCA SoW only covers F&HE in Y3 and Y5 and asked:

> Does that mean … some of these is (*sic*) beyond year 5, which I could not believe?!

I then confirmed this may be the case and the objectives may be applicable to later years of the curriculum. In response to this information he readjusted his order and put the Y8 objective as the most basic. The QCA years were then revealed, causing Malcolm to exclaim:

> That's ridiculous, 'cos (*sic*) the top one is 5 [actually pertains to Y9]…That's crazy **…**That is absolutely ridiculous, 'cos (*sic*) we do that, we definitely do that.

The reason behind Malcolm's belief that some of the KS3 concepts were covered in Y5 could be due to the fact they were taught in his school in Y5. It could also be due to a matter of interpretation, as with the first activity where the KS3 teachers believed the KS1 and KS2 objectives to be applicable to KS3.

Amanda (HoD Y5) and Derek (HoD Y8) commented that they found this activity easier than the previous activity, though only Derek identified the QCA order. Natalie (CT Y9) still felt that the activity was difficult. Amanda and Natalie were both confused by the meaning of the term an 'adequate diet' and how it compares to a balanced diet. This is an interesting point as, despite this term appearing in the QCA SoW for KS2, it did not appear in the exercise books (Section 4.4). This seems to suggest that the Amanda left out the term 'adequate diet' because she did not know what it meant and preferred the more common term 'balanced diet'. As these experienced teachers did not appear to understand the term that appeared in both the NC PoS and the QCA SoW, this could be an area that would benefit from the provision of CPD. However, as the term 'balanced diet' is so widely used by the population as a whole, its inclusion earlier in the curriculum must also be considered as an option.

In summary,

- Teachers believed that the QCA objectives did not demonstrate progression, or did so in such a subtle way that planning lessons which offered progression based on them would be difficult.
- The teachers found identifying which academic years the QCA objectives pertain to very difficult because they recognised similarities in what they taught. This could be an indicator of how hard teachers would find it to pitch lesson material based on these objectives.
- The study identified areas where CPD could be implemented in order to help teachers' understanding of the way in which progression is perceived and expressed by the curriculum developers in the PoS and SoWs.

6.5 Teacher Consultation Summary

Addressing RQ3, the consultation confirmed data from the documentary analysis (Section 4.4) and pupil consultation (Sections 5.2 and 5.3) that the pupils were taught content from both earlier and later stages of the NC PoS. It also identified potential reasons for the early introduction of concepts. The KS2 teachers in particular were concerned that the progression described in the QCA SoW was not adequate to meet their pupils' needs during second revisit in the key stage.

The teachers had a good knowledge of content taught during their own key stage but were less clear about content the pupils had encountered during prior key stages.

Although the teachers assessed pupils' prior knowledge and understanding they appeared not to be doing this effectively.

The KS2 teachers appeared to adhere more closely to the SoW than the KS3 teachers, who based their lesson plans on their experience or their own interpretation of the SoW.

The teachers perceived that pupils' enjoyed pupil-centred, hands-on activity such as practical work, and the majority of pupils did not enjoy graph work, confirming information acquired from the pupil consultation (Section 5.2 and 5.3). They also expressed how time issues or fears about health and safety limited the amount and type of T&LAs they were able to complete with the pupils.

The term progression was understood by the teachers and they could give examples. No teacher correctly identified the QCA order of the lesson objectives taken from the KS1 and KS2 SoWs. In other words, they could not identify progression in these objectives. Three of the teachers expressed the opinion that revisiting the topic was beneficial for lower-ability pupils but adversely affected the enthusiasm of higher-ability pupils. There was also a strong belief amongst the teachers that when content was revisited it should be built on in some way, that is, should provide progression.

The consultation with these experienced teachers identified three areas where they may benefit from CPD. Firstly, as the differences in the language used to express progression in the SoW appeared to be small they were not seen as important or significant by teachers. Further, there appeared to be a misunderstanding between those designing the curriculum and those charged with implementing it. These issues therefore appeared to be key factors impacting progression. CPD training could address the interpretation of the NC PoS and SoW, aiding teachers planning for progression. However, as the teachers involved in the study were all highly experienced, this seems to suggest that they would be most able to interpret the curriculum, yet they still found this difficult. In Section 4.3.1 I described how the QCA SoWs were open to a range of possibly conflicting interpretations, that is, as an experienced biologist and Science teacher, I spent weeks trying to determine progression in the F&HE topic (which in itself forms a small part of the wider curriculum). It is with little wonder that these teachers, with all their other responsibilities, would find this difficult. It may be that this indicates curriculum designers need to address these issues within the curriculum and not simply attribute the problem to issues with teacher training. Secondly, teachers' methods of assessment of pupils' prior knowledge appeared not to be effective and therefore may also be improved by CPD. Finally, two of the four teachers stated that they were prevented from doing certain T&LAs due to concerns over health and safety. This type of ungrounded fear was described in the literature discussed in Section 2.5 and could be addressed by further CPD or guidance from the local authority dealing with education.

CHAPTER 7

SYNTHESIS OF FINDINGS

7.1 Introduction

This chapter addresses the broad research question: Do pupils experience progression in the teaching and learning of the Food and Healthy Eating topic? In doing so, it will consider the findings from all the research instruments within the three phases used in the study.

The responses to this research question have been grouped into two sections. The first section deals with progression in content, the second with progression in T&LAs. Each section includes a discussion comparing this study's responses with those of other researchers, and details how this study has made a novel contribution in this research field. I end this chapter with my concluding comments and a revisit to the theoretical framework, learning theories and models that underpinned this study.

7.2 Progression in Content

The study has identified that whether pupils experience progression or not largely depends on how the topic is revisited in the curriculum and in the classroom. The term 'revisit' was defined in Section 2.4.1 to mean 'to return to an area of the curriculum previously taught'. The documentary analysis showed that: F&HE is visited in KS1 and revisited in KS2, KS3 and KS4 of the NC PoS (Section 4.2), and that F&HE topic is also revisited in the QCA SoW, used by the primary school, and the secondary school's SoW in KS1 (Y1 and Y2), KS2 (Y3 and Y5), and KS3 (Y8 and Y9) (Section 4.3). During the course of the study I have identified three ways that revisiting may occur, depending on how the content is covered:

1) **Recap of content, then progression**. The basic concept is revisited then developed into a more complex concept, thereby achieving progression. This type of revisit forms the basis for the spiral curriculum (Section 2.4.1): the content is introduced early in the pupil's education and on subsequent visits is developed by linking concepts to existing schema (Section 2.3.1).

2) **A totally new concept or theme but within the same topic area**. In this type of visit no specific recap is performed as the concept to be covered has not been taught before in any form, so there is no link on which to base the schema. This type of visit is likely to occur early in the curriculum, but may also appear later if the concept is particularly complex and cannot be simplified for younger pupils.

3) **Repetition**. This is where concepts are taught again without being developed in any way. Such mere repetition of a concept leads to no progression in learning of that concept. If this occurs with all the concepts within F&HE there will be no progression in the topic overall. On the other hand, limited progression in the topic may result if repetition occurs with some concepts at the same time as progression in others (through the topic being revisited in the ways outlined above).

In order to assess how the pupils' experience progression through the F&HE topic the study first explored the ways in which progression was identified as being expressed in key documents during the documentary analysis (Chapter 4) and separately described during the teacher interviews (Section 6.4). Findings from the analysis of these two sources appeared to be in close agreement, for example in the development of language. Such findings were also in agreement with the literature (Department of Education and Science (DES), 1990; QCA, 1998a; DfES, 2004; ncaction, 2007). In addition, the way in which pupils described how the curriculum changed as they got older during the focus groups (Section 5.3) also closely agreed with the examples of how progression might be described (Section 2.2.1), for example with the curriculum 'getting more advanced' or moving from 'little to more detail'.

Progression in the F&HE topic was also assessed during each revisit of the curriculum through the documentary analysis and through consultation with both pupils and teachers. During the documentary analysis, it was found that on each occasion the NC PoS revisited F&HE the content provided progression (Section 4.2). This was achieved by the content being revisited in two of the ways described earlier, either recap and progression (example 1) or the introduction of new concepts (example 2).

The pupils in the study experienced limited or patchy progression in the F&HE topic overall because although there was progression in some areas there was repetition in others. Further, where progression was observed, it was not achieved in the same way as is identified in the NC PoS. As the number of concepts that contributed to limited progression outnumbered those that demonstrated progression, this aspect will be addressed first.

Limited progression caused by repetition of content, was apparent during the documentary analysis (Section 4.4), the pupil consultation (pupil questionnaires (Sections 5.2) and focus groups (Section 5.3)) and during the teacher interviews (Sections 6.3 and 6.4). Confirmation of this finding therefore came from four separate sources, demonstrating internal consistency within the study. Repetition of content in the F&HE topic led to limited progression because concepts were not further developed. Repetition of content as experienced by pupils was also identified in much of the literature (Nicholls and Gardner, 1998; Osborne and Collins, 2001; Murphy and Beggs, 2003; Biosciences Federation, 2005; Braund and Hames, 2005; Lord and Jones, 2006; Collins *et al*, 2010).

The findings of the study described in Chapters 4, 5 and 6 appear to be novel in in the field by identifying three separate causes of repetition: too early introduction of content; teaching more concepts than detailed in the SoW; and the teaching of the same content in different school subjects. Figure 7.1 illustrates the how repetition may occur, and the following paragraphs will address these in turn and identify the sources of these findings.

Evidence was presented in Chapters 4, 5 and 6 for the early introduction of concepts connected to F&HE. Specifically, early introduction was identified where concepts designed to be addressed in KS3 were actually observed in pupils' exercise books from KS1 onwards (Section 4.4). For example, the NC PoS KS3 concepts of various 'food groups', such as 'carbohydrates', were evident in pupils' exercise books as early as Y2 and then reappeared throughout the sample years with no apparent extension.

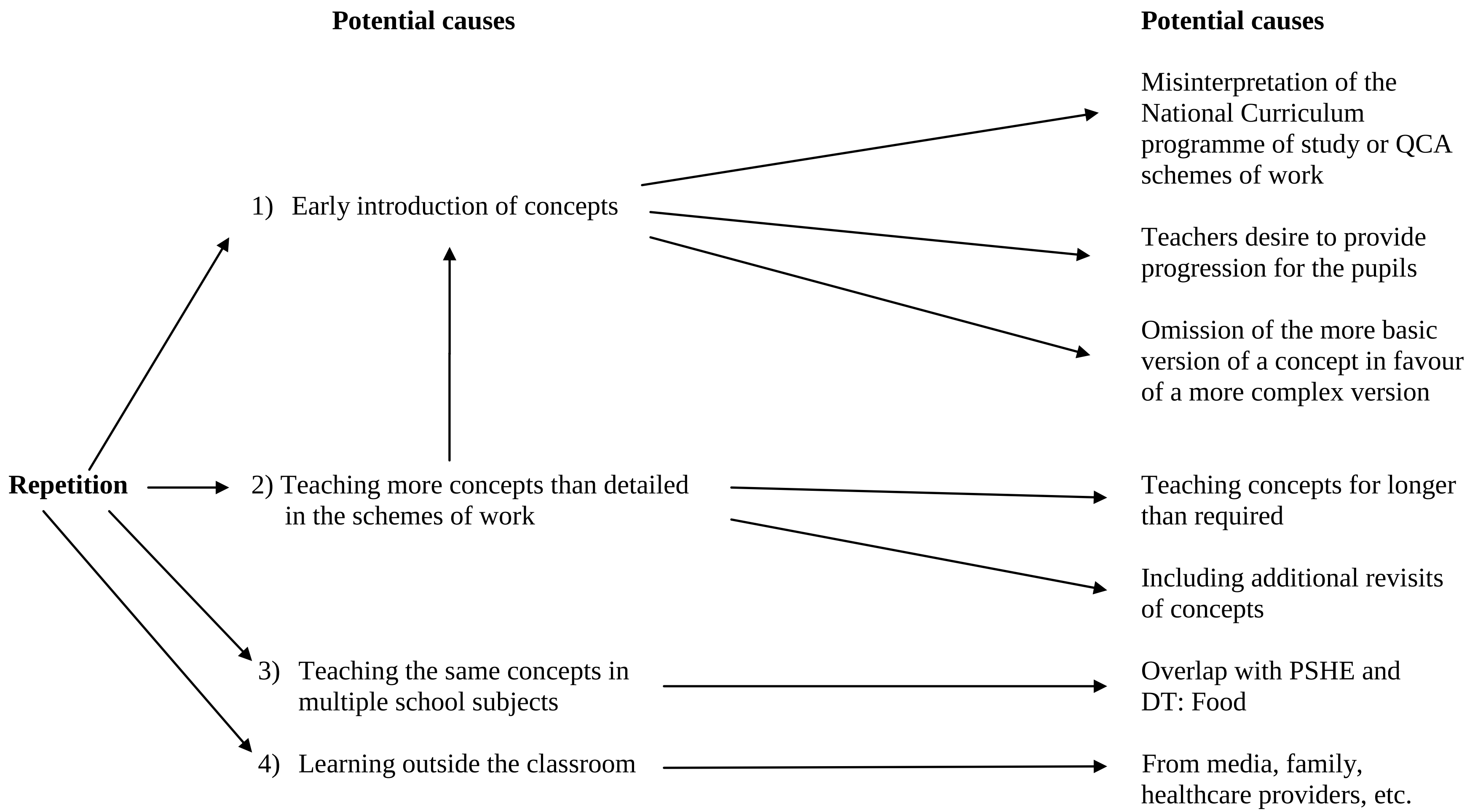


Figure 7.1 Potential causes of repetition of content

This led to discontent amongst some of the pupils (Section 5.2.3 and 5.3.3). The findings pointed to three potential reasons why this early introduction of concepts may be occurring. The first was because of a misinterpretation of the QCA SoW and/or the NC PoS by the schools. I have already suggested this possibility in Section 4.3.1, where I outlined how certain parts of the QCA SoW were confusing. During the exercise book analysis I uncovered documents that supported this notion (Section 4.4.1). The first such piece of evidence, found in a Y2 exercise book, was a worksheet produced by a company called 'Science Web'; the second, found in a Y3 exercise book was a photocopied table from the Coordination Group Publications Ltd (CGP) revision guide for KS2 (Parsons, 1999 reprinted 2005). Both of these pieces of evidence, found respectively in a KS1 and a KS2 exercise book, included concepts only described by the NC PoS for KS3. Misinterpretation of the NC PoS and/or QCA SoW has therefore demonstrably occurred on repeated occasions in different publications by different authors.

A second possible explanation for the early introduction of concepts was identified during the teacher interviews. Here it became apparent that the KS2 teachers were deliberately including some concepts in lessons to increase the amount of new material for the pupils (progression) on the second occasion that F&HE was revisited during the key stage. For example, teachers in Y5 included the concept of 'digestion' because they felt their pupils required the challenge to progress them beyond Y3 work (Section 6.4). It is possible to understand findings like these because the document analysis showed there was repetition in the KS2 lesson objectives in the QCA SoW in Y3 and Y5 (Section 4.3.1). This was endorsed during the focus groups (Section 5.3) when the Y5 pupils stated that the material covered was the 'same stuff as year 3' and that it was all 'kinda boring 'cos we already knew all about it'. Though the practice of addressing KS3 concepts earlier during KS2 may provide progression in the short term, when pupils revisit the topic during the next key stage, repetition may occur if the teachers in that key stage do not take this earlier teaching into account. This appeared to be the case in the schools in this study (Section 4.4, Section 5.3, Section 6.2 and Section 6.4).

A third possible explanation why concepts were introduced early may lie in the fact that some of the basic topics outlined in the NC PoS and QCA SoW appeared not to be taught at all. This omission of some basic concepts was first identified during the documentary analysis (Section 4.4). For example, with regard to the terms connected to diet/adequate diet, these were present in the NC PoS and QCA SoW yet were absent from pupils' exercise books (Section 4.4). This could be due to teachers' desire to allow time to concentrate on the more complex concepts, perhaps in the belief that pupils were already familiar with the more complex term. However, a lack of understanding of the terminology used in the NC PoS and QCA SoW also became apparent during the teacher interviews (Section 6.4.2). Two teachers, responsible for Y5 and Y9, indicated that they did not know what the term 'adequate diet' was supposed to indicate. As the term 'adequate diet' was one of the basic concepts in this area, this could possibly indicate both a cause and the effect with the Y5 teacher. That is, by not understanding the term she decided instead to concentrate on the more common, yet complex, term 'balanced diet', despite this being intended as content for a later key stage. It may be questioned at this stage if curriculum planners were correct to include the uncommon term 'adequate diet' when the phrase 'balanced diet' is widely used in society. Further, an adequate diet, though suitable for sustaining life does not necessarily represent a healthy or balanced diet.

In addition to repetition caused by early introduction of concepts, two other possible causes were identified. The documentary analysis identified the inclusion of a greater number of concepts in lessons (as shown in pupils' exercise books) than appear in the QCA SoW (Section 4.4.2). This was partially explained during the teacher interviews (Section 6.4) when the KS2 teachers outlined why they taught pupils concepts from later key stages. If the teaching of more complex concepts is carried out in addition to teaching all the age appropriate material, this would account for the increased number of concepts in the exercise books. This could, in turn, lead to such concepts being repeated during the next key stage. It is interesting to note that the findings from the documentary analysis indicated that the closest match of number of concepts in the SoW to the exercise books was in Y8 (Section 4.4). The Y8 teacher was also the only one not to state that he taught concepts pertaining to the next key stage (Section 6.2.1). Further, Y8 was the only year group in the study to be on the first occasion that the topic was visited during a key stage. That is, the findings suggest that on the first occasion a topic is revisited in KS2 (Y3) and KS3 (Y8) the teachers cover most, if not all, of what is to be expected to be taught from the NC PoS for that key stage. This means pupils in these years in particular will learn a number of 'new' concepts. On the second visit of the keys stages (in Y5 and Y9) the material is revisited and because teachers recognise that this may not provide progression for the pupils, they look to the next key stage for assistance.

The findings outlined in the previous paragraph appear to be in conflict with Collins *et al* (2010), who stated that it was a common belief among teachers that national testing at age 11 narrowed the curriculum and encouraged the inclusion of only those aspects thought likely to be in the test. My own work did not support this notion in two key ways. Firstly, if the curriculum was narrowed in KS2 then you would expect the number of keywords and concepts observable in the exercise books to be the same or fewer than those in the SoWs based on the NC PoS. On the contrary, my study showed that the highest number of keywords and concepts was actually observed in the Y5 exercise books. Secondly, if teachers were teaching to the test, then one might expect to observe only KS2 NC PoS concepts in the Y5 exercise books, as the national tests would concentrate on this material. However, my findings showed that more KS3 concepts than KS2 ones were observable in the Y5 exercise books (Section 4.4.2). It may be that the teachers were concentrating on this material because they believed that it would lead to higher attainment levels for the pupils. However, the teachers did not state this explicitly nor did they imply it during their interviews.

In order to explore whether teachers were including KS3 concepts because they were likely to appear in the KS2 SATs papers, I briefly analysed the papers from 2004-2010 (levels 3-5) (available from emaths, n.d.). I found that the concepts of ‘food groups’ in terms of ‘fats’, ‘carbohydrates’ and ‘proteins’ that appeared to have been introduced early to the pupils were **never** included in the test papers. All years had questions from the F&HE topic on ‘teeth’, ‘exercise’ or ‘interpreting results’ of experiments. If teachers were making a conscious decision to teach to the test then: 1) they would concentrate on the content areas most likely to be included, derived from an analysis of past papers (and likely to feature in the NC PoS for KS2); 2) they would do the experiments that were included in the tests to make sure the pupils understood them; and 3) they would not include the food groups concepts in their lessons.

There was agreement between the findings from the documentary analysis, the pupil consultation and the teacher interviews, that some concepts, although taught according to when they appeared in the NC PoS, were also taught later (Section 4.4, Section 5.3, Section 6.2.1). That is, some basic concepts were still being taught in the later key stages, which led to the repetition of some material and also to the increased numbers of concepts evident in the exercise books. For example, the documentary analysis of the exercise books and the teacher interviews highlighted ‘healthy and unhealthy’ foods as one such concept (Section 4.4, Section 5.3 and Section 6.2).

One further potential cause of repetition was the teaching of content on additional revisits. For example, although F&HE does not appear in the SoW for Y6, during the focus groups (Section 5.3) some pupils stated that it was covered in their SATs preparation. A second example of content being taught in addition to when it appeared in the SoWs was in Y5, where the documentary analysis (Section 4.4), the pupil consultation (Section 5.2.3) and teacher consultation (Section 6.2) all indicated that the concept of ‘teeth’ was covered. The reason for the inclusion of this additional content was not explored directly during the teacher interviews. However, one possible explanation is that this could also be due to SATs preparation. That is, in KS2 the concept of ‘teeth’ appears only in the Y3 SoW. There is therefore a long time lapse between then and the pupils actually being tested on it in the Y6 SATs, as was suggested in Collins *et al* (2010). Y5 pupils also described the content covered as feeling like ‘revision’ (Section 5.3), and this seems to support that it was covered as revision for the SATs. Although the practice of revising all KS2 work in Y6 has been described in the literature (Collins *et al*, 2010), this study is novel in that it identified that some work was also being revised in Y5.

The third potential cause of repetition and limited progression was the coverage of similar content to the F&HE topic in other school subjects. This was raised during the pupil consultation (Section 5.2 and 5.3) and the teacher interviews (Section 6.2). Both sources suggested that content included in the Science SoWs and NC PoS was also covered in other lessons such as DT: Food and PSHE. Both these subjects cover aspects of F&HE, and in the focus groups pupils stated that it was covered repeatedly (Section 5.3). To further clarify these comments, some additional research was undertaken on a PSHE SoW (Jowett and Power, 2006). This SoW was analysed with regard to four key themes, ‘healthy eating’, ‘healthy diet’, ‘balanced diet’ and ‘exercise’. It was found that these concepts were covered in multiple academic years. Pupils who were taught according to this SoW experienced aspects of the F&HE topic in PSHE in Y1, Y3, Y4, Y5, Y7, Y9 and Y10. In addition, if these pupils were taught according to the QCA Science SoW, then they would revisit the topic in Y1, Y2, Y3, Y5, Y8, Y9 and Y10 in Science lessons. In some years they might be taught similar aspects in both subjects (Y1, Y3, Y5, Y9 and Y10). Further, some of the concepts taught in PSHE appeared far earlier than outlined in the NC PoS for Science. For example, ‘balanced diet’ appeared in the PSHE SoW in Y1 (KS1), yet it did not appear in the NC PoS until KS3, and appears in the QCA SoW for Y8. Covering ‘balanced diet’ in PSHE in Y1 could account for the term being present in Y3 exercise books in Science. That is, if the Y3 teacher assessed the knowledge of the pupils and discovered they already knew the term, this might explain why they started from that point instead of the more basic term, ‘adequate diet’. In addition to the above analysis, I also analysed PSHE work in an exercise book from one pupil in Y4 attending the primary school in the study. ‘Food groups and their sources’ were covered in much the same way PSHE as in Science lessons and nomenclature intended in the NC KS3 PoS appeared in the Y4/KS2 PSHE work.

The fourth potential cause of repetition and limited progression was the influence on learning from sources outside school. Pupils from all years expressed in the questionnaires (Section 5.2.1) and focus groups (Section 5.3.1) how they learnt about the F&HE topic from a wide range of sources including the media (television, radio and internet), family and healthcare providers. All this exposure increases the chances of repetition in the learning of concepts when they are covered during science lessons.

The previous paragraphs detail how certain concepts were covered repetitively and the potential causes of this repetition. It may be prudent to note that these causes need not have led to repetition if the teachers had taken the pupils' current knowledge into account before embarking on the topic. However, during the teacher consultation it was shown that, although the teachers claimed to assess the pupils' current knowledge, they were not doing this very effectively. In addition, these teachers had a poor understanding of the extent of coverage of concepts covered during the previous key stage (Section 6.2.2). This is in agreement with Galton *et al* (2000), who detailed how secondary school teachers were not taking into account pupils' existing knowledge and were effectively giving pupils a 'fresh start'. A similar assertion was made by Nicholls and Gardner (1998). My study has identified that a similar phenomenon was observable with KS2 teachers and pupils moving up from KS1.

Despite the repetition in some areas of the curriculum experienced by the pupils, each time the F&HE topic was revisited there was some progression in content. This was identified during the documentary analysis (Section 4.4) and confirmed during both the pupil consultation (Sections 5.2 and 5.3) and teacher interviews (Sections 6.2 and 6.4). However, progression was partially achieved by those teachers responsible for the last revisit of the topic during a key stage (Y5 and Y9) by including concepts from the next key stage in their lessons. For example, Y5 pupils experienced progression because their teachers chose to teach them about 'digestion'. Progression then occurred due to the increase in pupils' depth of understanding about the function of the digestive system (Section 4.4 and Section 5.2). Though the inclusion of concepts from the next key stage provided for short-term progression, in the longer term it actually led to the repetition described above because teachers from the later key stages did not assess pupils' knowledge and understanding effectively (Section 6.2.2). Finally, the progression experienced by the pupils and described by the study was not, as it was intended to be, achieved through following the NC PoS. This was largely because the teachers did not stick rigidly to the content described in each key stage of the NC PoS.

The suggestion that some pupils were positive about revisiting content was shown by the pupil questionnaires (Section 5.2), focus groups (Section 5.3) and the teacher interviews (Section 6.4), and has also been reported in the literature (Chapman, 2001). The teacher interviews also suggested that revisiting was beneficial for some pupils, and was also in agreement with the literature (Cruey, 2006). Further, my study identified that pupils were most likely to express positive views if some progression had occurred. That is, some pupils who revisited an area familiar to them and who felt they had also learnt something new, felt positively towards the subject (Section 5.2.3). However, it was also identified in pupil questionnaires, focus groups and teacher interviews that other pupils can react negatively towards revisiting (Sections 5.2 , 5.3 and 6.4), in agreement with the literature (Bennett *et al*, 2005). The negative reaction of the pupils towards revisiting was especially pronounced when repetition had occurred, but was even apparent when some progression had also occurred (Section 6.4.1).

In general, my study has identified how pupils' positivity towards, interest in and enjoyment of the content of the F&HE topic becomes less pronounced with age (Section 5.2.1). This appears to be in agreement with the findings of other workers in the area of 'pupils' voice', who have linked this drop to a lack of progression, particularly following the transfer to secondary school (Galton 2002; Davies and McMahon, 2004; Evans 2004-5). Similarly, a decline in pupils' enthusiasm, linked to a lack of challenge in the curriculum during primary schooling was outlined by Pell and Jarvis (2001). The 'lack of challenge' could be the result of limited progression. In this study I have outlined how limited progression in the F&HE topic actually begins much earlier than the general lack of progression in the Science curriculum identified in the literature, with some concepts being taught repetitively from as early as Y2.

My study has identified from the pupil consultation that they enjoyed learning ‘new’ concepts (Sections 5.2 and 5.3). For example, the Y8 pupils felt they learnt the most new material, and they were also the year group who were most likely to want to learn more in the future. In addition, they were the only group included in this study to be on their first revisit of the key stage. That is, they should have been covering new material from the KS3 curriculum assuming that not all content had been introduced early in KS2. The sentiment that pupils enjoyed learning new material was also confirmed during the teacher interviews (Sections 6.2 and 6.4). This is in agreement with Lord and Jones (2006), who stated that the apparent newness of a topic raises enthusiasm.

My research findings are generally in agreement with the findings of other research in this area. However, they do make a novel contribution to the body of research as I identify the possible causes of and explanations for this situation, rather than simply identify the problem itself. While other workers state that pupils find the curriculum repetitive, I have shown how the NC PoS describes content in order to provide progression. Yet when this is translated through SoWs and then taught to pupils, it becomes repetitive. This study has also provided a direct consideration of aspects connected to F&HE which continue to be of key importance in pupils’ education because they are so important for the health and general well-being of the population at large. The generally regarded importance of F&HE is potentially why aspects are taught in a number of school subjects. I have identified where there is or is likely to be an overlap in content, and have shown how this overlap is counterproductive.

7.3 Progression in Teaching & Learning Activities

It was harder to identify whether pupils experienced progression through the use of T&LA because it was unclear how individual activities were being undertaken. I therefore compared findings from Chapters 4, 5 and 6 to judge whether pupils experienced progression in a manner described by the NC PoS and QCA SoW and, further, based the on range and variety of T&LAs used in lessons.

To identify progression in the area of T&LA, it was necessary to look closely at the tasks performed in class and to compare these with how progression was described in Section 2.2. In that section, I detailed how progression in investigative work could be identified by moving from the unstructured exploration of an area to a systematic investigation; or from using simple drawings, diagrams and graphs to complex scientific drawing graphs and using calculations when presenting quantitative data.

The findings of the documentary analysis (Section 4.3) showed how there was progression in the SoWs with respect to T&LAs, particularly with the use of ICT and in the production of graphs. When I then went on to look at pupils' exercise books, I encountered a significant problem in that there were too few T&LAs identifiable in the exercise books on which to make a judgment. I have outlined in Chapter 4 (Sections 4.4, 4.5) the circumstances that might have occurred where pupils had undertaken such T&LAs, yet had nothing to confirm this from their books, such as work that formed part of a wall display, and have further shown how the SoWs were not prescriptive and contained a range of T&LAs which the teachers may or may not select from. However, I was left with the underlying concern that the numbers of T&LAs observable in the exercise books were far fewer than in the SoWs at around one T&LA per lesson for years 2-8 and a single activity in the topic for Y9. The reason I felt this to be very low is because completing an investigation, for example, would lead to multiple T&LAs being observable in the books for that lesson. That is, the process of the investigation, the tabulating of results, the experimental write up, the drawing of a scientific diagram and the display of results in a graph would be registered as five distinct T&LAs in the documentary analysis. So one might therefore expect multiple T&LAs being performed during each lesson, hence the average of only one per lesson causing concern. A disengagement of the pupils towards the curriculum due to the very limited number of T&LAs was highlighted during the study (Section 5.3).

Fewer T&LAs being completed in class may also indicate limited progression in this area. That is, in order to achieve progression in T&LAs one has to actually perform the T&LAs. A possible reason for fewer T&LAs being completed in the class may be due to time constraints, as suggested during the teacher consultation (Section 6.3). This concern was expressed by three of the four teachers in my study. For example, the Y9 teacher stated she was not happy with the range of T&LAs she had completed with the pupils. She felt she was under time constraints because the pupils had started a separate sciences GCSE course and had therefore to complete the topic largely through a self-study project. During the focus groups, Y9 pupils expressed the view that the topic was rushed, and complained about the lack of preferred T&LAs (Section 5.3). In addition, the role plays indicated a strong desire of the pupils to have more variety of T&LAs (Section 5.3.6). They also stated that the paucity of practical activities made the work harder to understand. A lack of time for teaching Science in general was reported by Collins *et al* (2010), but they did not link this to the range of

T&LAs employed. They also proposed that primary teachers reported a lack of resources for Science lessons. In my study the teachers did not express any such concerns.

Despite the difficulties with the documentary analysis of accurately identifying T&LAs in pupils' exercise books, some progression was observable for KS2. Here, pupils in Y3 carried out an investigation that was based purely on descriptive observation, and Y5 pupils carried out an investigation based on quantitative measurements. Investigative work was not found in the KS3 books. Pupils in Y8, however, did undertake some practical work that involved the use of chemicals, so this may mean they had progressed from Y5 in their skills and also in their understanding of safety procedures. Pupils in Y2 and Y9 did not appear to undertake any practical work, which may indicate that they experienced limited progression in this area. Further, this may also indicate that the Sc1 section of the NC PoS (Section 4.2) had not been adequately addressed with these pupils with regard to this topic, although it may have been addressed during other topics.

The findings of the documentary analysis showed how there was progression in the SoWs and NC PoS in T&LAs with regard to the use of ICT and in the production of graphs. Yet when the exercise books were analysed, progression in these areas was not apparent (Section 4.4). Gillard and Whitby (2007) suggested that primary schools may find it difficult to implement the QCA SoW due to a lack of ICT resources. This could possibly be the reason why these were apparently not used with the pupils in this study. However, the teachers themselves did not mention this aspect during the consultation.

A further possible reason for a limited variety of T&LAs being completed in class compared with those suggested in the SoWs could be down to the personal choice of the teachers. For example, one KS2 teacher commented that the QCA SoWs were ‘too practical’; indicating that some specific types of T&LAs may intentionally not have been undertaken. Finally, health and safety fears were given as a reason for not completing certain T&LAs by two of the teachers (HoD Y5 and CT Y9). This appears to be in agreement with the Biosciences Federation (2005) and Tranter (2004) who outlined concerns that Biology teachers were failing to enthuse pupils due to a lack of practical work. Further, both sources stated that health and safety fears should not result in a poorer learning experience for the pupils.

Another potential indicator of limited progression within T&LAs was implied by the Y8 teacher during interview (Section 6.4) when he expressed a concern that he felt KS2 teachers were ‘nicking’ KS3 practicals, thus causing repetition and boredom in KS3. That is, if practicals were repeated, then progression with regard to T&LA may not be achieved unless some extension of the activity was included, for example in the further development of skills or evaluating results. The opinion that they were repeating practical work already completed in KS2 was also expressed by pupils in both a Y8 focus groups and a Y9 focus group, although they were referring here to a different topic, that of ‘forces’. Further, the KS2 teachers also stated that they were teaching KS3 content during the F&HE topic in order to provide progression (Section 6.4), whilst ignoring the potential negative outcome of boredom later on in KS3. In the same way as content was addressed before the designated key stage, specific T&LAs connected to such content may also have been employed. This may have resulted in repetition due to the teachers in the later years being unaware that these had already been completed or, indeed, being aware of earlier coverage but repeating the T&LA anyway. The phenomenon of KS3 pupils repeating practical work from KS2 without sufficient increase in challenge has also been reported by Braund and Hames (2005).

There was some agreement between the pupil consultation (questionnaires and focus groups (Section 5.2 and 5.3) and the teacher interviews (Section 6.3) regarding pupils' favoured and least favoured T&LAs. Experiments/practical work proved popular with pupils, and teachers were aware of this. This finding was also reported by Lord and Jones (2006). Writing activities, especially copying, were unpopular, a finding also reported by Osborne and Collins (2000), GTC (2005) and Lord and Jones (2006). During the focus groups (Section 5.3) the pupils outlined how T&LAs affected their feelings about a topic and there were in agreement with Parkinson *et al* (1998). Finally, pupils in KS3 felt the curriculum was rushed (Section 5.3); this appears to be in agreement with Osborne and Collins (2001).

7.4 Concluding Comments

The study showed how perceived progression for the pupils was dependent on the implementation of the curriculum by the teachers with findings from the research instruments appearing to be in strong agreement with regard to progression in content and T&LAs. The early introduction of concepts coupled with the frequent revisiting of the topic resulted in repetition of taught material and limited progression in the F&HE topic. The limited range and variety of T&LAs identified in the exercise books and described by pupils and teachers also appear to indicate limited progression in this area.

Of key concern are the findings which suggest that some teachers intentionally introduce concepts early, while missing out the more basic concepts in order to include more complex ones (Section 7.2). Neither the NC PoS nor the QCA SoW directly intends concepts to be repeated, as they were designed to provide a curriculum that offered both continuity and progression whilst adhering to a spiral model. However, the desire of the teachers in this study to teach concepts from later years, consciously or unconsciously, in addition to the teachers' apparent lack of effectiveness in assessing pupils' prior knowledge, exacerbates the potential for repetition and potentially therefore reduces progression and pupils' enthusiasm.

This study was not able to identify if pupils from all years experienced progression with respect to T&LAs. This was because too few T&LAs were identified during the study as being used in lessons. Further, progression was not evident in the exercise books in the manner described by the SoW. In general, the pupils' desire to perform such practical work was not fulfilled during KS3. This appears to show how the teachers are implementing the curriculum in a manner that is developing pupils' knowledge of the content whilst not developing their practical skills.

Finally, there is a mismatch between the teachers in this study feeling that they have time to introduce content which is applicable to later years, whilst at the same time employing too few of the T&LAs suggested in the SoWs. These are T&LAs that the pupils' want yet which the teachers themselves claim they are unable to offer due to 'time pressures'.

7.5 Reflection on Implementation, Theories of Learning and Curriculum Models

In Section 2.4.5 I identified how teachers and those who draft SoW have the responsibility of translating the curriculum and putting it into practice (McDonald and Butler Songer, 2008). During the documentary analysis and teacher interviews the study outlined how the primary school relied on the QCA SoWs whereas the secondary school produced their own SoWs. Beyond the SoWs the teachers as individuals had the role of implementing the curriculum. During the literature review I identified how primary school teachers tended to be generalist teachers without a specialism in Science (Watt and Simon, 1999) and this may affect how they choose to implement the curriculum (Sharpe, Hopkin and Lewthwaite, 2011). Perhaps unusually, both the primary school teachers in the study were from a scientific background and this may have given them greater confidence in implementing the curriculum. Further, their willingness to take part in the study may also be due to their confidence as Science specialists. The fact that both primary school teachers were Science specialist has clear implications for the generalisability and validity of the present study. However, these teachers were selected and used in the study because they taught at the only primary school that agreed to participate. The school matched another desired requirement as they the used the QCA SoWs that were being included in the documentary analysis. The QCA SoWs were being included because it was reported in the literature that they were widely used by primary schools (Gillard and Whitby, 2007).

The availability Science specialists could offer an explanation as to why the feeder schools declined to be involved in the study, that is, they may have had non-specialist teachers who were not confident enough to discuss the study area. However, the responses from the head teachers of the feeder schools, regarding why they did not want to be involved in the study, were reported exclusively as time issues for their staff.

The fact that the study's primary school teachers were Science specialists may have allowed them the confidence to alter the curriculum and add concepts from later key stages and this may raise concerns over validity and generalisability of the findings.

The techniques used to validate the findings in the study were identified in Chapter 3. These included: extensive piloting of the tools, for example, by presenting the draft questionnaires for peer review and by trialing the questionnaires with two age groups of pupils; validation of responses by, for example, making interview transcripts available to the teacher interviewees to approve; and validation of the analysis of pupils' responses to open questions such as 'why do you feel that way?', by having three teachers, unconnected to the study's schools, independently group responses to validate my own grouping.

Several methods were used to establish the consistency of findings. For example, to ascertain concepts covered at primary school, data were gathered from five sources: the SoWs, primary pupils' exercise books, consultation with primary and secondary teachers (interviews) and primary and secondary aged pupils (questionnaires and focus groups). The resulting data, triangulated in this way, were found to be in strong agreement that concepts connected to F&HE, were introduced early, thus showing consistency.

The secondary school pupils, who were from a variety of feeder primary schools and not the primary school included in the study, stated that KS3 concepts were being taught in KS2. It is highly unlikely that all of these pupils had Science specialist primary teachers and therefore suggests that primary school teachers who were not Science specialists also included KS3 concepts. Such findings indicate that non-specialist primary school teachers are confident with KS3 concepts of the F&HE topic, possibly because there is widespread coverage in the media. The evidence discussed here supports the notion that primary teachers who are not Science specialists behave in the same way as the specialists with respect to the F&HE topic. This evidence could explain why early teaching of KS3 F&HE concepts was consistently found by triangulation across varied evidence sources.

The fact that the primary school teachers were Science specialists may have implications for the generalisability of findings from this small-scale case study. The outcomes may not be generalisable to other topics, where having a Science specialism may have more influence on confidence, especially if it does not receive widespread coverage in the media as F&HE does. There was, however, a suggestion in the teacher interviews which indicated that primary school teachers were selecting material from the next key stage as a generic response. Both the HoDs from the primary and secondary schools made comments to that effect whilst talking about the curriculum as a whole. For example, the primary school HoD stated that they ‘stepped on the toes’ of the secondary school with respect to curriculum content, while the secondary school HoD said that primary schools ‘nicked all’ the KS3 practicals to make the pupils’ experience more pleasant. In addition, the secondary aged pupils indicated other topics, for example forces, that included practical work in KS2 which was later repeated when they reached secondary school. Future studies could usefully extend the findings presented here by collecting data from both a greater number of schools and a greater number of topics. Further, a larger number of specialist Science teachers in primary schools could be accessed to see if this is a new phenomenon in response to new, more challenging curricula.

Another factor that affects implementation of the Science curriculum, reported in the literature, was a lack of resources (Collins *et al*, 2010). None of the teachers in the study expressed any concerns about a lack of resources .The main concerns of the teachers in implementing the curriculum in this study appear to be twofold: firstly, that the curriculum outlined in the QCA SoW did not provide adequate progression for the primary school pupils and this led to the early introduction of some content. A lack of progression in the curriculum in general was expressed in the literature (Davies and McMahon, 2004) and this study highlights this issue in relation to the F&HE topic. Secondly, an apparent lack of time meant that teachers felt they were somewhat restricted in the T&LAs employed in the classroom. This finding is in agreement with Sharp, Hopkin and Lewthwaite (2011) who identified time as the most inhibiting factor in curriculum implementation. The literature review suggested that pupils felt there was a lack of practical work in Science (Murphy and Beggs, 2003) and that pupils responded positively to an active and practical approach during Science lessons (Lord and Jones, 2006). The pupils in this study expressed the feeling that the F&HE topic was not implemented in a way that provided a range of learning experiences and practical work in particular.

I now explore how the data reflect the theories of learning and the adoption of the spiral curriculum. I will consider the key theorists of Bruner, Piaget and Vygotsky as they seem to have been the most influential in the development of the NC as a spiral curriculum and I will discuss whether a change to a mastery style curriculum influenced by Bloom's work might be appropriate.

The study has identified that the F&HE curriculum was not being effectively implemented in a manner that matched the spiral model described in Section 2.4.1 because some of the content was repetitively revisited with the pupils. That is, the 'spiral' in this case was not increasing in breadth in these areas (Section 4.4.2). Bruner (1960, ix) described how the spiral curriculum should build on from 'where the learner is'. That is, some judgment should be made of the knowledge currently held by the pupil and then built upon. However, this study highlighted how the teachers were largely unaware of the knowledge that the pupils held and further, their likely experience of the topic. This made it difficult for the teachers to build on pupils' prior knowledge thus restricting the effectiveness of the spiral curriculum.

The effectiveness of the spiral curriculum may also be compromised by the frequency of the revisits. The F&HE topic is revisited on six occasions through KS1, KS2 and KS3. That is, it is revisited on six occasions in nine years. This means that increments of conceptual challenge and progression are small between revisits making the likelihood of repetition for individual pupils greater. Further, in this instance, pupils' knowledge was also greatly influenced by external sources such as the media. That is, with reference to the Ryland model of the spiral curriculum, pupils may hold a large amount of core or personal knowledge (value 'C'), and this may overlap with content provided by the curriculum (values 'D' and 'E'). The study did however identify some concept areas where the spiral model was being employed more effectively and provided progression for the pupils (value 'D').

More (2000) suggested that the four compulsory key stages (KS1 to KS4) of the NC are linked with Piaget's stages of development (Section 2.3.1). This can be supported by data collected during the documentary analysis of the NC PoS and QCA SoWs. For example, it was found that concepts in the NC PoS and QCA SoWs, and objectives and activities detailed in the SoWs would be appropriate to pupils in the corresponding stage of development; concepts detailed in the NC PoS for KS1 and QCA SoWs for Y1 and Y2, would also be appropriate for those in the pre-operational stage of development. For example, the pupils learnt the names of types of food such as bread, carrots, apple, etc. with the aid of pictures. This is reflective of the pre-operational stage because it relies on the ability to use pictures to represent things that are not actually there and has aspects of classification. Concepts detailed in the NC PoS for KS2 and in the QCA SoWs for Y3 and Y5 would also be appropriate for pupils in the concrete operational stage of development. For example, the pupils learnt that food is needed for activity, growth and health and, if we do not have enough of the right types of food, then we would not be able to function properly and may become ill. This is reflective of the concrete operational stage because it takes into consideration multiple aspects of the situation (types and amounts of food and the different uses). Concepts detailed in the NC PoS for KS3 and in the secondary school's SoWs for Y8 and Y9 would also be appropriate for pupils in the formal operational stage of development. For example, the pupils learnt about the lock and key model of enzyme function and further carried out experiments using enzymes that would have required them to think abstractly and draw conclusions. The ability to think abstractly and draw conclusions is reflective of the formal operational stage.

In addition to these examples, other concepts can be identified in the key stages that may be appropriate for pupils in earlier key stages. For example, the concept of balanced diet appears in KS3 in the NC PoS, potentially reflecting the formal operational level. However, it may be that aspects of the superordinate concept of a balanced diet could be addressed in KS2 by pupils in the concrete operational level who have developed the ability to take into account multiple aspects of a problem. That is, they may understand simple concepts such as certain people need lots of meat or beans because they are growing and others may need less because they are not. It may be that they would need to be in the formal operational level to truly draw conclusions about diet from data and this may be why in the NC PoS it has been allocated to the later key stage.

When considering any topic in its totality, it is conceivable that concepts of differing complexity could be addressed by children in different stages of development. Therefore it would not be wise to expect that all concepts would fit neatly into the appropriate level of development. This is potentially a reason why the spiral curriculum was developed; so that different and wide ranging aspects could be addressed at different stages of development.

Piaget proposed that, although his stages of development could not be skipped, some children pass through them more quickly than others (Piaget and Inhelder, 1969). During the documentary analysis and the analysis of teachers' perceptions, it was apparent that some pupils gained understanding of the content sooner than others. Therefore the teachers felt they needed to be moved on to material outlined in the next key stage of the NC in order to offer progression. This was not part of differentiation for individual pupils within a class, but was a measure implemented for the whole class. For example, the Y9 pupils in the study were a top set, in that they represented the most academically able pupils in the year. They were progressed onto KS4 material by beginning separate Science GCSE courses and ceased to cover KS3 work. The HoD in the secondary school commented during interview that they had a different examination [course] for each academic set. This appears to be similar to views expressed by a teacher in Ryder and Banner (2013) of how schools are implementing different courses dependent on pupils' needs. It is possible that these findings are illustrative of how these more able children are passing through the stages of development more rapidly than others and teachers are therefore introducing aspects that could be understood by younger children. For example, as detailed above, the superordinate concept of balanced diet could be interpreted as appropriate to pupils in KS2. It was found during the study that teachers were introducing this concept to the pupils earlier than outlined in the NC PoS. This could be because the pupils had developed more swiftly and had passed into the formal operational stage or it could be because the concept was simplified to make it appropriate to the less developed pupils in the concrete operational stage. This seems to reflect Bruner's belief that a concept could be introduced to a child of any age as long as it was structured properly (Bruner, 1960).

The study highlighted how pupil interest in the F&HE topic appeared to wane with increasing revisits to the topic and with the lack of a variety of T&LAs. Bruner (1960, p.80) stated:

> …motives for learning must be kept from going passive in an age of spectatorship, they must be based as much as possible upon the arousal of interest in what there is to be learned, and they must be kept broad and diverse in expression.

In addition he stated that the teachers' role be supported by (*Ibid.*, p.91):

> …a wise use of a variety of devices [aids to teaching] that can expand experience, clarify it, and give it personal significance.

The views expressed by the pupils therefore, appear to show how Bruner's intentions were not being followed.

Regarding Vygotsky's theory of the ZPD, there is not sufficient detail within the collected data about individual learning conversations between teacher and pupil, pupil and pupil and between learning assistants and pupils, to draw any clear conclusions about the presence or effects of any scaffolding. However, the evidence collected in the study seemed to suggest that the ways in which the teachers were implementing the curriculum would not necessarily help scaffold individual pupil's knowledge. Such scaffolding is closely linked to providing progression for the pupils. The teachers' understanding of the background knowledge and understanding of the class as a whole was not clear or accurate and it follows that individuals' knowledge would also not be known. It would therefore prove extremely difficult for the teacher to scaffold new material towards new understanding whilst working in individual pupils' ZPD. This was exemplified by teachers introducing repetitive or very similar concepts providing pupils with an unchallenging diet of concepts and experiences. That is, since pupils already understood some concepts, they could not be successfully extended within or beyond their ZPD. It is also possible that different pupils within a class are at different developmental stages which could mean that they would need different work and different types of intervention to others in order to operate within their individual ZDP. It seemed, during the study, that many pupils were offered work less demanding than that which they could learn on their own or which they had reached with prior guidance. Further, when teachers did attempt to extend the pupils, they did so by introducing concepts from the next key stage, rather than developing skills and extending work from the existing key stage. Also, when introducing such concepts, they were not doing it based on an individual's ZPD but doing so because of the belief that their class contained 'bright' pupils or because they felt the QCA SoWs were repetitive. Whatever the teachers' motives were in introducing concepts a key stage early, the pupils may well have been guided to achieve something that they could not have achieved without help and this, in turn, may have led to gains in self-sufficiency. For example, when the KS2 teachers introduced aspects connected to the digestive system and digestion, the pupils were potentially guided to developing in their ZPDs in the area of digestion.

At this point it seems prudent to consider how possible it would be for individual teachers to be able to consider individual pupils' ZPDs and the detailed scaffolding they might require when one teacher may be responsible for the education of hundreds of pupils; a situation common in secondary schools that is further exacerbated by crowded and busy classrooms and the fixed curriculum. Detailed knowledge of individual pupils' ZPDs may be more of a possibility at primary schools where pupils are taught by a single teacher for all or most of the subjects. In such situations, teachers should develop a good understanding of their pupils' abilities. The primary school in the study moved to a system whereby, in the last two years of KS2 (Y5 and Y6), the pupils were taught by specialist teachers in the core subjects of Mathematics, English and Science, presumably so that they could provide the best possible education for those older, more advanced pupils prior to SAT's testing. This type of specialist teaching provision may be more feasible in large primary schools but would be difficult to facilitate in smaller ones. However, it also carries with it an increase in the numbers of pupils that teachers have contact with and therefore teachers' familiarity with individual pupils may be adversely affected along with their ability to provide appropriate scaffolding. This leaves head teachers with a conundrum as to whether they should provide specialist teachers who are more confident teaching the material but are responsible for a greater number of pupils or, non-specialists responsible for fewer pupils.

With these points in mind, the question arises as to whether the spiral curriculum is efficacious in this instance or whether a move to an alternative curriculum model, such as the mastery (Block, 1971a), should be supported. Although the issues raised during the study highlight areas of concern in relation to limited progression and lack of variety of T&LAs, I would still support the use of the spiral curriculum in schools for two key reasons. Firstly, the spiral curriculum allows for the development of schema as described by Piaget (Piaget and Inhelder, 1969). The development of existing schema can be achieved through progression in the spiral curriculum. For example, the NC PoS outlines how pupils in KS2 will know how bread fits into a group with other foods such as pasta and rice. Their understanding is developed in KS3 when they are taught that the reason these foods fall in the same group is that they provide high amounts of carbohydrates. The schema involving food grouping already exists yet is developed with the additional understanding. The spiral curriculum is based on Bruner's belief that content can be taught to a pupil of any age as long as it is structured properly (Bruner, 1960). This means that content is simplified for younger pupils to understand, for example food belonging to the bread group rather than carbohydrates. The mastery curriculum would not simplify such content and would arrange topics according to the complexity and only introduce it at an appropriate time (Block and Anderson, 1975; Eisner, 2000). That is, the bread group would not be taught at all and such food would be described as belonging to the group known as carbohydrates when pupils are developed enough to master it. With this in mind it is important to understand that mastery curricula can also build on existing schema though the links may be more subtle. For example, pupils may hold schema that they have developed through experience rather than formal education and when they are taught content they may make links themselves. Or the development of schema may be based on links with simpler related topics in the curriculum. This possibility is described in the Ryland mastery curriculum model by factor ‘D’. An example of this (not from the study) could be with the topics habitats (early topic) and adaptation (later topic). The pupils could be taught about different habitats at an early age and find out how they differ based on temperature, rainfall, etc. At a later point when they learn about the adaptation they can develop the existing schema about habitats and link the knowledge to how different plants and animals are adapted because of the habitats where they live. This is not the development of the schema from a simple understanding to a more complex one but more of a linking of two schemas. Individual schema may be developed within the mastery curriculum from a simpler form to a more complex one but this is likely to be over days or weeks as the topic develops rather than through repeated revisits over years. Secondly, revisiting work has been identified by teachers in the study and in the literature (Cruey, 2006) as benefiting lower ability pupils. This potentially allows the pupils develop over the intervening period so that they can gain understanding on the subsequent revisit. With the mastery curriculum pupils not reaching the required standard would not progress to the next topic and would receive remedial work. A concern with the mastery curriculum would be the effect on confidence of pupils not reaching the required standard when their peers progress and they do not. Though I continue to support the spiral model it is with the proviso that the more able pupils are not adversely affected by the design and recommendations are made which embody this implication (Section 8.3).

Though the study does not support the uptake of a mastery curriculum, aspects of mastery learning could be employed within the spiral curriculum. Pupils expressed a view during focus groups that they did not find the curriculum challenging enough. Bloom’s taxonomy

(Bloom, 1956) could be employed to give direction so that objectives are targeted to develop the higher skills (synthesis and evaluation) thus increasing challenge of the pupils. This could be implemented through differentiation and may preclude the need to borrow content from future years.

Mastery learning could also be employed to ensure that concepts were not unnecessarily repeated. This could be implemented as part of the Personalised Learning Agenda (Department for Children, Schools and Families, 2008b). For example, at the end of the revisit and after focused assessment, if it was found that pupils were not yet grasping concepts, intervention could be employed immediately to address the understanding rather than waiting until the next revisit of the topic in the spiral curriculum.

A final reason for not supporting a fully mastery style curriculum include concerns over how time costly the implementation would be, as it requires a higher level of teacher input to assess progress and mastery and further, in general coordination (Block and Anderson, 1975; Engelmann, 1999). This is of key significance as teachers outlined during the study how they already feel they have little time to implement the spiral curriculum, which was deemed during the literature review to be easier to implement than the mastery curriculum (Engelmann, 1999; Bennett *et al*, 2005).

In summary the study supports the continued use of the spiral curriculum model whilst recommending the development of aspects of mastery learning within to increase the efficacy of the design.

CHAPTER 8

FINDINGS, IMPLICATIONS AND RECOMMENDATIONS, CONTRIBUTION TO THE FIELD, CRITIQUE AND FUTURE WORK

8.1 Introduction

This chapter contains a succinct answer to each of the research questions (Section 8.2) and the wider implications and recommendations arising from the findings (Section 8.3). Section 8.4 focuses on unique elements of this study and the contribution it makes to knowledge in this field. I then critique the study (Section 8.5) and finally suggest areas for future work (Section 8.6).

8.2 Answers to the Research Questions

The broad research question, ‘Do pupils experience progression in the Science National Curriculum when learning about food and healthy eating?’ was broken down into the sub-research questions detailed below. I summarise answers to each sub-research question then conclude with a general response to the broad research question.

1a) Is progression illustrated in the National Curriculum programme of study?

Progression in the coverage of F&HE in the NC PoS is illustrated in a number of ways: the development of language from personal and everyday to scientific; by a move from concrete ideas to more abstract ones; by an increase in the depth of knowledge; and by an increase in the number of concepts covered across the key stages (Section 4.2).

1b) Is progression in content and teaching and learning activities illustrated in the schemes of work?

The QCA SoWs used by the primary school in the study do illustrate progression in content when viewed at the key stage level matching the coverage of content in the NC PoS (Section

4.3.1). Progression was also illustrated in T&LAs by an increase in the depth of challenge posed by ICT and graph work (Section 4.3.1). However, when the content was analysed within the key stages, limited progression was evident in some areas (Section 4.3.1). For example, within KS2, the objectives for Y3 and Y5 were so similar that they appeared to be a tautology. In addition, text describing content could be interpreted in a number of ways and was therefore confusing.

The secondary school SoWs also showed progression from KS2 to KS3 and within KS3 by matching the coverage of content in the NC PoS (Section 4.3.2). Further, progression was also illustrated in T&LAs by an increase in the depth of challenge posed by ICT and graph work (Section 4.3.2).

1c) Is progression in content and teaching and learning activities reflected in pupil exercise books?

Progression in content was reflected in pupils' exercise books in some areas, for example 'digestion'. However repetition in content was also displayed in, for example the areas of 'food groups' and 'balanced diet' (Section 4.4.1). These were also the areas that appeared to have been introduced earlier than indicated by the NC PoS. Some of the progression experienced by KS2 pupils was achieved by teaching content from KS3 (NC PoS and SoW) (Section 4.4.2).

In general, progression with T&LAs was more difficult to assess with confidence because they were not always reflected in the exercise books. However, progression as defined in the SoWs was not displayed in the exercise books either in the area of ICT or graph work (Section 4.4.2).

In summarising all the above findings and addressing the overarching question ‘Do pupils experience progression in the Science National Curriculum (NC) when learning about food and healthy eating?’, the findings of this study show that pupils only experience progression in some aspects. The reason for this was that, although the NC PoS detailed content that provided for progression, when this was developed into an individual SoW and actually taught to the pupils, progression became less clear due to a repetition of content and a lack of variety of T&LAs. Further, the progression that was evident in pupils’ exercise books was not expressed in the manner as outlined by the NC PoS because it was achieved by introducing content earlier than the detailed key stage (Section 4.6).

2) What are pupils’ views on the content, teaching and learning activities, and progression in the food and healthy eating topic?

The pupils believed that learning about F&HE was important, due largely to the perceived health benefits. However, they learnt about it from a range of sources, including other school subjects, and this led to some repetition of content and to what I identified as limited progression (Sections 5.2.2, 5.2.3, 5.3.2, 5.3.4 and 5.4).

The types of T&LAs used during lessons influenced how interesting pupils found the topic. They enjoyed lessons that included practical and/or creative work and did not enjoy some writing tasks, for example copying (Sections 5.2.3, 5.3.3, 5.3.6, 5.4).

It was not possible to directly ask pupils about progression, but their responses implied that they were interested in concept areas that provided progression or content which was ‘new’ to them. Pupils were less interested in areas that provided limited progression (Sections 5.2.3, 5.3.4, 5.4).

3) What are teachers' perceptions on the content, teaching and learning activities and progression in the food and healthy eating topic?

The teachers' perceptions of content showed that they had a good understanding of the breadth of coverage taught during the key stage they were currently teaching (Section 6.2.1), but they were less aware of content the pupils had encountered during the previous key stages which they had not been responsible for teaching (Section 6.2.2). Although the teachers did attempt to assess pupils' prior knowledge and understanding, they appeared not to be doing this effectively.

With respect to T&LAs the teachers perceived that pupils enjoyed pupil-centred hands-on activities such as practical work, and also that the majority of pupils did not enjoy graph work. However, teachers expressed how time pressures and/or worries about health and safety limited the number and type of T&LAs they were able to complete with the pupils (Section 6.3).

The desire of some teachers to provide progression for their pupils led them to introduce concepts earlier than stated in the NC PoS. The teachers understood the term progression and could give examples. During the sequencing activity, no teacher could identify the QCA order of the lesson objectives taken from the KS1 & KS2 SoWs, indicating that they could not identify progression within these objectives. Three of the teachers expressed an opinion that revisiting a topic was beneficial for lower ability pupils, but adversely affected the enthusiasm of higher ability pupils (Section 6.4).

8.3 Implications and Recommendations

In this section I outline implications and provide recommendations based on the findings of this study, and identify its potential beneficiaries.

The study outlined issues in the implementation of the F&HE topic. Although the study still supports the use of spiral curricula for the reasons outlined in Section 7.5 I would recommend a reduction in the number of times the F&HE topic is revisited to once per key stage, this would be represented by a decrease in the number of turns of the spiral in the Ryland model described in Section 2.4.1. This would allow for greater increments of conceptual challenge between revisits whilst still allowing pupils to develop schema. However, more frequent revision of the topic may still be advisable for some lower ability pupils. Aspects of mastery learning described in Section 7.5 could also be employed to ensure pupils were not left behind by the curriculum. That is, steps to increase mastery of the content could by employed such as targeted remedial work following detailed assessment of the pupils' understanding.

Findings indicate that frequent revisiting of the topic leads to repetition of taught material. Unnecessary revisiting can also lead to pupils' disaffection, and to teachers looking for other ways to increase progression for the pupils, for example by including content from the next key stage. This repetition could be avoided by curriculum developers indicating clearly when key scientific concepts should be introduced (greater levels of prescription). It might be thought that greater prescription goes against the Personalised Learning Agenda (Department for Children, Schools and Families, 2008b) and precludes responsive and creative teaching; however I believe greater prescription does not necessarily mean this. Greater prescription could apply to a slimmer statutory curriculum at, for example 50% of current content. That is, 50% of the time would be used to cover the statutory key stage content and the remaining time could be devoted to areas outside the curriculum, allowing pupils/teachers to develop particular interests that are not covered in the current curriculum, such as Botany. This would lead to a more heterogeneous cohort rather than thousands of pupils with the same experience. The remaining time could also be used flexibly with the less able pupils so that they had a chance to catch up with the more able pupils' understanding of core statutory content, potentially employing aspects of mastery learning. Greater prescription across subjects may also be advisable to account for the overlap in content. I also recommend greater dialogue within schools between departments to ensure that aspects of the curriculum are not unnecessarily covered in different school subjects. These recommendations could benefit both the pupils, who may have increased engagement with the subject, and the teachers who may not find it necessary to include concepts from later key stages to aid progression and who could have more time to perform a greater range of T&LAs with the pupils. The greater engagement of the pupils in the subject could lead to a greater number taking up STEM subjects at A-level and at university.

The study recommends an increase in the number and variety of T&LAs in a manner outlined by Bruner (1960) in his chapters on developing motives for learning and aids to teaching. This is because the F&HE topic tended to be content-heavy and T&LAs light (which appears to be in conflict with Bruner's suggestions), that is, greater importance was put on the learning of factual content than on the experience of more variety in T&LAs, particularly hands-on work, which in turn linked to pupils' a lack of enjoyment. This is of great concern because Science is essentially a practical subject, and future scientists need to be able to develop skills of scientific enquiry during their education. Also, if teachers only included the content that was required by the statutory content of the NC PoS, there would be more time available to use a range of T&LAs with their pupils. My findings suggest that this would raise both pupils' enthusiasm and their interest. Further, if a more prescriptive curriculum was adopted as suggested above, much more time would be available for teachers to use flexibly. The teachers during the interviews stated how they were restricted in the activities they could complete due to time issues (Section 6.3.2), thus additional time could be used to include a greater range of activities.

The findings of this study also have implications on CPD for teachers. Three key areas for CPD were identified that could benefit teachers implementing the F&HE curriculum to ensure progression and pupil engagement the study recommends:

- that teachers need to develop an understanding of the intentions of the curriculum planners. CPD training could address the interpretation of the NC PoS and the SoWs, thus aiding teachers' planning for progression. The need for this was identified because teachers in the KS1, for example, were introducing KS3 content. This appeared to be due to a misinterpretation of the NC PoS and or SoWs. KS2 teachers also introduced content early and may have been misinterpreting the NC PoS and/or SoWs, but they also stated explicitly that they had made the conscious decision to include some concepts to improve progression. However, in doing so they did not then leave themselves enough time to cover the Sc1 (scientific enquiry) aspects of the NC PoS or use the range of T&LAs identified in the SoWs.
- a better assessment of pupils' prior knowledge by teachers. Findings suggest that although the teachers reported assessing pupils' prior knowledge the methods they used appeared to be ineffective. Bruner (1960) described how the spiral curriculum should build on from where the learner is. It appears that this is of key importance to the successful implementation of the spiral curriculum. This situation could also be improved by CPD.

- that teachers should receive CPD to address their worries about employing certain T&LAs due to health and safety issues. This would help teachers reflect Bruner's (*Ibid.*) intensions on motives to learning and aids to teaching within the spiral curriculum.

Findings also identified how KS2 teachers were aware that they were covering material from KS3 and that KS3 teachers were aware this was happening, yet there appeared to be little or no dialogue between schools to remedy the situation. It may be that if the topic under discussion was taught in Y6 and Y7, then dialogue may have been greater as part of bridging units or if the primary school in the study were to be a feeder into the secondary school as part of transition procedures. However, both HoDs involved in the study did not suggest that any bridging work (across KS2 and KS3 transition) was being undertaken. One might suggest that this problem could be reduced if the working relationships between schools were improved. However, as outlined in Section 2.2.2 the use of bridging units and other measures can be difficult to implement due to the numbers of feeder schools, logistics, time and so on.

8.4 Contribution to the Field

This study has contributed to the field in the three areas of context, methods and findings.

This study was designed to explore the extent of progression experienced by pupils when learning about F&HE. It appears that there are no other published studies examining this issue.

The study involved the development of models for both the Spiral and the Mastery curriculum (Section 2.4.1 and 2.4.2 respectively). The Ryland Spiral model can be used both as a theoretical premise and to interpret the data from the study in the area of food groups (Section 4.4.2).

While focus groups have been used in a wide range of studies the use of role plays as a methodological tool within them appears to be unique to this study. This approach has proved to be revealing and useful in the triangulation of findings. Further, some of the information gathered may not have been readily accessible had other methods been used.

Although authors of other studies have identified generalities of issues linked to progression, I have identified causes of limited progression in the curriculum related to F&HE:

1. The early introduction of concepts due to the misinterpretation of the NC PoS or QCA SoWs (Ryland 2009 & 2010b); the omission of the more basic concept in favour of a more complex version (Ryland 2009 & 2010b); and teachers' desire to provide progression for the pupils (Ryland 2010a and 2011).
2. Teaching more concepts than detailed in the SoWs due to teaching concepts for longer than required and including additional revisits of concepts (Ryland, 2009 and 2010b).
3. Teaching the same concepts in multiple school subjects, in particular PSHE and DT: food (Ryland, 2011).

All of these continued to cause limited progression because teachers did not take account pupils' prior knowledge (Ryland, 2011).

8.5 Critique of the Study

Four main issues were identified during the course of the study:

Firstly, the generalisability of this cross-sectional study may be somewhat restricted due to the method of sampling and small sample numbers and the qualitative nature of the research. However, the fact that generalisability is challenged in this case does not invalidate the research. On the contrary, this study could act a primer for a much larger and more generalisable study that incorporates probability-based sampling. Alternatively, it could lead to a number of small-scale studies which, in combination, could increase generalisability, and some examples are suggested in Section 8.6.

Secondly, the primary school involved in the study would ideally have been a feeder to the secondary school. This would have given a more accurate picture of the likely experience of pupils passing through the schools in this cross-sectional study. However, despite a number of approaches to the feeder schools all requests were rejected. In order for the study to continue I had to recruit a non-feeder primary school. Although this was not ideal the sample primary school did base their lessons on the QCA SoWs, and it has been reported in the literature (Gillard and Whitby, 2007) that primary schools widely use these.

Thirdly, problems were encountered during the documentary analysis with the use of exercise books for assessing progression in T&LAs that created a limitation in the findings in this area. One problem was that the exercise books did not include all the T&LAs completed in class; a second was that the study was unable to identify how T&LAs were employed in class. With hindsight, this area could have been investigated more effectively using either pupil and teacher logs or lesson observations, but this was beyond the scope of the study and might itself have caused teachers to alter their planning. Despite this limitation involved in the documentary analysis the findings based on the teacher and pupil consultation (Sections

5. 4 and 6.3, respectively) supported the documents analysis (Sections 4.4 and 4.5) which suggested that few T&LAs were completed with the pupils.

Finally, the role plays could also have been improved by exploring with the pupils their reasons for different aspects of the plays. For example, did pupils portray the teachers as scary, disciplinarian, etc. because they felt they were or were, they just portraying a stereotypical image of a teacher? Due time constraints imposed by the schools, however, there was insufficient time to examine this.

Some of these issues could be addressed with further studies in the area, as outlined in the following section.

8.6 Future work

This section identifies avenues for future work of two types; those that build on and extend the findings of the study, and questions that arose during the course of this study but were considered outside its central direction.

There are avenues of future work that would further clarify whether pupils are experiencing progression in the area of F&HE. This study largely addressed the Science curriculum; although some preliminary work was completed on a PSHE SoW. Future work might involve an analysis of all the subjects that cover aspects of F&HE, including DT: Food, PSHE, Physical Education and Geography. This could ascertain the degree of overlap in school subjects, identify possible implications for progression, and suggest adjustments to minimise these. Furthermore, the influence of the media in the development of attitudes to and understanding of F&HE might also be an avenue worth exploring.

One of the limitations of the study was the lack of certainty in what T&LAs were being completed with the pupils and how they were being used to provide progression. Additional studies based on classroom observations or pupil/teacher logs could aid understanding in this area, and such information could be used to directly assess how schools and teachers address the statutory aspects of the Sc1 section (Scientific Enquiry) of the NC PoS.

Also in the area of T&LAs, the study identified the potential lack of use of ICT in the schools (Section 4.4.1). This area could be more specifically explored to examine the reasons for this, for example whether a lack of resources in school, teacher confidence or time issues, etc. were affecting which T&LAs were completed with the pupils.

In Chapter 4, I identified two sources of additional documents that were connected to the study yet lay outside of the initial research questions: the 2007 NC PoS and National Strategies for Science (Sections 4.5.1 and 4.5.2, respectively). These, and their potential successors, could be the subject of future work: The 2007 NC PoS was part of a further curriculum review in 2011 and the new NC PoS is due to be published in 2013. This would be an ideal time to investigate whether the changing PoS influences SoW development in schools.

In addition to these avenues of future work I have also identified two potential similarly designed studies to increase generalisability. The first could explore progression and identify whether the early introduction of concepts was also happening in other Science topics, such as forces and electricity particularly as they are covered in Y6 and Y7 (at the point of transition) and /or are potentially less open to influence from wider society or the media than F&HE. The second study could address whether other Science topics also significantly overlapped with other school subjects. During the course of this study, for instance, two of the teachers identified how some subject material from other Science topics was also taught in Maths and Geography (data not previously reported in the thesis but suggested by the HoD Y8 and a teacher during the pilot study).

In addition to this research building on the study I have also identified two side avenues that I find of particular interest. This study identified that there was a reliance of the primary school on published worksheets, and that I believed these were often inappropriate for the pupils (Section 4.4). A similar observation has been reported by Campbell (2005) in connection to literacy provision in primary schools. I would like to explore this area further by undertaking a study on the use and selection of externally produced or published worksheets by primary schools. In particular I would like to explore how teachers select worksheets and how appropriate the worksheets are for their pupils. That is, do the worksheets reflect progression in the curriculum and, further, provide the pupils with a variety of learning opportunities.

Finally, the findings of the study showed that pupils were becoming disengaged with the F&HE because coverage was so repetitive. This raised a concern that there may be a psychological impact of the repetitive coverage of F&HE. Future work could include a collaborative/interdisciplinary study with researchers from the field of Psychology to address this possibility. The justification for this lies in the fact that despite F&HE being thoroughly taught inside and outside of school, the numbers of people with eating disorders at both ends of the spectrum (over-eating and obesity, and under-eating and anorexia) are rising. It could be that repetitive teaching of concepts is causing people to either ignore the message altogether or to become so concerned that eating fat, for example, is unhealthy that they omit it from their diet. In Section 4.4.1 I raised concerns that class materials often focused on negative aspects of some food groups. Fat in particular is often deemed as unhealthy without reflecting on its positive benefits. A collaborative study could also focus on specific emotions connected to different foods. For example, do pictures of seemingly unhealthy food evoke positive or negative emotions? Are they seen as foods that can be enjoyed as part of a healthy diet or are they seen a detrimental to health with no benefit?

The study identified concerns in the area of progression in the F&HE curriculum experienced by pupils in the two schools studied. It also identified potential causes and future research, which could increase generalisability, and additional areas of interest. Finally, the study suggested potential solutions that may, based on further research, remedy the situation.

APPENDICES

Appendix 1.1

Outline of National Curriculum key stages

<table>
<tr><th>National Curriculum Key Stage</th><th>Academic Year</th><th>Pupil Age Range</th><th>Type of school</th><th>Type of schooling</th></tr>
<tr><td>Early years or foundation stage</td><td>Preschool to Reception</td><td>0 to 5 years (Reception age 4-5)</td><td>Nursery school, Kindergarten, child minder

Reception year in a Primary school</td><td>Early Years</td></tr>
<tr><td rowspan="2">Key Stage 1</td><td>1</td><td>5-6</td><td rowspan="2">Primary school</td><td rowspan="6">Primary Years</td></tr>
<tr><td>2</td><td>6-7</td></tr>
<tr><td rowspan="4">Key Stage 2</td><td>3</td><td>7-8</td><td rowspan="4">Junior School</td></tr>
<tr><td>4</td><td>8-9</td></tr>
<tr><td>5</td><td>9-10</td></tr>
<tr><td>6</td><td>10-11</td></tr>
<tr><td rowspan="3">Key Stage 3</td><td>7</td><td>11-12</td><td rowspan="5">Secondary School</td><td rowspan="5">Secondary Years</td></tr>
<tr><td>8</td><td>12-13</td></tr>
<tr><td>9</td><td>13-14</td></tr>
<tr><td rowspan="2">Key Stage 4</td><td>10</td><td>14-15</td></tr>
<tr><td>11</td><td>15-16</td></tr>
<tr><td colspan="5">Currently the End of Compulsory Education in England
From 2013 it will Compulsory for Children to stay in Education until they are 18</td></tr>
<tr><td rowspan="2">Key Stage 5</td><td>12</td><td>16-17</td><td rowspan="2">Secondary school, Sixth form College, College</td><td rowspan="2">Tertiary Years</td></tr>
<tr><td>13</td><td>17-18</td></tr>
</table>

Appendix 2.1

QCA guidance on progression and continuity table

This consists of deconstructed text of QCA continuity across curriculum document entered into a table to allow for comparison.

Key Stage 2	Key Stage 3
1. During key stage 2 pupils learn about a wide range of living things, materials and phenomena	1. During key stage 3 pupils build on their scientific knowledge and understanding and make connections between different areas of science.
2. They begin to make links between ideas and to explain things using simple models and theories. They apply their knowledge and understanding of scientific ideas to familiar phenomena, everyday things and their personal health	2.They use scientific ideas and models to explain phenomena and events and to understand a range of familiar applications of science.
3.They begin to think about the positive and negative effects of scientific and technological developments on the environment and in other contexts.	3. They think about the positive and negative effects of scientific and technological developments on the environment and in other contexts. They take account of others' views and understand why opinions may differ.
4. They carry out systematic investigations, working on their own and with others.	4. They do more quantitative work, carrying out investigations on their own and with others. They evaluate their work, in particular the strength of the evidence they and others have collected.
5. They use a range of reference sources in their work.	5. They select and use a wide range of reference sources.
6. They talk about their work and its significance and communicate ideas using a wide range of scientific language, conventional diagrams, charts and graphs.	6. They communicate clearly what they do and its significance.
	7. They learn how scientists work together on present-day scientific developments and about the importance of experimental evidence in supporting scientific ideas.
8. By the end of key stage 2, most pupils are able to carry out systematic	8. By the end of key stage 3, most pupils are able to carry out more advanced

investigations.	systematic investigations.
9. They are able to ask questions that can be investigated scientifically, consider what evidence needs to be collected, and what equipment and materials need to be used.	9. They are able to use their scientific knowledge and understanding to turn ideas and models into appropriate investigative approaches and decide whether evidence from primary or secondary resources should be used.
10. They are able to offer predictions and make a fair test.	10. They are able to carry out preliminary work to help inform predictions and consider the key variables that need to be taken into account.
11. They are able to make observations and measurements using ICT where appropriate and identify the need to repeat where necessary.	11. They are able to consider how evidence may be collected in contexts in which the variables cannot be readily controlled. They are able to decide on the extent and range of data to be collected in order to reduce error and obtain reliable evidence.
12. They are able to communicate data in a wide range of diagrammatic, tabular and graphical forms, identifying relationships in data and drawing conclusions.	12. When presenting and considering evidence, they are able to use more quantitative approaches such as drawing graphs with lines of best fit.
13. They are able to use their scientific knowledge and understanding to explain data and are able to evaluate work and describe its significance and limitations.	13. They are able to consider anomalies and offer explanations for them, and are able to consider whether evidence is sufficient to support conclusions made. In their evaluative work, they are able to suggest improvements that could be made.

Appendix 2.2

Email communication with Jerome Bruner

In short I ask;

... Here in the UK we follow the national curriculum which sets out what children should be taught year on year. It follows your fundamental principle of a spiral curriculum. I have my concerns that the way the UK interprets your work is not how you intended. Considering this statement ‘A curriculum as it develops should revisit the basic ideas repeatedly, building upon them until the student has grasped the full formal apparatus that goes with them.’ The way the national curriculum interprets this is to teach the same topic over and over gradually building in detail. As a consequence the food and healthy eating topic is taught every year with the exception of 2 from the ages 6-15. The way I would interpret your work is for the curriculum to be very much more flexible. It is clear that some children will reach understanding much sooner than others and then after that point teaching of the topic should cease. However, the curriculum as it stands does not cater for this and some children become bored and resentful that they have to study a concept again. I understand from my work that other countries follow your principle differently and repeat topics with less frequency...

He responds;

[redacted]

[redacted] [redacted]

Appendix 3.1

Copy of the letter sent to pupils

Please note that the following text was printed on Birmingham University headed writing paper.

DATE

Dear Parent/Guardian,

I am a teacher who is conducting research for a PhD study at Birmingham University, into pupils' views on the science curriculum. I will be working with [**detail removed to protect anonymity of school]** during this academic year. Your son or daughter is in one of the classes who will be taking part in the study. The study will involve each pupil filling in two questionnaires, during a science lesson, about their views on the food and healthy eating topic. A small number of pupils will also be invited to take part in a focus group discussing school science which will take place during the school day. The focus group will be audio taped to aid accurate documenting of pupils' opinions. The audio tape will only be used for this purpose, will not be distributed to a wider audience and will be destroyed after use. All the views expressed by the pupils will be confidential and anonymous and pupils are free to withdraw from the study at any stage.

If you are happy for your son or daughter to be involved with the study you need not do anything. If however, you do not want them to be involved with part, or all of the study, please send a note into school before [DATE]. If you have any questions regarding the study or would like more information please contact me on my mobile phone or by email (details given below).

Yours sincerely,

Frances Ryland

[redacted]

[redacted]

Appendix 3.2

Pupil questionnaires, part a and part b Y5

Have your say!

You are about to learn about food and healthy eating. I would like to find out what you think about this topic. Please answer all the questions.

Name…………………………………………………………………… Class………………………………….

Q1. Please tick. I am a;

Boy ☐

Girl ☐

Q2a. Have you learnt about food or healthy eating in science lessons before? Please tick.

I can't remember (go to Q3a) ☐

No (go to Q3a) ☐

Yes (go to Q2b) ☐

Continued on the next page

Q2b. If you have answered "yes", which of these activities can you remember doing when you last learnt about food and healthy eating. You can tick more than one;

Activity	Have you done? Yes or No	Enjoy	Indifferent	Did not enjoy
Group Work				
Favourite food survey				
Planning a meal				
School trip				
Fact finding using computers, leaflets, DVD or books				
Making a poster, display or leaflet				
Quiz				
Tasting foods				
Keeping a food diary				
Cutting out food labels				
Making graphs, charts or diagrams				
Looking at food adverts				
Doing a report or project				
Experiments with foods, food testing				
Using or making models				
Other, please state				

Q3a. Have you learnt about food or healthy eating in <u>other lessons</u> or <u>outside of school</u>? Please tick.

No (go to Q4a) ☐

Yes (go to Q3b) ☐

Q3b. Please tick where you have learnt about food and healthy eating. You can tick more than one.

- In other lessons (PE or other school subjects) ☐
- At nursery or preschool ☐
- At youth groups for example, Brownies or Scouts ☐
- From family ☐
- From friends ☐
- From television or radio programmes ☐
- From the internet ☐
- From posters, displays or leaflets at the doctors ☐
- From posters, displays or leaflets at the dentist ☐
- From posters, displays or leaflets at the supermarket ☐
- From cereal packets ☐
- Magazines or books, for example, Horrible Science ☐

Other (please say where)……………………………………………………………………

Q4a. How do you feel about learning about food and healthy eating? Put a tick in the cloud that best describes how you feel. If you cannot find an answer you like please write your own word in the empty cloud.

Bored

Disappointed

Interested

Excited

OK

Unhappy

Happy

Q4b. Why do you feel this way?

....
....
....

Q5a. Do you think learning about food is important?

Yes ☐

No ☐

Q5b.Why?...
....
....

Q6a. Do you think you should learn about food and healthy eating in school science lessons? Please tick.

No ☐

Yes ☐

Q6b. Why?

....

....

....

In this section please think about <u>science lessons in general</u> (that means <u>all the topics</u> you learn about in science).

Q7a. Take a moment to think about what it was like to learn about science in primary school. How did you feel about the things you learnt about in science lessons? Put a tick in the cloud that best describes how you felt. You can tick more than one.

It was important

I knew it already

It was boring

It was all new to me

It was exciting

It was not important

Q7b. Why did you feel this way?

....

....

....

Q7c. Now thinking about what it's like to learn about science now in junior school. How do you feel about the things you learn about in science lessons? Put a tick in the cloud that best describes how you feel. You can tick more than one.

It's exciting

I know it already

It's not important

It's boring

It's all new to me

It's important

Q7d. Why do you feel this way?..
....
....
....

Q8. What would you like to learn about in science lessons if you had the choice?
....
....
....
....

Continued on the next page

Q9. Below is a list of science topics please tick the box that best describes how much you like the topic;					
	Like a lot	Like a bit	Neither like, Nor dislike	Dislike a bit	Dislike a lot
1. Food, healthy eating and fitness					
2.Plants					
3. Life cycles					
4. Habitats					
5. Materials					
6.Rocks and soils					
7. Solids, liquids, gases (particles)					
8. Change of state (heating and cooling)					
9. Forces					
10. Planets and the solar system					
11. Electricity					
12. Light and sound					

Q10a. Please put these school subjects in order starting with number 1 for your favourite and ending with number 13 for your least favourite.

Subject	Number
Science	
English	
Maths	
History	
Geography	
PE/Games	
Religious studies	
DT	
PSHE	
ICT	
Languages	
Music	
Art	

Q10b. Why is number 1 your favourite subject at school?

....

....

....

Q10c. Why is number 13 your least favourite subject at school?

....

....

....

Thank you for telling me what you think!

Have your say! Continued….

During this topic you have learnt about food and healthy eating. I would like to find out what you think about this topic.

Please try to answer all the questions.

Name………………………………………………………………… Class………………………………….

Q1. Please tick, I am a;

Boy	☐
Girl	☐

Q2. How many new things have you found out about food or healthy eating during this topic (things that you did not know before)? Please tick.

Nothing	☐
A little	☐
Some	☐
Quite a lot	☐
Loads	☐

Q3. How much did you enjoy learning about food this time? Please tick.

Lots	☐
Quite a bit	☐
A bit	☐
A little	☐
Not at all	☐

Q4. Here is a list of information that you may have learnt during this food and healthy eating topic. Please tick ONE statement that best describes how you feel about it.

	I have not done this before and we did not cover it this time	I have done this before but not this time (in year 8)	This information was completely new to me in this topic	I had done some of this before but now I understand more	I have done this all before but it was good revision	I have done this before and did not need to do it again
1. Food groups: Fats, carbohydrates and proteins						
2. How different types of food are used by the body, for example, proteins for growth						
3. The need for exercise						
4. That a poor diet leads to disease						
5. The function of the heart, lungs and blood vessels						
6. Pulse rate						
7. Names and functions of different types of teeth						
8.The structure of the digestive system						
9.The function of the different parts of the digestive system						
10. Food tests (using chemicals to find out what is in food)						
11. Enzymes						

Q5a. How did you find this topic? Please tick.

Not at all interesting ☐

Some was interesting ☐

It was very interesting ☐

Q5b. Why?..
....
....
....

Q6. Did you find the work in this topic hard? Please tick.

Yes, it was mostly hard ☐

Some was hard, some was easy ☐

No, it was mostly easy ☐

Continued on the next page

Q7a. Please tick which of these activities you have done <u>during this food and healthy eating topic</u>. You can tick more than one;

- Group work ☐
- Favourite food survey ☐
- Planning a meal ☐
- School trip ☐
- Using computers, leaflets, videos or reference books ☐
- Making a poster, display or leaflet ☐
- Quiz ☐
- Tasting foods ☐
- Keeping a food diary ☐
- Cutting out food labels ☐
- Making graphs, charts or diagrams ☐
- Looking at food adverts ☐
- Doing a report or project ☐
- Experiments with foods, food testing ☐
- Other, please state…………………………………………………………………

Q7b. Please pick your favourite activity from Q7a and explain why you like it

……

……

Q7c. Please pick your least favourite activity from Q7a and explain why you dislike it………

……

Q8a. Would you like to learn more about food in the future?

No (go to Q8b) ☐

Yes (go to Q8c) ☐

Q8b. If no, why?...
....
....

Q8c. If yes, what would you like to learn about food in the future?
....
....
....

Q9a. Do you think you should learn about food and healthy eating in school science lessons? Please tick.

Yes ☐

No ☐

Q9b. Why?
....
....
....

Q10a. Is there anything else you would like to say about how you are feeling after studying this topic?

No (go to Q11) ☐

Yes (go to Q10b) ☐

Q10b. If yes, please write it here;
....
....
....

Q11a. Have your feelings on science lessons changed after studying this topic?

Yes ☐

No ☐

Don't know ☐

Q11b. Why?

……
……
……
……

Please turn to the next page

In this section please think about science lessons in general (that means all the topics you learn about in science).

Q12a. Take a moment to think about what it was like to learn about science in junior school. How did you feel about the things you learnt about in science lessons? Put a tick in the cloud that best describes how you felt. You can tick more than one.

It was important

I knew it already

It was boring

It was all new to me

It was exciting

It was not important

Q12b. Why did you feel this way?

………..
………..
………..
………..
………..

Q12c. Now thinking about what it's like to learn about science now in secondary school. How do you feel about the things you learn about in science lessons? Put a tick in the cloud that best describes how you feel. You can tick more than one.

It's exciting

I know it already

It's not important

It's boring

It's all new to me

It's important

Q12d. Why do you feel this way?...
....
....
....
....

Q13. What would like to learn about in science lessons if you had the choice?
....
....
....
....

Q14. Below is a list of science topics please tick the box that best describes how much you like the topic;					
	Like a lot	Like a bit	Neither like, nor dislike	Dislike a bit	Dislike a lot
1. Food, healthy eating and fitness					
2.Plants					
3. Life cycles					
4. Habitats					
5. Materials					
6.Rocks and soils					
7. Solids, liquids, gases (particles)					
8. Change of state (heating and cooling)					
9. Forces					
10. Planets and the solar system					
11. Electricity					
12. Light and sound					

Q15. Please draw a line from each of these school subjects to a number in order, starting with number 1 for your favourite and ending with number 13 for your least favourite.	
Art	1 (most favourite)
Music	2
Languages	3
ICT	4
PSHE	5
DT	6
Religious studies	7
PE/Games	8
Geography	9
History	10
Maths	11
English	12
Science	13 (least favourite)

Thank you for telling me what you think!

Appendix 3.3

Focus group data recording sheet (Y9)

***Please note that blank spaces have been condensed to reduce the number of pages required to reproduce this**

Year 9 Focus Group

"Hi everyone, thanks for volunteering today, I'm hoping that you will enjoy telling me what you think about your science lessons. Ok, if I can just remind you that everything you say in this focus group is confidential, that means I will not tell anybody that you said it, so if I quote you in a report it will say something like girl a or boy b. I'm going to be making a recording today, this is because I can't write everything down that you say so if I record it I can listen to it again."

Section 1: Background information

Focus group number and date:		
	Boys	Girls
Gender balance of the group		
Any other notes? Location? Time? General mood?		

Section 2: Questions arising from the questionnaires (15min?)

"Thanks for filling in the questionnaires I'm going to start by asking you a bit more about the food and healthy eating topic"

Question	Notes
2a) Quite a lot of you said you learnt about F & HE from your family, What sort of information did you find out that way?	
• Prompt- **Food groups?** • Prompt- **Healthy food?** Probe- Who in your family?	

Question	Notes
2b) Quite a lot of you said you learnt about F&HE from posters or tv? (doctors, dentist, supermarket), What sort of information did you find out that way?	
• Prompt- **Food groups?** • Prompt- **Healthy food?**	
Question	Notes
2c) Lots of you said you learnt about food in other lessons, Which ones were they?	
Question	Notes
2d) What sorts of things did you find out there?	
Question	Notes
2e) When I asked you how you found the F&HE topic, most of you ticked some was interesting. What sort of things do you find most interesting?	
Question	Notes
2f) What parts of the topic did you not find the topic interesting, why?	
Question	Notes
2g) Most of you said that you had learnt about food before year 9. Can you remember when?	
Question	Notes
2h) Can you remember what you learnt about in year x? • Prompt- food groups , fats carbohydrates, proteins • Probes- how about what the food is	

used for?	
Question	Notes
2i) A lot but not all of you said that you had learnt about food groups (fats/carbs/proteins) before year 9. What did you learn about them in the past? • **Prompts- types? Uses?**	
Question	Notes
2j) What did you learn about food groups in year 9? • **Prompts – types? Uses?**	
Question	Notes
2k) I asked you in the questionnaire what you would like to learn about in science. The second popular answer, across the two questionnaires, was space or the solar system. What is it about space that you want to learn about? **The second most popular answer was don't know/don't care (5 boys in a and 7 boys 2 girls). Do you not care what you learn about?**	
Question	Notes
2l) When I asked you for your opinions of different topics, the most popular was Space, because we have already talked about that, I would like to ask you about the second most popular, chemical reactions. Why do you like that topic in particular?	
Question	Notes
2m) What do you think about learning about the topic forces?	

• **Probe-why?** **How about rocks?**	
Question	Notes
2n) When I asked you about your favorite subject lots of you put PSHE somewhere near the bottom, why? • Not examined? **And what about languages?**	
Question	Notes
2o) PE is a very popular subject, why?	

<u>Section 3 (10min)</u>

"Ok, now I'm going to move away from the questionnaires and ask you about you opinions on science lessons in general."

Question	Notes
3a) To find out what you think can I ask you to split into two groups. Can you write down on this spider gram what you think about science lessons this year? Like this (show them a spider gram about something else). You've only got 2 min so quick get writing! • Ask about what they have written	
Question	Notes
3b) If not thrown up by activity, **What makes you interested or excited in science lessons?**	
Question	Notes
3c) If not thrown up by activity, **What makes you bored/less interested in science lessons?**	
Question	Notes

3d) Is there any difference in how you feel about learning about science, since leaving junior school?	

3e) Ok, We are going to do a bit of a brainstorm now. Thinking about your time in secondary school, can you tell me the topics you have learnt since year 7?

Topics in junior school (Key St 2)	**Topics in senior school (Key St.3)**

"Fantastic, now I want you to think back to junior school year 3-6. What topics can you remember doing?"

Question	Notes
3f) Ok, from looking at you list I can see some topics that are related/similar. What are the differences between when you did it in junior school and now at senior school? Activities? (Name activity, how differ, experiments) Teaching? Content? Amount? **3g) Why do you think you do similar topics in junior and senior school?** **3h) How do you feel when you learn about something that you have learnt a bit about before?**	

<u>Section 4: Role Play Activity</u>

"Thanks for that, now I would like to finish with a role play activity. I would like you to act out what science lessons were like in primary and what science lessons are like in junior school. You can either do both scenes as a whole group or half can do primary and half can do junior school. What do you think?"
If they need assistance suggest that someone pretends to be the teacher and the others are pupils.

How have the children divided themselves up? Who decided? Boys/girls? Balance?
Notes
Does anybody not want to be involved?
If someone does not want to be involved give them the notes book from the previous activity, to jot down any comments they might have.
Describe how the content of the role play was decided upon? All in agreement?

Flashcards (two) 1)This is what science lessons were like in junior school
2)This is what science lessons are like in senior school

Appendix 3.4

Focus group data recording sheet (Y6)

***Please note that blank spaces have been condensed to reduce the number of pages required to reproduce this**

Year 6 Focus Group

"Hi everyone, thanks for volunteering today, I'm hoping that you will enjoy telling me what you think about your science lessons. Ok, if I can just remind you that everything you say in this focus group is confidential, that means I will not tell anybody that you said it, so if I quote you in a report it will say something like girl a or boy b. I'm going to be making a recording today, this is because I can't write everything down that you say so if I record it I can listen to it again."

Section 1: Background information

Focus group number and date:		
	Boys	Girls
Gender balance of the group		
Any other notes? Location? Time? General mood?		

Section 2: Questions on F&HE (15min?)

Question	Notes
2a) Where do you learn about F&HE other than in science lessons? What sort of information did you find out that way?	
• Prompt- **Food groups?** • Prompt- **Healthy food?** Probe- Who in your family?	

Question	Notes
2b) Anywhere else?	
• Prompt- **Food groups?** • Prompt- **Healthy food?**	
Question	Notes
2c) Have you learn about food and healthy eating in other lessons. Which ones were they?	
Question	Notes
2d) What sorts of things did you find out there?	
Question	Notes
2e) Do you find the food and healthy eating topic interesting? What sort of things do you find most interesting?	
Question	Notes
2f) Does anybody find the topic interesting, why?	
Question	Notes
2g) Can you remember when you learnt about food in science lessons? The years?	
Question	Notes
2h) Can you remember what you learnt about in year x? • Prompt- food groups , fats carbohydrates, proteins • Probes- how about what the food is used for?	

Question	Notes
2i) Can you remember when you learnt about teeth. What did you learn about them in the past? • **Prompts- types? Uses?**	
Question	Notes
2j) What did you learn about teeth in year 5? • **Prompts – types? Uses?**	
Question	Notes
2k) If you had the choice what would you like to learn about in science lessons? Why?	
Question	Notes
2l) What sort of topics do you enjoy the most?	
Question	Notes
2m) What sort of topics do you enjoy the least? 1.food and, healthy eating and fitness 2.plants 3. Life cycles 4. Habitats 5. Materials 6.Rocks and soils 7. Solids, liquids, gases (particles) 8. Change of state (heating and cooling) 9. Forces 10. Planets and the solar system 11. Electricity 12. Light and sound • **Probe-why?**	
Question	Notes
2n) What is your favorite school subject? Art, Music, Languages, ICT, PSHE, DT, Religious studies, PE/Games, Geography, History, Maths, English, Science **Why?**	

Question	Notes
2o) What is you least favorite subject, why?	

<u>Section 3 (10min)</u>

"Ok, now I'm going to move away from the questionnaires and ask you about you opinions on science lessons in general."

Question	Notes
3a) To find out what you think can I ask you to split into two groups. Can you write down on this spider gram what you think about science lessons this year? Like this (show them a spider gram about something else). You've only got 2 min so quick get writing! • Ask about what they have written	
Question	Notes
3b) If not thrown up by activity, **What makes you interested or excited in science lessons?**	
Question	Notes
3c) If not thrown up by activity, **What makes you bored/less interested in science lessons?**	
Question	Notes
3d) Is there any difference in how you feel about learning about science, since leaving primary?	

3e) Ok, We are going to do a bit of a brainstorm now. Thinking about your time in junior school, can you tell me the topics you have learnt since year 3?

Topics in Key St 1	**Topics in Key St.2**

"Fantastic, now I want you to think back to primary, from nursery to end of year 2. What topics can you remember doing?"

Question	Notes
3f) Ok, from looking at you list I can see some topics that are related/similar. What are the differences between when you did it in primary and junior? Activities?(Name activity, how differ, experiments) Teaching? Content?Amount? **3g) Why do you think you do similar topics in primary and junior school?** **3h) How do you feel when you learn about something that you have learnt a bit about before?**	

Section 4: Role Play Activity

"Thanks for that, now I would like to finish with a role play activity. I would like you to act out what science lessons were like in primary and what science lessons are like in junior school. You can either do both scenes as a whole group or half can do primary and half can do junior school. What do you think?"

If they need assistance suggest that someone pretends to be the teacher and the others are pupils.

How have the children divided themselves up? Who decided? Boys/girls? Balance?
Notes
Does anybody not want to be involved?
If someone does not want to be involved give them the notes book from the previous activity, to jot down any comments they might have.
Describe how the content of the role play was decided upon? All in agreement?

Appendix 3.5

Teacher interview data recording sheet

***Please note that blank spaces have been condensed to reduce the number of pages required to reproduce this**

<u>Section 1: Background information</u>

"Hi, thanks for taking the time to talk with me today it is much appreciated. It should take us about 1 hour to complete. As I mentioned to you before, I'm doing these interviews with the teachers of year 5, 6, 8 and 9 to help me explore progression in the curriculum available at school. This interview will be for this purpose only and will be confidential, that is, I will not identify you by name in any report or discussions with other people unless, of course, you would like to be accredited with any quote that I might use in academic papers, etc… Finally, can I remind you that I'm recording this interview so that I don't have to write everything down. Do you have any questions before I begin?" "Is it still Ok for me to record this? Great, lets do recording test, speak now. Thanks."

Question	Prompt	Probe
1. "Ok, lets get started then. Could you give me a few details about yourself; 1a) How long have you been teaching?		
Question	Prompt	Probe
1b) And here?	At this school	In what capacity
Question	Prompt	Probe
1c) What is your subject specialism?	Biology/chemistry/Physics	Did you do that at university?

<u>Section 2: Year 5 and the Food Topic</u>

Question	Prompt	Probe
2. "In this section I'm going to ask a bit about the planning behind the food topic"		

2a) What aspects of food and healthy eating do you teach in year 8?		
Question	Prompt	Probe
2b) How do you decide how to teach this topic?	Do you consult any resources? Any others?	How do you use the S of W/lesson plans etc? How?
Question	Prompt	Probe
2c) The schools S of W- How were these developed?	Based on QCA/NC?	Personal involvement? 1 person? Specialist? Team?
Question	Prompt	Probe
2d) How much flexibility do you have as an individual to decide how you want to approach this topic?	Prescribed? Allowed? Permitted? Encouraged?	What actions do you take personally, that is, do you adhere to the guidelines?
Question	Prompt	Probe
2e) What aspects of food and healthy eating do you think the pupils have covered before year 8?	(See if they mention junior/primary then if not…)Specifically at primary/junior school? Bridging units?	How do you become aware of it? NC assumptions? Dialogue with school?
Question	Prompt	Probe
2f) Do you assess their knowledge/understanding before the topic begins?	On entry into year 7? Q&A? Testing?	How do you assess their k/u? Do you take their current knowledge into account when teaching this topic?

<u>Section 3: Views on the food topic and other subject matter</u>

Question	Prompt	Probe
3. "In this section I'm going to explore your experience of what the pupils think about the food topic and other subject		

matter".		
3a) When was the last time you taught the food and healthy eating topic?	Before now with others years?	
Question	Prompt	Probe
3b) Did you get a sense of the childrens' feeling toward the F & HE topic?	In the mood? Verbally? Opinions expressed to you?	What sort of reactions do you get? Can you elaborate/give specific examples?
Question	Prompt	Probe
3c) "And with this group, did you get a sense of the childrens' feeling toward the F & HE topic?"	What sort of reactions do you get? In the mood? Verbally? Opinions expressed to you	Can you elaborate/give specific examples?
Question	Prompt	Probe
3d) Do they have the same reactions to all the topics (in year 8)?	Show list of topics taught in this year	Can you give me any examples? Can you explain why you think they react in that way?
Question	Prompt	Probe
3e) Thinking about your own views, how do you feel about teaching the food topic?	Is it something that you enjoy?	Why?
Question	Prompt	Probe
3f) What sort of topic do they seem to enjoy the most?		How can you tell? Why do you think they enjoy it?

Question	Prompt	Probe
3g) What sort of topic do they seem to enjoy the least?		What gives you that impression? Why do you think they don't enjoy it?

Question	Prompt	Probe
3h) Do you think the children enjoy whole curriculum not just target topic?	What is their general attitude towards science?	What makes you think that way?

Flexible section, hold back on the word spiral until they have answered all three unless they mention it first

Question	Prompt	Probe
3i) How do you think the curriculum is organised?		
Question	Prompt	Probe
3j) Now thinking about the content of the curriculum, how do you feel about the content of what you teach? Way content is organised?	Maybe the areas of the topics? How about depth versus breadth issues?	Is there anything you would like to see on the curriculum that isn't on at the minute…..Or maybe something you would like to do more of? Ecology/technology/zoology/palaeontology etc………… Is that something you are particularly interested in?/Background in? Why would you like to see this on in particular?
Question	Prompt	Probe
3k) What do you think about the structure of the curriculum?	Some people describe the national curriculum as a spiral curriculum where the topics are revisited several times….how do you feel about this structure?	Why do you feel that way?
Question	Prompt	Probe

3l) What are your views on depth vs breadth issues?		

Section 4:Teaching and learning methods

Question	Prompt	Probe
4.Did you bring that list of activities for me? The activity list you completed about year 8 (all activities you did during the topic, especially those not be apparent in the exercise book, such as field trip, demo, role play, poster, model making, debate, etc). Thanks…Its just so that I don't miss anything out when completing the other part of my research.		
4a) Thinking about these activities which you completed with year 8, what activities did they enjoy the most?	Show list	What prompts you to think that? How often are you able to use this type of activity in your lessons?
Question	Prompt	Probe
4b) Which activities were not so successful regarding their enjoyment?		What gave you that impression? How do you try and engage them if you are required to do this activity?
Question	Prompt	Probe
4c) Thinking about your own views, are you happy with they range of activities you are able to complete in class?	Is there anything you would like to do more/less of?	Why?

(dependent on level of prescription of the school)		

Section 5: Progression

Question	Prompt	Probe
5. In this section I'm going to be asking about progression of the curriculum.		
5a) What do you understand about by the term progression?	In relation to the curriculum?	Is it a term that is often used in school? By whom? In what context?
Question	Prompt	Probe
5b) Thinking about the food topic how is progression expressed in the national curriculum?		
Question	Prompt	Probe
5c) And in your own scheme of work?	Objectives? Key words?	
Question	Prompt	Probe
5e) Do you use any of the literature available online or in other resources?	QCA, DfES, NC Online, Journals	Can you be specific? How did you use this material? Why?
Question	Prompt	Probe
5f) What do you think about progression in the curriculum available to state school pupils?		Why?

Section 6: Sequencing Activity

"Ok, great. Almost there now. I want to end with an activity. I've had a look at the **objectives** highlighted in the **QCA's schemes of work** in connection with the food topics. Could you have a look at them for me?

> (Yr 1 not shown) that we need to eat and drink to stay alive, (Yr 2 not shown) that humans need water and food to stay alive, (Yr 3 not shown) that all animals, including humans, need to feed

Question	Prompt	Probe
6a) Do you have any thoughts on them?		
Question	Prompt	Probe
6b) Could you put them in order for me to illustrate how you think about progression?	How do you think these objectives show progression?	Can you explain to me the reasons behind this order? **If they have illustrated progression in terms of we, humans, all animals;** Removing those terms from the statements, is there anything in the remainder of the statements you could illustrate progression with?
Question	Prompt	Probe
6c) They are from three separate years. Do you have any thought on which years they might be?	3 consecutive years (if applicable) Bridging two key stages.	What makes you think this way?
Question	Prompt	Probe
If incorrect reveal the QCA order and years.		
6d) How easy did you find it coming up with the order?	Is there anything in particular you found confusing?	Can you explain why?

Question	Prompt	Probe
6e) How do you think these objectives show progression? (If applicable)	Maybe something to do with the wording?	Can you explain to me the reasons behind this order? **If they have illustrated progression in terms of we, humans, all animals;** Removing those terms from the statements, is there anything in the remainder of the statements you could illustrate progression with?

Question	Prompt	Probe
6f) How easy do you think it is to come up with lesson material that ensures progression based on these objectives?	Considering the objectives in years 2 and 3, and that these cross key st 1 and 2.	Can you expand upon that?

Question	Prompt	Probe
6g) Could you off the top of you head come up with lesson material that would show progression based on these objectives?		

Second Set

(Yr 5 not shown) that to stay healthy we need an adequate and varied diet, (Yr 8 not shown) that a healthy diet contains a balance of foodstuffs, (Yr 9 not shown) that a balanced diet requires nutrients, including vitamins, in the correct quantities

Question	Prompt	Probe
7a) Do you have any thoughts on them?		

Question	Prompt	Probe
7b) Could you put them in order for me to illustrate how you think about progression?	How do you think these objectives show progression?	Can you explain to me the reasons behind this order?

Question	Prompt	Probe
7c) They are from three separate years. Do you have any thought on which years they might be?	3 consecutive years (if applicable) Bridging two key stages.	What makes you think this way?
Question	Prompt	Probe
If incorrect reveal the QCA order and years.		
7d) How easy did you find it coming up with the order?	Is there anything in particular you found confusing?	Can you explain why?
Question	Prompt	Probe
7e) How do you think these objectives show progression? (If applicable)	Maybe something to do with the wording?	Can you explain to me the reasons behind this order?
Question	Prompt	Probe
7f) How easy do you think it is to come up with lesson material that ensures progression based on these objectives?	Considering the objectives in years 2 and 3, and that these cross key st 1 and 2.	Can you expand upon that?
Question	Prompt	Probe
7g) Could you off the top of you head come up with lesson material that would show progression based on these objectives?		

“Well that’s everything thank you very much. Could you please sign the consent form(?), all this is is to say that its ok for me use your views in my research. Any questions? Once again thank you and goodbye!”

Appendix 4.1

Excerpt of summary document analysis

Key Words, Concepts

	NC KS1	QCA Y1	SofW 1	Ex Bk 1	QCA Y2	SofW 2	Ex Bk 2	NC KS2	QCA Y3	SofW 3	Ex Bk 3	Ex Bk 4	QCA Y5	SofW Y5	Ex Bk 5	NC KS.3 old	NC KS.3 new	QCA Y8	SofW 8	Ex Bk Y8	QCA Y9	SofW 9	Ex Bk Y9
Food groups											*				*			*	*	*			*
Fats							*		*	*	*	*	*	*	*	*		*	*	*			*
Carbohydrates							*				*				*	*		*	*	*			*
Proteins							*				*	*			*	*		*	*	*			*
Fats (+/- oil qca yr5) supplied by							*				*	*	*	*	*	*		*	*	*			*
Carbohydrates supplied by							*				*				*	*		*	*	*			*
Proteins supplied by							*				*	*			*	*		*	*	*			*
Starch supplied by											*		*	*	*			*	*	*			
Sugar supplied by											*	*	*	*	*				*	*			
Fibre supplied by											*	*			*	*			*				*

Teaching and learning activity

	NC KS.1	QCA Y1	SofW 1	Ex Bk 1	QCA Y2	SofW 2	Ex Bk 2	NC KS.2	QCA Y3	SofW 3	Ex Bk 3	Ex Bk 4	QCA Y5	SofW Y5	Ex Bk 5	NC KS.3 old	NC KS.3 new	QCA Y8	SofW 8	Ex Bk Y8	QCA Y9	SofW 9	Ex Bk Y9
Text book							*															*	
Concept mapping																		*			*		
Discussion		*	*		*	*			*	*			*	*				*	**		***		
Debate																		*			*		
Worksheet t/f											*				*			*					
Worksheet-cloze											*				*								
Worksheet-table completion																			*				
Worksheet-data interpretation															*					*			
Worksheet information only											*									*			
Worksheet- word search												*											
Creative writing																			*	*			

Appendix 5.1

Results of pupils' favorite topics from questionnaire part a and b

Year 5					Year 8					Year 9				
Topic N=varies/17	Part a		Part b		Topic N=29/20	Part a		Part b		Topic N= 28/29	Part a		Part b	
	Like	Dislike	Like	Dislike		Like	Dislike	Like	Dislike		Like	Dislike	Like	Dislike
1. F&HE and fitness n=13/17	9 (69%)	1 (8%)	**15 (88%)**	0	1. F&HE	16 (55%)	2 (7%)	**12 (60%)**	2 (10%)	1. F& HE and digestion	16 (57%)	2 (7%)	16 (55%)	4 (14%)
2.Plants n=17	12 (71%)	4 (24%)	**13 (76%)**	2 (12%)	2. Plants and photosynthesis	12 (41%)	6 (21%)	**10 (50%)**	5 (25%)	2. Plants and photosynthesis	9 (32%)	4 (14%)	7 (24%)	7 (24%)
3. Life cycles n=17	13 (76%)	0	11 (65%)	1 (6%)	3. Environment and feeding relationships	14 (48%)	3 (10%)	**11 (55%)**	4 (20%)	3. Inheritance and selection	9 (32%)	5 (18%)	7 (24%)	4 (14%)
4. Habitats n=16/17	13 (81%)	0	11 (65%)	3 (18%)	4. Microbes and disease	18 (62%)	6 (21%)	**15 (75%)**	3 (15%)	4. Microbes and disease	24 (86%)	6 (21%)	16 (55%)	4 (14%)
5. Materials n=17	14 (82%)	1 (6%)	10 (59%)	3 (18%)	5. Materials and chemical reactions	24 (83%)	1 (3%)	**17 (85%)**	1 (5%)	5. Chemical reactions	24 (86%)	2 (7%)	20(69%)	2 (7%)
6.Rocks and soils = 16/17	14 (88%)	0	12 (71%)	1 (6%)	6. Rocks and soils	13 (45%)	4 (14%)	**9 (45)**	3 (15%)	6. Rocks and weathering	15 (54%)	9 (32%)	5 (17%)	13 (45%)
7. Solids, liquids, gases n=17 (particles)	15 (88%)	0	14 (82%)	2 (12%)	7. Solids, liquids, gases (particles)	15 (52%)	2 (7%)	**13 (65%)**	1 (5%)	7. Solids, liquids, gases (particles)	17 (61%)	5 (18%)	7 (24%)	5 (17%)
8. Change of state (heating and cooling) n=17	12(71%)	0	9 (53%)	2 (12%)	8. Atoms and elements	17 (59%)	5 (17%)	11 (55%)	1 (5%)	8. Atoms and elements	17 (61%)	5 (18%)	9 (31%)	10 (34%)
9. Forces	10	1 (6%)	**11**	1 (6%)	9. Forces	14	7	**12(60%)**	4	9. Forces	15	7	10	9

n=16/17	(63%)		**(65%)**			(48%)	(24%)		(20%)		(54%)	(25%)	(34%)	(31%)
10. Planets and the solar system n=17	15 (88%)	0	14 (82%)	0	10. Planets and the solar system	24 (83%)	2 (7%)	16 (80%)	3 (15%)	10. Planets and the solar system	28 (100%)	0	24 (83%)	1 (3%)
11. Electricity N=15/17	11 (73%)	2 (13%)	**13 (76%)**	3 (18%)	11. Electricity	20 (69%)	3 (10%)	12(60%)	5 (25%)	11. Electricity	17 (61%)	2 (7%)	11 (38%)	5 (17%)
12. Light and sound n=17	11 (65%)	5 (29%)	10 (59%)	3 (18%)	12. Light and sound	16 (55%)	2 (7%)	**12(60%)**	6 (30%)	12. Light and sound	20 (71%)	3 (11%)	9 (31%)	5 (17%)

Appendix 5.2

Excerpt of focus group summary

Standard print focus group 1, italics focus group 2

	YEAR 5	YEAR 6	YEAR 8	YEAR 9
2a) Quite a lot of you said you learnt about F & HE from tv and radio programmes, What sort of information did you find out that way? (8), (9- family)	Healthy/unhealthy mum and dad Plenty of fruit and veg Not too much chocolate, butter etc *Healthy/unhealthy/junk food, get fat,* *Eat your greens* *Few sweets* *"my mum tells me about sweets and fats and when it was Halloween she threw most of the sweets away" girl* *Mum dad and auntie*	Mum, home, parents not good/good, not too much of one thing TV adverts-mostly healthy/unhealthy, macdonalds its all a lie! Some about vitamins and minerals Also from posters in classrooms and at the sports centre-food pyramid and pie chart. "there are food pyramid posters in others classrooms other than science" *Dt food, cooking and how to prepare healthy food, and hygiene* *Football club, sports and the right foods, food groups.* *Mum at home-eat more food.* *Mum a bit, healthy and*	Good for you/not good for you, balanced diet, artificial stuff. **FG?** Kind of. Preservatives/high sugar are bad-From kiddies programmes, 5 a day from adult telly *Junior school mostly, he, balanced diet, food groups etc.* *Tv obesity etc mostly and health effects, adverts*	Basic nutrition, good and bad for you, portion size, eat fruit and veg, vitamins and calcium Everybody now joined in with mum. *Eat more fruit.* *No chocolate* *Not too many snacks.* *Lots of water, cut down on fizzy drinks.* *No smoking* *Mostly mum(6) but also dad(2) and sister (1)*

		unhealthy *Good groups mainly in science*		
2b) Quite a lot of you said you learnt about F & HE from posters (doctors, dentist, supermarket), What sort of information did you find out that way?	The heart-damage by smoking Types of different foods Food pyramids Pie chart All food groups vits and minerals *Food groups and foods that cause cavities*	See above	Dentist-about sugar etc and teeth. Sweets rotten teeth Dr- fats. heart problems, Charts, pie charts food pyramid so fg and portions etc. Supermarkets-biased stuff eg great for you, low fat stuff, expensive and they are kind of lying because there is bad stuff in there too. *Pie chart, 5 a day stuff.*	Posters-food groups, uses, growth health etc.Vitamins etc *TV- loads of programes and commercials, also cartoons for the younger kids. Mostly about 5 a day healthy stuff.* *Poster- pie charts, more information on food groups etc, how much to eat.*
2c) Many of you said you learnt about food in other lessons, Which ones were they?	DT RS Geography Languages DT and PSHE	PSHE year 5 and 4, exercise and general things like healthy/unhealthy, food groups too abit but that was mainly in science. Just general things. Much agreement here. PE keeping fit, and there are posters on healthy eating, pie chart outside swimming pool. *French* *RS-halal etc* *Games*	Life tracks, PE and history. PE water bottle, diet plan at the youth group. We also get teacher reinforcing issues constantly-make sure you eat breakfast etc. *DT food, healthy Vs non healthy in the preparation of food (healthy encouraged), posters on the walls of food types and groups.* *Lifetracks healthy eating*	Life tracks in year 8 and 9. In year 8 we did the food groups and healthy food etc, in year 9 we did about healthy living cigarettes, drugs and alcohol. *Food technology/DT* *Lifetracks/PSHE* *PE*

		PSHE	*and health effects.*	
2d) What sorts of things did you find out there?	DT/psheHealthy foods and how to prepare Rs-Kosher etc Geog farming and harvesting Mfl-Foreign food *Dt pshe What you should eat-different types, how to make it* *"we found out what areas they fit in" "like protein and calcium*	See above	Life tracks drugs and alcohol as well as calories, balance diet, benefits of chewing gum for teeth. *DT food, healthy Vs non healthy in the preparation of food (healthy encouraged), posters on the walls of food types and groups.* *Lifetracks healthy eating and health effects.*	See above *PSHE-diet, food groups, balanced diet, health consequences.* *DT- healthy foods, ideas, healthy meals, meal planning, actually make healthy versions of different food eg bread.* *PE- active lifestyles, how to exercise and why.*
2e) When I asked you how you found the F&HE topic, most of you ticked <u>some was interesting</u>. What sort of things do you find most interesting?	How it effects your body, if you don't eat properly what the consequences are *Food groups like carbohydrates (1)* *Practical work with the microscope*	Yes find the health aspects interesting, good to know what is bad, (3) I like to know what I'm eating Not really (1) sort of, (1) some no.(1) *Yes the food pyramid and stuff* *Food tasting in year 3 is good* *Not much enthusiasm at al*	Consequences of unhealthy eating obesity and liposuction video, Experiments. Disgusting pictures made it interesting, shocking *Practicals and food testing* *Video clips and smart board*	Big pause no-one answered. **I said ok then what did you not find interesting.** In primary school we did more activities and practical work which made it more interesting. In secondary school its about facts and study which is not interesting. Also finding out info and tests not good. *The different health effects/consequences of different food because it makes you more aware and makes you think.*
2f) What parts of the	No	You hear about it a lot-	Writing, stuff we already	See above

topic did you not find the topic interesting, why?	*"stuff we already know" (much agreement) Stuff like "parents nag you about" "food groups" (much agreement) "what happens when you eat certain food" "about a balanced diet" "yes (in agreement) we learnt that all before it was kinda boring cos we learnt it in year 4"*	everyone is telling you outside and inside of school. Keep hearing it so it is boring. "if you keep hearing something eventually it gets boring" g1 Its annoying. "I hate Jamie Oliver he stopped tuck" "sometimes when we were doing the topic miss xxxx would randomly come up to you in the canteen and go 'what are you having today?' And I'm like sausage and potato and she would say 'how much carbohydrate is in that'" *Finding out about vitamins, calories and fats*	know (like basic digestion), copying off the board and book work. *Some stuff we already know (from junior school-food groups healthy eating balanced diet) just learn it again from yr 1/reception. The technical stuff about enzymes.*	*Exercise-we already know it. Food groups: repeat repeat, done it already and then had to copy off the board. "Food groups we already did at primary school, we spent whole lessons covering what we already know"b2. Quotes: "Exercise"(b1) "yeah exercise"(b2) why? " 'cos it drags on all the time about what you need to exercise and keep fit" (b) "yeah we already know it" "from primary school"(b12, g1) "food groups, we learnt food groups in primary school" (b) "exactly" (b2) "we spent whole lessons on things that we've done already. I mean they could have just set us a small task or sumut (slang)" b1 "but when we've done it, it gets a bit (fake snores)"*
2g) Most of you said that	3,2,4	**Do you think learning**	6,4 and 5. 5 and 6 kind of	Primary school-basic food

you had learnt about food before year 8. Can you remember when?	*1,2,3,4*	**about food is important?** Yes,(all) don't want to end up obese, good knowledge for when you have kids yourself. Don't want to die young *Sort of* *Yes* *Health reasons mainly anorexic or too fat, diabetes, emotional issues of being made fun of if fat* *Yes and sort of*	the same stuff. Pulse rate and exercise. Yr 6 even did food testing experiments which we did in year 8 yesterday. *1, uses, comparing diets, portion plate.-balanced diet* *6 revision of everything, nothing new* *3* *5 a lot proteins compared healthy diets* *All years really*	groups, nutrition Year 8 *Most years/all ayears, 2,3,5,8,6, reception* *"nearly every year"*
2h) Can you remember what you learnt about in year x? • Prompt- food groups , fats carbohydrates, proteins • Probes- how about what the food is used for?	2, food pyramid, posters 3food pyramid competition, posters how food affects you, carbohydrates, proteins and fats etc 4, a bit All the fg before. *1 & 2 sweets, fruit and veg, food groups* *"what the different food groups are. And what they did to us. Like carbohydrates give you energy and stuff like that(2) we did something like that (points to poster displaying pie chart of*	**Do you think you should learn about food in science lessons?** No, yep yes We've already done it in year 4/5 experiments are better (than learning about food) Boring sometimes. Yes because-can do it with exp in other lessons you cant. No because we've already learnt it and its boring *Yes because its about the digestive system and that's to do with the body* *Yes science it is a science*	Def 5-6, before leaving. ,Same stuff, survival thing, pulse and exercise, food tasting, healthy/unhealthy, put weight on you 4 All the year groups-fats, carbs protein but when we were really young we used the term dairy group *End of year 6 definitely in the revision.* *As young as year 1.* *Some used dairy in year 1* *Others used it alongside correct terms such as protein etc.*	Primary/junior, an overview, dairy fruits and veg, fats, carbs and proteins, sugar but not starch. Uses of these included but not as much depth as in year 8, for example in yr 8 we found out where in the body things are used. Balanced diet *R,1,2- Plate portions, why you need it the basics, healthy, fruit and veg highlighted in the canteen to show healthy* *3, exercise, balanced diet, same things really, just*

	food groups)(2) we learnt something else too….um….um (5) we learnt about balanced diet too. (2)That was it, balanced diet" *3 (3) digestion and balanced diet again (1) we do balanced diet nearly every year (2 and 5) yeah* ***ok*** *(4) year in year 4 (?) interrupts year 4? We did about exercise (?) yeah about exercise* ***Ok (****2 or 1)do you remember we had the food pyramid (5, interrupts) in year 3 we did the food pyramid (?) and year 4 (?) yeah year 3 and 4 we did food pyramid.*	*thing* *DT food is more practical based more on food prep.* *3 people maybe better in food tech because that's what it is mainly about*		*going over it.* *4,5 5 a day, balanced diet.* *6, just went over it, more detail "with SATs in mind/revision?" Yes yes.*
2i) A lot but not all of you said that you had learnt about food groups (fats/carbs/proteins) before year 8. What did you learn about them in the past?	Sugar and Starch was new this year (as carbs) Names and uses of teeth in the past *Functions of teeth, names of teeth, shape, different parts like root and crown*	**What sort of activities do you enjoy in class?** Experiments and trips, not sitting down writing, outside Writing is boring *Group work anything that means we can chat* *Experiments where you can get involved* *ICT enjoy work on*	Carbs some early in primary ½ some later on 5/6. *Protein for growth etc*	See above *-amount needed of each nutrient, how much of each.* *-Carbs in 3 0r 5 uses and sources or sometimes earlier of from home* *-fats introduced the earliest* *-protein before carbs.*

		computer *Making models* *Things allowing you to talk more than usual*		
2j) What did you learn about food groups in year 8? • **Prompts – types? Uses?**	Teeth- Same again (as yr 3) but not so much time on them-revision *"Kinda boring cos we already knew all about it"* *Same stuff as yr 3*	**What sort of activities do you enjoy not so much?** Writing and comprehension Writing from the board *Book work, dull, learn to much in one time/to handle* *Practicals are much more fun/way to learn*	Detailed information, enzymes which break them down.. Specific enzymes break each nutrient down *Digestion in the most detail Everything in more depth and digestion* *Uses growth and repair* *Enzymes*	Same and then, cholesterol, Blood pressure, balanced diet Link of diet to disease *-more about fats such as polyunsaturated, cholesterol, high blood pressure, advantages/disadvantages* *-balanced diet and the project.*
2k) I asked you in the questionnaire what you would like to learn about in science. The most popular answer was space or the solar system. What is it about space that you want to learn about?	like the different parts of the universe, planets stars and stuff and what are the possibilities of life on (interrupts) things like black holes there's a there's one a space poster over there *3 children they put chemicals not space as they like exp* *1 liked habitats* *Space-different and cool*	**If you had the choice what would you like to learn about in science lessons?** Burning stuff and experiments, chemistry and fizzing Sport science Trees and what happens when they cut them down *Electronics and robots-cool and challenging stuff you could actually use.* *Chemistry and experiments, practicals.*	Although we do it in school we spend little time on it 2 weeks etc. Enjoy cos there are so many unanswered question in general. Only done the main facts interesting but only a small amount of time. *Trips, interesting good project, ICT, models PowerPoint-made* *Learning in a fun way*	Planets and other solar systems, space center, simulators, not many people have been to space so it makes it interesting, interesting, massive galaxy See original for don't care comment *Its interesting especially* *Life on other planets* *In lots of science we know the answer but in space we are still discovering things so that makes it more interesting* *Unanswered questions* *Most of the stuff we know*

				about we do already *People cant be bother to give an explanation*
2l) When I asked you for your opinions of different topics, the most popular was Space, because we have already talked about that, I would like to ask you about the second most popular, chemical rxns. Why do you like that topic in particular?	SLG-(1) well we experimented a lot (1) it was interesting (2) it was very interesting about the separating(1) yeah and how you can change a solid into a liquid and a liquid into a solid or gas and turn it back again **Do you know what that's called?** (1) Evaporation from a liquid to a gas **brilliant well done** *"because its chemistry"* *Experiments, fun modeling –pretending to be particles*	**What sort of topics do you enjoy the most?** Going round the circle Electricity (4) like playing with the circuits, practicals Planets and space (2) Materials and experiments (1) (interrupts I hate change of state) *Electricity-fun practical making circuits-practicals (2)* *Materials and exp(2)* *Light and sound enjoyed the shadow work and we were allowed to chat* *Space-interesting-milky ways, modeling and went outside*	Experiments and practical work Periodic table a bit boring but the rest of the stuff fine *Practical work* *1 said they didn't like the written work after*	Lots of practical work, see the results, use chemicals, yourself doing it instead of watching the teacher "get stuck in" *Experiments* *Explosions* *Hard to learn but interesting* *Things happening all the time* *Its like Brainiacs!*
2m) What do you think about learning about the topic forces? • **Probe-why?** **How about plants?**	Light and sound (2) I've never done it before (2) no (1) no I think we did it in year2 or 1(2) I don't know (1) I don't know whether we actually do, but it feels familiar that we did it when we were younger at a very basic	**What sort of topics do you enjoy the least?** Life cycles boring no practicals, cant see the relevance, not fun, always writing Plants- I don't like the idea that they try and kill you in the	Boring, don't do exp, confusing as so many different types acting at the same time. X 5 You could learn the whole thing in one day. OK x1 but nothing major happens *Boring we did it a lot in*	Boring(5)- not that many practicals. Sometimes interesting(1)- if you do get to do a practical. Rocks- V.boring1, alright 3 Found out how rocks were formed interesting, done in

	level, not a lot (2) in year 3 I remember we did it when light travels in one direction (1) oh! **Yes that would have been in a light topic** *Boring –shadows and that are boring* *Some found it fun to go outside and look at shadows/not writing*	night by breathing out carbon dioxide *Plants-boring, not fun, not practical and then they die (4)* *Planets didn't do much* *Rocks and soils don't do much confusing diagrams*	*junior school, same thing with light and sound, nothing changes and taught in a boring way* *Some boring some like .* *Did the structure several times. Structure boring – dry facts, like the interesting facts like about oxygen production*	8 and 9?? There was a song on the computer the really stuck in my head! *Boring, done it already in year 6, primary school we did more experiments* *More pressure now we are older.* *Don't care that new things are covered it starts of the same so you think its boring xxx transcribe excerpt* *Boring and confusing, why do we need to know this anyway.* *We did some experiments/ok.* *"oh god it wasn't that fun"(G)* *"boring"(b1) "cos it is boring (b2)"* *"well some bits are interesting but when you have done it already it is just not"(b)* *"yeah"(g)* ***"when you say, done it already, when do you mean?" me*** *"year 6"(b) "year 5" (g)*

				"both, but it's the same thing it just gets more complicated each time" ***"so you are learning new things when you do it" me*** *"uhhuh"*
2n) When I asked you about your favorite subject lots of you put RS somewhere near the bottom, why? **And what about languages?**	Pshe (1) well you don't do a lot in it (2) its one where you don't actually concentrate on one thing that you actually do (1) in a way its not really a subject its one where you kind of (1) (interrupts) have a rest! (1) yes you have a rest in the morning (1) its like randomness (2) its like a registration in a way Mrs xxxxx just talks to us (1) and tells you about the notices (2) but sometimes you do have sheets about eating and stuff (2) oh yeah (1) yes last year in year 4 we did have the folder that said PSHE and we did do things like that. (2) Yes but we don't do hardly anything *"We don't actually do anything"*	**What is your favorite school subject?** 6 PE active fun, show off skills, active DT (1) and Art also good *Music-fun* *Art-easy, not bad at it* *Art and Dt(2) good like making stuff* *ICT & music-listen and compose, funny teacher.* *ICT easy*	Too much talking, homework and don't like the teacher. Teacher talks for 50 mins then gives you 10 mins to do the writing-time pressure *Learn at home, and primary* *Teacher is mean* *History the same info over and over, too much cloze activities* *Teacher again.* *Good teachers can make even boring subjects interesting, bad teachers make fun topics boring*	Pshe- Not really a serious subject, more like form time. Ended up at the bottom because like other subjects more. *Boring "stuff we learn already in our daily lives"* *Its not the teachers own subject so they are not enthusiastic about it.* *"half the stuff is science anyway" (pshe stuff)* Languages- Boring, not active not fun, board work not good, speak too fast, lessons at the end of the day

<table>
<tr><td></td><td>boring</td><td></td><td></td><td></td></tr>
<tr><td>2o) Sci and PE are a very popular subjects, why?</td><td>Dt and pe
(1) well in dt its just really fun' cos you get to make stuff (2) and you can take it home and baking things as well (1) you can just be creative with it and throw everything together and see what you get. And what about PE? (2) well we just like sport (girls laugh) (1) well it depends what type of PE it is, because sometimes its really tiring and hard like cross country (2) yes I don't like cross country (1) but swimming and playing hockey and gym and things like that
Creative, cooking, running around, active not book work</td><td>What is you least favorite subject, why?
(all) Geography boring, a lot of writing, never do anything and RS-boring too much writing
Geog and history, boring, not good at it, not interesting, don't like the teachers, oh and maths
English-don't like writing
English-writing-don't like writing stories
Hist and rs not interesting and too strict, like more modern stuff
Rs not interesting
Maths bad</td><td>Practical fun active go outside not stuck in classroom

Practical, physical, get up and move around, no writing in pe</td><td>pe-Active, constant practicals, exercise, dance
Active and physical, variety, choice, different sports, something for everyone.

sci top then dropped in second Q-
Exams getting closer, les
Because they announced the module tests and everything got serious.s practical than before</td></tr>
<tr><td>3a) To find out what you think can I ask you to split into two groups. Can you write down on this spider gram what you think about science lessons this year? Like this (show them a spider</td><td>(2) ok interesting inquisitive intrigued inspired Girls? Inspired brilliant interesting fun inspired

Fun, nice, imaginative, somethings are boring,</td><td><table>
<tr><td>Girls</td><td>Boys</td></tr>
<tr><td>Boring</td><td>Its boring</td></tr>
<tr><td>Scary/strict</td><td>Experiments</td></tr>
<tr><td>Blowing stuff up</td><td>Fun</td></tr>
<tr><td>Paper aeroplanes</td><td>Writing</td></tr>
<tr><td>Yellow cards</td><td>Sad</td></tr>
<tr><td>Bad</td><td>More fun</td></tr>
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<tr><td>helpful</td><td>Has a purpose</td></tr>
<tr><td>New</td><td>Awesome</td></tr>
<tr><td>Knowledge</td><td>Good</td></tr>
<tr><td>Experiments fun</td><td>Important</td></tr>
<tr><td>Written wrk sometimes boring</td><td>Boring</td></tr>
</table></td><td>Lots of discussion, projects, experiments, pressure because of tests, harder since GCSE, less practical, text book based, team effort, revision clubs, harder since GCSE.</td></tr>
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<td>gram about something else). You've only got 2 min so quick get writing!</td>
<td>change topics more often , experiments are fun, boring, exciting, surprising

excited, cool, weird, experiments are fun, sometimes boring, interesting, sometimes boring sometimes surprising.</td>
<td>
<table>
<tr><td>Homework</td><td>ok</td></tr>
<tr><td></td><td>Scary</td></tr>
<tr><td></td><td>strict</td></tr>
<tr><td></td><td>Electrics</td></tr>
<tr><td></td><td>Worried</td></tr>
<tr><td></td><td>Bad</td></tr>
<tr><td>Like practicals</td><td>More interesting</td></tr>
<tr><td>You do more fun subjects</td><td>Better last year(because more practicals)</td></tr>
<tr><td>Not as much writing</td><td>You remember the things (because its practical and more fun)</td></tr>
<tr><td>More interesting than last year</td><td>Its fun</td></tr>
<tr><td></td><td>More practical</td></tr>
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<tr><td>Alkalis/acids</td><td>Challenging</td></tr>
<tr><td>Exciting</td><td>movement</td></tr>
<tr><td>Learn a lot from practicals</td><td>Acids</td></tr>
<tr><td>Overworked</td><td>Intermediate</td></tr>
<tr><td>Interesting</td><td>Meaningful</td></tr>
<tr><td>Fun</td><td></td></tr>
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<tr><td>Fun</td><td>Interesting</td></tr>
<tr><td>Interesting</td><td>Okish</td></tr>
<tr><td>Alright</td><td>Boring</td></tr>
<tr><td></td><td>Fun sometimes</td></tr>
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<td>Boys-GCSE pressure, hard need to concentrate more, not a lot of experiments, more complicated, exam pressure, a lot of gcse stuff.

Girls-\confusing, boring, hard, like experiments, it was better in year 8 more fun, rushed-exam pressure.</td>
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<td>3b) If not thrown up by activity, What makes you interested or excited in science lessons?</td>
<td>Space (2) experiments (1)
I like the body

experiments</td>
<td>Paper aeroplanes and experiments

Practicals</td>
<td>Chemistry and practicals, acids
Challenging stuff-we like a challenge , so don't mess about

Space, Chemistry, Practicals, Video clips, biology</td>
<td>Practicals, group work, responsibility
-experiments,
Then they took the flow to pointing out that not enough experiments are done this year
there are less experiments this year.
Now we learn what happens in experiments without actually doing it-</td>
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				not good. Last year we actually did it. We would understand more about the equations if we were allowed to do the experiments ourselves.
3c) If not thrown up by activity, **What makes you bored/less interested in science lessons?**	Lack of time *Copying from board or text books, things we already know, lots of writing*	Writing, Need more fun *Writing and book work*	Written work-although recognize need to do it to revise from Boring not challenging mess about *Write ups, Homework, Graphs, Reports forces*	Less experiments compared to last year, copying from the book, not a good way. Don't mind making notes on a video though *Bookwork, writing, copying, text book work, keywords, questions* *More experiments, we wouldn't mind doing the writing up at home if we did experiments in class. At the open day there were loads of experiments but now we are hey whats happened?*
3d) Is there any difference in how you feel about learning about science, since leaving junior school? Is secondary school science what you expected? (8)	No time *"(2) yes (3) yeah* **Ok so how does it differ?** *(2) big difference! (3) primary was more exciting and fun (5) yeah you did more experiments and things (?) yeah (5) yeah and in year 5 its much more serious*	Now we have "scarier g1teachers" and they press you more, its all about exams "miss xxx is always blabbing on about exams" b1 "Its more serious" ***What do you think***	At junior school I already knew everything! *Easy, Simple* Kinda expected it to be harder, I expect that will happen after yr 9 *More detail but interesting*	Prim more fun, less pressure until it was the SATs, kept book there didn't have to carry round. Yr 7 and 8 good too as more practicals, not now though GCSE pressure/separate sciences. *Junior was easy, fun*

	like paragraphs, text books (?) yeah (5) tests (?) yeah (3) in primary you do lots stuff (lots talking in agreement over top of each other) **right, so you felt that in primary it was all about being fun and doing experiments** *yeah yeah yeah* **but in [junior] school** *(5 interrupts) tests* **its all about knowledge** *(5) and SATs and that (3) in primary we got to go out of school and we got to look at all these habitats, like forests (5) remember we went to ??? (talking over each other, excitedly talking about going out to look for bugs)* **OK** *(5) we saw butterfly eggs in the leaves* **brilliant** *(5) remember?"*	***secondary school science is going to be like?*** *"Half boring and half not" " in a way you get bored of doing the same thing, because in [primary] we did something then we did it again at [junior], but if we do it again(meaning at secondary school) it will be boring"* ***"do you think you will be doing it again?(at secondary school)" "****I think yes"(boy) another child "yes a little bit but I'm sure we will do new stuff as well"(girl) "they will take things a lot more seriously" "more complicated but more fun" "there will be separate sciences"*		*experiments or playing with things 7 and 8 ok cos lots of experiments*
3e) Thinking about your time in junior school, can you tell me the topics you have learnt since year 7?	Not relevant as just a leader for following Q	Not relevant as just a leader for following Q	Not relevant as just a leader for following Q.	Not relevant as just a leader for following Q
3f) Ok, from looking at you list I can see some topics that are	(1) it wants you (2) I know! (1) to get better at subjects (2) yeah (1) and	*The get more advanced and need to refresh your mind*	More detail at senior, more lessons per week. Taught by specialists,	Familiar Basic and more practicals Gravity

related/similar. What are the differences between when you did it in junior school and now at senior school? Activities?(Name activity, how differ, experiments)Teaching? Content? Amount?	its gets to it. (all talk at same time) (1) they don't want you to forget it 'cos its still important. And you have loads of topics. And you don't want to have a test on it and think oh my goodness I can't remember anything on that subject (2) my mum. No my sister just like she's 14 now and she just did a test on the body again and like and um she said you just add more things to it. You know. (1) revise *(2) to refresh our minds (3) because say if you do habitats when you are younger and you do like ants are on the floor and when you are older you do more information. More details (5) um say in [primary] you learn about animals and you don't do it in [junior] school. And then you go to college you wont remember it.* **Ok yep** *(4) say you are in*		aware Primary aware they are non specialists/class teacher *Little detail to more detail* *Sheets to Writing and text books*	Senior more details *Remind you just in case you have forgotten and there is an exam.* *Some schools haven't done the work before* *Exams more detail* *New words appear so it gets more complicated* *Push and pull early then words like gravity and efficiency* *Equations*

	transition(reception) you do that and when you come to year 5 its quite good to do it again **so maybe you are thinking about for revision?** *Yeah* **right um right for example when you did, lets pick one, um habitats in whatever you did it in primary and when you do it again in junior school, how does it differ? ………… yep?** *(3) in [primary] it was more fun doing it. Because we got to go outside and (5? interrupts ?) now we just stay inside (2) yeah and we just copy (3) but we learn more* **you've got more information but less fun?** *(5) in a week like in [primary] you only have one lesson in a week or something but year 5 we have loads more lessons and we take it more seriously. (2) yeah double lessons* **Ok let me just check…one of the questions is how the**			

	teaching would differ, you actually said before it was more practical based and now its more (1) serious **theory** (1) yes. **Content…you learn more stuff in year 5, more information given to you? Is that right?** *Hmmm (2) sometimes its good to have it written down because you can look at it when you are older*.			
3g) Why do you think you do similar topics in junior and senior school?	**So you learn about some things when you are younger and then when you get older you learn about the same things again but you learn more about it.** (1) yeah, and some things. You get extra things. It slowly adds more topics on it so you don't just get completely into the other topics. **What are you saying? Is it that in a year a primary you might only do a few topics** yeah **but in a small amount of detail but as you get older you do**	Know more about it You cant tell we cant remember *They get more advanced and need to refresh you mind*	Get ready for senior, giving you the basics.	Its easy at first, less daunted, more info *"to make you remember it"*

	more topics and yeah **more detail** yeah **Do you think that's a good way of learning about things?** (1) yes(2) um yeeees (1 interrupts) its good 'cos when you are younger you can only take so much in **Ok** when you are young you get so much in your mind you cant take any more in **yes** And you just say right I cant handle this any more I'm going to forget it all. **Yep.** *See above*			
3h) How do you feel when you learn about something that you have learnt a bit about before?	Confident *2) bored (?) bored (?) bored* *(1) um if you have only learnt a little bit and now you are learning lots it can be quite interesting* *(talking over each other)* *(5) sometimes I get confused in [primary] or say year 3 we learnt something then say in year 5 we learn something different about the same*	*A bit happy because its easier cos you remember it*	Girl-comfortable because you know it, you know a bit about it but then you learn more and that's ok Boy-I kinda hope it gets more challenging Boy-sometimes its exactly the same but then you move on. Now we have a lab so we do more experiments. *Depends on the topic*	Its easy at first, less daunted (g), more info *Bored, annoyed* *If we cover new stuff then its fine* *Other times you forget you have done it before* *When we do it exactly the same its very annoying* *"it seems that when we do something new we spend only a day on it, but when we do something we know we spend ages on it"*

	thing so I get confused sometimes ***yep*** *(5) and I'm surprised, so why are they different?* ***can you think of an example?*** *(5) yes early on we learnt only about molars then suddenly we find out there are premolars (?)yes (?) you are learning more* ***yes ok so learning more information but sometimes things are introduced to you in a different way*** *yes* ***so for example when you are very young maybe in year 1*** *(1) they don't tell you much because they think you wont understand things til you are older* ***yes so it starts off basic. Ok but when you've got new information as you say you find that interesting so if it is new to you you like that? And you don't like it if they are telling you something you already know*** *(1) if you are doing the same topic again (?) yes* ***but if its new***		*sometimes don't mind(space) other times hate it (forces magnets)*	

	you don't mind *(?) yes yes we learnt about butterflies in [primary] then in year 5 we did the same thing and its boring (she is referring to life cycles) (1) yes its boring* ***For example when you did food in [primary] did you learn the words fats, carbohydrates and proteins? (?)*** *Yes(?) yes (?) yes we did* ***So you learnt THOSE words in primary*** *yes Yes but really early we learnt all the dairy was the fat group* ***can you remember when the dairy group suddenly changed into the fat group?*** *(2) year 3. (1,new to school girl) I remember I had a sheet in year 5 and it said name them so I put the dairy group but it was fat and I got it wrong (?) yes I did that as well and my mum got cross* ***so that is quite confusing then something you learnt as one group suddenly turns into a new group.*** *(5) I*			

	think what happened was in primary it was dairy products turned into fat products in year 3. (2?) so I guess they were keeping it simple in primary ***When can you remember first hearing the word carbohydrate?*** *(2) year 3 (1) year 1 (?) year 2* ***year 2?*** *(?) year 2(?) I'm sure we might have done it in transition.* ***So in general most of you heard it in primary years, I mean primary.*** *(?) yeah (nods of agreement)* ***Ok***			
Role play	<u>Primary</u> Boys: (both sitting at a desk close together) T "My name is Mr.Buffle-Bottom (giggles from all). And erm well I'm ….er just ….er going to tell you a bit about er teeth. The molars help you chew and grind and the incisors help you …….bite….like into the food…….And?" (doesn't know what to say and stalls..) P "the premolars help you	Both groups did both plays as all wanted to do junior Boys: (pupils sit teacher stands) Primary Play starts with boys drumming on the table Teacher: "stop that or I will send you to nursery" Teacher: "right ok, today we are going to do drawings of plants" Pupils 1: (cheers) "wow" Pupil 2: "but I don't want to I think I need the toilet"	<u>Primary</u> -all girls, all standing T-"good morning class" P1,2-"good morning miss" T-"ok, today we are learning about space" P1 and 2 together "yeah!" (cheering and clapping) T "first of all we are going to learn the 9 planets" "first there's mars" P1 "oh!, my mum says those chocolate bars are bad for you" T "mercury, venus,	<u>Primary</u> -mixed group, girl teacher. Pupils sit t stands Teacher announces forces "yeah!" Then she says that they are doing to do a practical with springs, pupils excited, "yippee" <u>Senior</u> -boys, vocal boy teacher. Teacher stands pupils sit. Teacher write on board and told pupils to make notes and copy it,

	eat………. “**Ah the pupil helping the teacher!** T “yes.. I love my pupils!” (giggles all round) <u>Junior</u> Girls: teacher standing, pupil sitting T “There are many types of food group. Proteins, Vitamins and minerals, carbohydrate, fats, fibre and water. And there are plenty of other smaller groups inside these (2, quietly says oh my god). Vitamins and minerals keep you healthy. Fat….” (boy 2 from primary group interrupts Quietly), hey they are cheating (referring to the fact that girl 1 keeps glancing at a poster about nutrition on the wall) (responding to boy 2) **No, I think the girls chose well!** T “fat can help give you energy, for a short period of time. Carbohydrates give you energy. Proteins	Teacher: “be quite or I will put you in the naughty corner” Pupil 2: (sharp intake of breath) Junior: Pupil: “miss I haven’t done my homework” Teacher: “YOU SHOULD HAVE DONE IT, YELLOW CARD, NO MESSING ABOUT, STOP IT YELLOW CARD, STOP LAUGHING, STOP IT, YELLOW CARD”(getting louder and more frantic) Girls: Primary all sitting Teacher: “we are going to do plants and some colouring” Pupil: “miss I need the toilet” Teacher: “ok I will take you” Pupil: “good cos I don’t want to go on my own” Teacher: changes her mind “you go on your own2 Pupil: “but im scared on	earth……. Now repeat them after me” T “Mercury” P1 and 2 “mercury” T “Venus” P1 and 2 “venus” T “Earth” P12 “Earth” Continued in same vane until finished. T “well done!” <u>Senior</u> Boys pupils sit teacher stand. Hadn’t sorted out what they were going to do properly so copied the girls until they bottled the end and fizzled out T “today we are going to do al about space, so who knows the 9 planets?” P1 “sun, moon” P2 “that’s not a planet” P1”pass then” P2 “merury, venus, earth……”.until fizzle out P1 “are we doing practical work now?” T “detention!” *Boys only junior wrote:*	chemicals, acids/alkali, Q&A. *Girls junior – all sitting on same level around a table* *T-“morning class, today we are going to learn about forces and we are going to do an experiment” “does anyone know what forces are?”* *P1 “a drop to the ground”* *P2 “gravity”* *T-“does anyone want to come up to the board and draw me an example?” P2 Draws* *P1”wow”* *T “our experiment will be about springs”* *P1 “shall we write that in our books?”* *Boys senior- teacher stands, pupils sit.* *In practice:*

	help you grow. Do you have any questions about that?” (pupil shakes head, looks scared and leans back on stool T “Right turn to page 362 in your text book and copy out the diagram…. Boy from other group (interjects) “copy out all 4000 questions!” ***Discussion from Primary group (from their VR)-*** *(3) so I’m teacher. Lets say I say today students we are going to learn about.. can anybody think what we learnt about (2) butterflies! (1) we could go outside (3) ok, I think today we are going to carryon learning about butterfies ok. We will do butterflies then (2) yeah! (3) shall we go and check on tibby (1) who’s that? (3) the butterfly! Can you remember in primary we had those (1 and 2) yep (3) what was the other one called? (2) tubby. (giggles) (3) so we’ve got tibby and*	my own” Teacher: “I told you last time there aren’t any ghosts in the toilet, I know there are in harry potter but it doesn’t mean its true” Junior school Teacher: “WHERES YOUR HOMEWORK?? Pupil: “miss I didn’t do it” Teacher: “open your locker” Pupil: cries Teacher: “where your key? (glares at the pupil)” Boy (from first group)comments “she’s giving her the hawk eye, she just stares at you” (referring to class teacher) *Mixed groups 2:1* Primary *All standing.* *Teacher: “That’s a butterfly, this is a caterpillar, it turns into a chrysalis before it turns*	*Basics, magnet, paper clips, sound. All standing* *T “in science we are going to learn the basics”* *T “Today we are doing magnets”* *P “yeah!”* *T “magnet, paperclips (p giggle) lets see how many paperclips we can pick up!”* *P “ok”* *T “now how was that children?”* *P “well it was quite boring, when are we going to learn more detail?”* *T “We are going to do one practical per week like dissolving in water”* *P “yeah!”* *Mixed senior, wrote on paper:* *Essay, homework, the heart, veins, copy this. P sitting, T standing* *T “right 8L come in and stand behind your places in Silence….THATS NOT SILENCE! (shouting)”* *T “Today we are going to*	 *T “have you forgotten your homework? Someone hand out the text books”* *P1 “(whisper to other pupil) Shut up ginger nut”* *T “I will have none of that in my class, do you need to calm down? GET OUT OF MY ROOM!”* *T begins to write on board/* *“we’ve got our learning objectives”* *P1 “just put LO its easier”* *T “right now copy out of your text books”* *In performance:* *T “settle down settle down, right penalty point!”* *T “OK homework please, have you got your homework?”* *P1 “sorry sir I forgot it”* *T “THAT’S a detention!”* *“have YOU got your homework?” (p2 shakes*

	tubby the little butterflies. Oh look they seem ready to go away now. (2) oooh noo (mournfully) (3) lets go outside and let them fly away (2) ok. (123) bye bye tubby. *(1 and 2 sat one side of desk and 3 sat the other. They gesture to an imaginary basket/net with butterflies in)* *(3) now what are we going to learn about today?* *(1 and 2) Butterflies!* *(2) ok then lets go and check on tibby and tubby (giggles)* *(3) look the butterflies are in the little..* *(1) yes* *(?) whats…….* *(2) it's a beautiful butterfly in a cage* *(3) its lovely isn't it? Now I think they are ready to be let go now so lets go outside and let him free (all three stand up and pretend to go outside)* *(123) bye bye tibby and bye tubby!*	*into a butterfly"* *Pupil: "why doesn't it just be a butterfly in the first place?"* *Teachers: "because it has to have er a long life"* <u>*Junior*</u> *Teacher stands, pupils sit to begin with then get up during* *Teacher: "ok right today we are going to be learning about airplanes"* *Pupil: "wow!"* *Teacher: demonstrates making an aero plane "fold it down the middle, down here, then here on the other side"* *Pupils: copy instructions "yeah"* *Teacher: then throws it and grabs a metre rule "now we need to measure it to see how far it goes"* *Pupils: copy and measure "that works"*	*do the heart and stuff, the arteries. You need to write it down in your books. For your homework I want you to do an essay on the heart and stuff"* *P "ohh"* *T "ok, we are going to do a practical tomorrow"* *P "yeah!"* *T "so I want you to find out about it and do a report on it, and I want you to do graphs and lines of best fit, NEVER do dot to dot, line of best fit……and get your ruler"*	*head"* *"OK you as well"* *T " the learning objective is erm,…..Revision!"* *"hand out the textbook, p52 do the questions now!"* *"you have to the end of the lesson!"*

	Discussion from junior school group (from their VR)- *(4) just choose one of us to be the teacher* (1) look just do rock paper scissors *(girls to rock paper scissors) (5) I one I've got paper* *Chat (4) so you could tell us to sit down and then say NOW (5) children open your text book to page 55 (5) so I'm going to give you all a red card then I will give you wrappers and ask whose got a carbohydrate (4) then you got to tell us to write i (5) Now everyone SIT DOWN! (loudly)....Sit down (firmly) (4 and* 1 sit down on the floor) *I'm going to give you all a wrapper (gives out imaginary food labels) there you are, there you are. Now tell me (forcefully raises voice) who has a carbohydrate? (4 raises hand but does not speak) Who has a fat? (*1 raises hand but does not			

	speak) *Who has…calcium? (both pupils raise hand) Who has protein (both raise). Now chicken has protein What does…. Now open you text book to page 55 and right down the whole passage then I'm going to ask you some questions and you SHOULD know the answers for them* **Ok that's it Thank you very much! Well done very quiet pupils!** *(4) she's scary* **(giggles)**			

Appendix 5.3

Results of pupils' favorite school subjects from questionnaire part a and b

Rank	Year 5				Year 8				Year 9			
	Part a		Part b		Part a		Part b		Part a		Part b	
	Combined	Gender bias removed	Combined	Gender bias removed	Combined	Gender bias removed	Combined	Gender bias removed	Combined	Gender bias removed	Combined	Gender bias removed
1	PE	PE	PE	PE	PE	**Sci**	=**Sci**	=**Sci**	**Sci**	**Sci**	PE	Art
2	DT	DT	Art	Art	**Sci**	=ICT	=ICT	=ICT	PE	=Eng	Art	Music
3	ICT	ICT	DT	DT	Eng	=Eng	=music	PE	Music	Music	Music	**Sci**
4	Art	Eng	ICT	ICT	ICT	PE	=PE	Music	=Eng	PE	**Sci**	DT
5	Eng	Art	**Sci**	**Sci**	Hist	Art	Art	History	=Art	=DT	DT	PE
6	Hist	Hist	Eng	Hist	Music	=Hist	=Hist	=Art	DT	=Art	ICT	Eng
7	**Sci**	**Sci**	Music	Eng	DT	=DT	=Eng	=Eng	Hist	Hist	Geog	=Geog
8	Math	Math	Hist	Music	Math	=Music	Math	Maths	Geog	Geog	Hist	=Hist
9	Geog	MFL	MFL	=MFL	Art	Math	DT	DT	ICT	ICT	Eng	ICT
10	MFL	RS	Math	=RS	Geog	Geog	Geog	Geog	Math	Maths	MFL	=Math
11	RS	Geog	RS	=Maths	MFL	PSHE	MFL	MFL	PSHE	PSHE	PSHE	=MFL
12	Music	Music	Geog	Geog	PSHE	MFL	RS	RS	MFL	MFL	Math	PSHE
13	PSHE	PSHE	PSHE	PSHE	RS	RS	PSHE	PSHE	RS	RS	RS	RS

Key

PE= Physical Education, DT= Design technology, ICT= Information Communication Technology, Eng= English, Hist= History, Sci= Science

Math= Mathematics, Geog= Geography, MFL= Modern Foreign languages, RS= Religious Studies, PSHE= Personal, Social and Health Education

Where '=' is observed then an equal in ranking of the subjects was found

Appendix 5.4

Notes on the roles plays

I will now consider each year individually comparing the role plays for each focus group. I focus directly on the similarities of the two groups.

Summary and discussion of the two Y5 role plays

In act 1, depicting the primary years (KS1), both groups portray the KS1 pupils and teachers all sitting close together. They also show both the KS1 teachers and pupils talking during the play. The general atmosphere during these plays is happy and relaxed.
In act 2, depicting the junior years (KS2), both groups portray the KS2 pupils sitting and teacher standing. The plays are also structured in such a way that only the teacher talks letting the pupils respond with gestures only. The teachers also appear to be strict or scary (identified because the pupils leant back in the seat and pulled a face when the teacher spoke to her). Both plays end with the teacher telling pupils to copy out of a text book.

In summary, it would appear that pupils were more relaxed with their teachers in KS1 shown by all (including the teachers) sitting at the same level, smiling and talking. In comparison it would appear that the KS2 teachers convey more discipline which is highlighted in a number of ways: firstly, the teacher stands and looks down on the pupils in a way that would seem to convey more power; secondly, it would also appear that pupils feel less able to vocalise their responses as not one pupil spoke during the KS2 acts. Regarding the T&LA employed by the 'teachers' only one act included practical work appearing in the first focus group, and referred to KS1 act, whereas both KS2 acts included pupils being asked to copy out of a text book.

Summary and discussion of the two Y6 focus group role plays
All the pupils from the first focus group in Y6 were adamant that they wanted to portray both KS1 and KS2 and I agreed to their request. Potentially as a consequence both acts it followed similar themes. However, the two focus groups differed considerably. Whilst the first group stressed the discipline in both key stages, with the second act being dominated by the teacher shouting the second focus group plays were much calmer. The first point to note is that the pupils in the two focus groups came from two separate classes with two different teachers so it may be a reflection of the differing teaching styles. Furthermore, the two focus groups seemed to be portraying different points within the academic year in Y6. The first group focused much of the plays about Y6 on homework so it would appear that this group was portraying lesson at a point in the academic year before the exams. The second group portrayed in their play an activity that was completed in the post exam enrichment period, that is, when pupils are not expected to do homework and lessons across the school curriculum were activity based.

In summary, it would appear that act 1 displayed pupils in KS1 partaking in activities such as question and answer, drawing and colouring in. Pupils appear in the most part to be comfortable with the teacher and appeared calm during the lesson. In act 2, homework seems to be a key issue in the lessons, as was discipline, but there seems to be more obvious practical work.

Summary and discussion of the two Y8 focus group role plays

In act 1, depicting the junior school (KS2) all teachers and pupils remained standing and pupils responded with positive noises. The pupils exclaimed ‘yeah!’ when being told the topic to be covered. The T&LA included a ‘repeat after me’ activity.

In act 2, depicting senior school (KS3) both groups had the teachers standing and the pupils sitting. The lessons seemed to be more disciplined demonstrated by the threat of detention and or stern words. Practical work is talked about but not completed.

In summary, the first group seemed to display that learning in junior school was achieved by parrot learning, in senior school there appears to be a desire of the pupils to do practical work. The second group seemed very aware that they wanted to make key points about the differences in learning in the two key stages. This was shown in the preparation both groups took and the stressing of key points in the acts. For example, in act 1 (depicting KS2) the teacher stressed that they were going to learn the “basics” and complete one practical per week. One of the pupils in the act expressed a desire to cover the material in more detail (potentially eager for progression in this area). The pupils were happy that they were going to complete practical work in future with the teacher. Act 2 (depicting KS3) was also well prepared with the pupils wanting to highlight the key activities of essays, homework and copying. During the act they also expressed the discipline of the class. Similar to the first group they expressed a desire to do practical work but also that this practical work had a down side because it would be followed up by research, a write up and the drawing a graph which were unpopular activities mentioned earlier in the focus group. This last act got very positive response by the other group in the room.

Summary and discussion of the two Y9 focus group role plays

In act 1, depicting junior school, both groups showed pupils completing practical work on forces. Both groups also depicted positive excited pupils.

In act 2, depicting senior school, both groups portrayed lesson with the pupils sitting and the teacher standing. The pupils appeared mildly disruptive or disinterested. Further, both groups showed the teacher writing on the board and had activities where the pupils were told to copy.

In summary, both focus groups portrayed pupils in KS2 completing practical with positive and excited pupils. The pupils portrayed KS3 by completing copying activities, mildly disruptive pupils and less excited/positive children.

Appendix 6.1

Aide-mémoire sheets

Concepts

Concept	
1. Food groups: Fats, carbohydrates and proteins	
2. How different types of food are used by the body, for example, proteins for growth	
3. The need for exercise	
4. That a poor diet leads to disease	
5. The function of the heart, lungs and blood vessels	
6. Pulse rate	
7. Names and functions of different types of teeth	
8.The structure of the digestive system	
9. The function of the different parts of the digestive system	
10. Food tests (using chemicals to find out what is in food)	
11. Enzymes	

Activity

Activity	
1. Group work	
2. Favourite food survey	
3. Planning a meal	
4. School trip	
5. Using computers, leaflets, videos or reference books	
6. Making a poster, display or leaflet	
7. Quiz	
8. Tasting foods	
9. Keeping a food diary	
10. Cutting out food labels	
11. Making graphs, charts or diagrams	
12. Looking at food adverts	
13. Doing a report or project	
14. Experiments with foods, food testing	
15. Other, please state	

Appendix 6.2

Summary of responses of the teacher interviews

Section 1 : Background Information

	Pilot	Y5	Y8	Y9
1a) How long have you been teaching?	12 years	17 years	19 years	5 years
1b) And here? In what capacity	5 years class teacher	8 yrs HoD (Sci and formally sci and maths),Yr 6 co-ordinator, Form Tutor	10years HoD, senior mentor (prev 2nd dept)	4 years Sci teacher key st 3 coordinator
1c) What is your subject specialism? Did you do that at university?	Maths here Psychology uni	Maths and Sci (50-50) Biosci at uni	Biology Biology with geology at uni	Biology Psychology at uni

Section 2: Year X and the Food Topic

Question	Pilot	Year 5	Year 8	Year 9
2a) What aspects of food and healthy eating do you teach in year X?	Healthy balanced diet, exercise, food groups, pulse rate.	1-9 on Q4 Main FG and uses, developing the language from yr 3 Dig system-most detail, from 11+ curr not QCA	Health and balanced diet, parts of dig syst, nomenclature, function of dig syst, and structure for function, Enzymes	Not so much of the food groups etc. Cholesterol, weight loss diets, blood pressure, “A balanced diet is talked about but not specifically taught.” “a recap”
	Pilot	Year 5	Year 8	Year 9
2b) How do you decide	QCA documents,	Depends on pupils’	Primarily based on	Does depend on the

how to teach this topic?	practical as poss. **Do you consult any resources?** QCA doc, reviewed in school **How do you use the S of W/lesson plans etc?** QCA intended and peer review	background knowledge and resources/time available. Also based on expected knowledge in curriculum **Do you consult any resources?** Yes and a lot of consultation with colleagues, constantly changing and developing year on year. **How do you use the S of W/lesson plans etc?** Try to develop a story linking themes together, common thread, depends on the students, refer to previous lessons and previous years lesson plans. Student led can go off plan	ability, decide on practical work & theory, verbal/visual Lower more practical Higher more theory/verbal Have problems in planning as so many PGCE students Time constraints, behaviour. **Do you consult any resources?** Software-ICT often limiting, network issues, text books, articles, student brains **How do you use the S of W/lesson plans etc?** Not in any great detail, tend to do it from experience MRS GREN esp from memory	group, fast track with this grp so more self study, mid ability group I will put more in- "taught out" **How do you use the S of W/lesson plans etc?** We have got a scheme of work for that topic but I sized it up and did my own.
	Pilot	Year 5	Year 8	Year 9
2c) The schools S of W- How were these developed?	QCA and reviewed as a team **Based on QCA/NC?** yes **Personal**	HOD and curriculum coordinator can make changes to existing Colleague consultation mainly and now trying to develop better links	Predecessors' effort one side of A4 I developed a lever arch file and included worksheets, tests etc. Allowing a wide	Written by one member of staff, who asked for resources and ideas off others, advice re changes also noted

	involvement? 1 person? Specialist? Team? Team reviewed	between ks1 and ks2 **Based on QCA/NC?** QCA, mainly in primary junior QCA but extend these due to capabilities of pupils **Personal involvement? 1 person? Specialist? Team?** Constantly evolving due to changes in staff Depends on staff individual knowledge Spec/non spec.	variation of teaching, also good for PGCE. Now new coordinator has made a new one somewhere in between of the above but includes no worksheets **Based on QCA/NC?** NC not QCA because that came out later than when we redeveloped the scheme **Personal involvement? 1 person? Specialist? Team?** 1 person then peer review	
	Pilot	Year 5	Year 8	Year 9
2d) How much flexibility do you have as an individual to decide how you want to approach this topic?	Reasonable, how teach not what teach	Quite a lot of flexibility on how but have the same lesson objectives as other teachers on same topic. **Variety in methods, based on strengths Permitted? Encouraged?** Depends on idea, within reason, must run past HOD, also resources issues, must be similar	Very flexible **Variety in methods, based on strengths Permitted? Encouraged?** Encouraged for all	As long as we cover what's required we have complete flexibility **Variety in methods, based on strengths Permitted? Encouraged?** Encouraged

		to others as we have 4forms. What actions do you take personally, that is, do you adhere to the guidelines? N/A		
	Pilot	Year 5	Year 8	Year 9
2e) What aspects of food and healthy eating do you think the pupils have covered before year 5?	In yr 3 they do lots on teeth, diet in less detail, not the digestive or circulatory system **(See if they mention junior/primary then if not…)** **Specifically at primary/junior school?** **Bridging units?** No idea	Certainly FGs Some will know uses too Structure and function of teeth Exercise and health (PE) **(See if they mention junior/primary then if not…)** **Specifically at primary/junior school?** **Bridging units?** Bridging units-yr 3 have separate lesson on Earth, Sun and Moon in the lab out of their normal building. Y2-3 planning link getting stronger to avoid repetition Listen to this q again	-Possibly in DT food and lifetracks' PSHE -KS2 (sci) fundamentals healthy unhealthy **(See if they mention junior/primary then if not…)** **Specifically at primary/junior school?** **Bridging units?** Label major organs but not function though **How do you become aware of it?** **NC assumptions?** **Dialogue with school?** Pretesting, verbal Q&A, judge individual knowledge, little wipe boards, 35-40 feeder schools	** Food groups, sources and uses, balanced diet, digestive system, higher ability enzymes **What about in ks2?** **8.22 "I think they vaguely cover healthy eating **How do you become aware of it?** **NC assumptions?** **Dialogue with school?** "they seem to know a bit about what a healthy diet is going to be" Healthy or unhealthy foods
	Pilot	Year 5	Year 8	Year 9
2f) Do you assess their	Mind mapping	Time dependent. Not	Yes ref 2e	Yes normally if I hadn't

knowledge/understanding before the topic begins?	**On entry in year 3/7?** **Q&A?** **Testing?** Not in science just in cognitive tests **How do you assess their k/u?** **Do you take their current knowledge into account when teaching this topic?** I try to (take into account)	every topic. **Food?** Yes **On entry into year 3?** **Q&A?** **Testing?** Yr 2 no SATs anymore so tutor writes a statement to y3 teacher, (+ planning link) Same school How do you assess their k/u? Do you take their current knowledge into account when teaching this topic? Multiple choice or T/F – quick quiz 1 side A4, orally/discussion Mostly highlights gaps in knowledge	**On entry into year 7?** **Q&A?** **Testing?** Set on SATs scores but same sets as maths some problems as some kids are good at sci but not maths **How do you assess their k/u?** **Do you take their current knowledge into account when teaching this topic?** How? Ref planning qs Q&A	given it to them as a research project I would have done some sort of brain storm activity/starter activity. **How do you assess their k/u?** **Do you take their current knowledge into account when teaching this topic**? Only with SATs results 10.15 *** “Yeah no point spending a lesson talking about something they already know.”

Section 3: Views on the food topic and other subject matter

3. “In this section I’m going to explore your experience of what the pupils think about the food topic and other subject matter”.	Pilot	Year 5	Year8	Year 9
3a) When was the last	This year and last year	Last yr with yr 5, (for	Yearly yr 8	Year 8 now too (in same

time you taught the food and healthy eating topic?		the last 8 years)		term).
	Pilot	Year 5	Year8	Year 9
3b) Did you get a sense of the children's' feelings toward the F & HE topic?	Yeah, I think they enjoy it **In the mood? Verbally? Opinions expressed to you?"** Mood of class, ask lots of Q's, generally enthusiastic	They find some interesting some boring because they've done it before, but then some don't know it. Overall a balance a mixture **In the mood? Verbally? Opinions expressed to you?"** Level of their participation and enthusiasm, when they have lots of Q's and ideas I think they are interested. They are involved and interested Buzz/no buzz	Difficult a bit hyper and talkative group, high enjoyment cloud 9 of practical aspects low of any written work miserable as sin **In the mood? Verbally? Opinions expressed to you?** Don't dare talk as strict, but I am approachable I'm sure they would say if the had a big problem.	They seem to know some things. 11.44 They seem to enjoy it **In the mood? Verbally? Opinions expressed to you?"** Verbal- enjoyed the experiments. Made model digestive system
	Pilot	Year 5	Year 8	Year 9
3c) "And with this group, did you get a sense of the children's' feeling toward the F & HE topic?"	All really positive	As above -although generally more animated than last year	As above	Gcse more focused, don't really know as personal study. More mature. What sort of reactions do you get? In the mood? Verbally? Opinions expressed to

				you No complaints! Yr 9 re project
	Pilot	Year 5	Year 8	Year 9
3d) Do they have the same reactions to all the topics (in year 5)?	Not in my experience (so less favourable) **Can you give me any examples?** **Can you explain why you think they react in that way?** Earth, sun and moon, they struggle with it because its abstract	Mostly yes Kids find keeping healthy and life cycles easier to understand so the engage well with it, more real/relevant to their own lives Gases and changing state they find more difficult because its more abstract –tend to find this harder because of the language E, s, m very enthusiastic, more engaged because I enjoy that topic/really enthusiastic about it	Always prefer practical work. Practical-like esp chem. Rxns, rocks boring, slg enjoy some bits, Plants and photo boring because don't do anything, FHE like a bit 20.23, environment dislike 20.41 Microbes and disease enjoy the gory aspects Forces dislike a lot, boring because I'm bored with it, 22.00 **a drawback of us not be subject specialists**, I enjoy electromagnets, radioactivity Planets not sure as mainly project, got their teeth into, like a bit. 25.06** Atoms and elements like some aspects	No, haven't enjoyed one of the chemistry topics, Rocks. **Can you give me any examples?** **Can you explain why you think they react in that way?** I think because its dry, not that many practicals in there, also disjointed cos over Easter.

	Pilot	Year 5	Year 8	Year 9
3e) Thinking about your own views, how do you feel about teaching the food topic?	Good **Is it something that you enjoy?** Yeah **Why?** Lots and lots you can do	The food aspect in particular- It is difficult not to repeat some things but I try to make the main focus on the digestion, exercise and the heart and lungs. Try to skip over FG by playing games etc Is it something that you enjoy? Yes Why? Its bright and colourful because you can use the adverts and packaging, bringing in food or talking with them in the dining rooms about it/their choices	Like it, don't mind it at all, I'm a veggie and I have an interest in food, cooking, help get them away from the crap	I quite enjoy it. Why? Kids quite receptive to it because they know a little bit about it already.
	Pilot	Year 5	Year8	Year 9
3f) What sort of topic do they seem to enjoy the most?	Healthy living, gases all around us, plants, sounds **How can you tell?** **Why do you think they enjoy it?** Danger, fire triangle, videos of explosions Experiments can do with it	Practical topics, if you can do an investigation they enjoy doing it Or if you can make something More active things away from books at tables How can you tell? Why do you think they enjoy it? More likely to remember,	See above	Biology themes, **How can you tell?** **Why do you think they enjoy it?** Quite motivated and they give me ideas for the next lesson More confident with it, because people know little

		talk about it to each other, smiles/happy		bits before they start
	Pilot	Year 5	Year 8	Year 9
3g) What sort of topic do they seem to enjoy the least?	Earth, sun and moon, or things which reduce your ability to do things practically **What gives you that impression?** **Why do you think they don't enjoy it?** Not practical, detached from own life experiences	Topics they don't understand/Challenging topics, gases, invisible things/nature of it magnets and electricity- difficult to understand how works cant see touch **What gives you that impression?** **Why do you think they don't enjoy it?** Puzzled Need prompting Need to remind them/wont remember	See above **What gives you that impression?** In the mood, happy go lucky	Rocks, see above
	Pilot	Year 5	Year8	Year 9
3h) Do you think the children enjoy whole curriculum not just target topic?	Yeah they like science **What is their general attitude towards science?** Good, **What makes you think that way?** They do a favourite subject survey in Y6	Yes Enough variety and range for everyone to find something they enjoy and become engaged **What is their general attitude towards science?** Majority are keen **What makes you think that way?** Want to know about lessons beforehand	Not the whole, like some bits and not others, would be surprised if they enjoyed the whole curriculum in any subject **What is their general attitude towards science?** General enjoyment, would like to think so, enthusiastic questioning, integral part of life, **What makes you think that**	Yeah I think so, this group. **What is their general attitude towards science?** Very good **What makes you think that way?** Rarely have issues with behavior, hand work in on time, enthusiastic in lessons

		Talk about books they have read chatty	**way?** general q's outside of school science 29.40	
	Pilot	Year 5	Year8	Year 9
3i) How do you think the national curriculum is organised?	The topics do fit into the pure sciences, biology, chemistry and physics, practical side (sc1-4?)	Very useful to a non specialist, generally practical	Badly, some aspects not formulated correctly For example plants in KS2 – structure then not again til as and then the cant remember structure The progression is patchy in areas 31.40 ** Now its so diluted you can teach what you like, levels made up now, ***happier if it was a lot more prescribed*** this is what you teach and when. old one better, new one contribute to patchy coverage, exam q on absolutely anything. Graphs and lines of best fit not in maths Curriculum with tick boxes good, more like an GCSE and A level syllabus. SATs abolished so we have to do marking and they not have to pay for it	I don't know. Hard to say you would change it, it works, generally kids find it interesting.
	Pilot	Year 5	Year8	Year 9
3j)	Very good for age designed	Personally I think there are	Ok not too bad, some	

Now thinking about the content of the curriculum, how do you feel about the content of what you teach?	to teach Qca very helpful/really good ideas, really good foundations D vs b just about right, reasonable pace **Is there anything you would like to see on the curriculum that isn't on at the minute…..Or maybe something you would like to do more of? Ecology/technology/zoology /palaeontology etc………… Is that something you are particularly interested in?/Background in? Why would you like to see this on in particular?** More data handling, graph interpretation, tables	missed opportunities for cross curricula links -which may happen in time here but in the state sector you are more topic teaching. Could allow for a fuller experience Some things could be spread across subjects **Maybe the areas of the topics?** **How about depth versus breadth issues?** "We tend to do things in depth because we have bright kids but we are aware that we cover some material from secondary school, trodden on toes but we like to extend the children. Personally I'm more for breadth-add in more area not already covered. ** don't necessarily help the child by pushing them on and on because they then get bored in year 7 and 8**" Our after school sci clubs also extend them more with some good projects outside the curriculum- bee garden **Is there anything you**	interesting and stimulating stuff, so many constraints haphazard, should be progression ks1,2,3 but it seems that now they have removed prescription not happy **Maybe the areas of the topics?** **How about depth versus breadth issues?** Wide breath little depth at mo, ok at ks3 should be depth in ks4 **Is there anything you would like to see on the curriculum that isn't on at the minute…..Or maybe something you would like to do more of? Ecology/technology/zoology /palaeontology etc………… Is that something you are particularly interested in?/Background in? Why would you like to see this on in particular?** Plants back in! 39.30 STOP CHANGING IT!	GCSE - Tried to make it relevant to everyday life. Ks 3- basics in science rather than everyday science. Need it in there but not so much everyday Way content is organised? **Maybe the areas of the topics?** **How about depth versus breadth issues?** I think the kids prefer little chunks, esp. if not interested in something **Is there anything you would like to see on the curriculum that isn't on at the minute…..Or maybe something you would like to do more of? Ecology/technology/zoology /palaeontology etc………… Is that something you are particularly interested in**

		would like to see on the curriculum that isn't on at the minute…..Or maybe something you would like to do more of? Ecology/technology/zoology /palaeontology etc…………. Is that something you are particularly interested in?/Background in? Why would you like to see this on in particular? Density- I feel it fits in nicely with floating and sinking and the kids understand that concept more than other concepts that are in the curriculum, density ks3 but it ties in with their general maths ability (high) I did try acids and alkalis with them but they didn't really understand it but they did enjoy the colour changes Fossils, I try to bring it into the rocks topic in yr 3 to make it more interesting for the kids Environmental aspects-nature garden		**in?/Background in? Why would you like to see this on in particular?** Sure something, cant think, Quite like to do psychology cos that's my specialism

		Not allowed to have pond due to health and safety issues		

	Pilot	Year 5	Year8	Year 9
3k) What do you think about the structure of the curriculum?	Strength is that it does repeat itself a bit, built on **Some people describe the national curriculum as a spiral curriculum where the topics are revisited several times….how do you feel about this structure?** I think its good and particularly helps the **weaker ones**. Reinforces, big impact if taught in a different way. "I think its good, I think its goo(sic) it it helps everybody but it particularly helps the, the weaker ones. But I think it is good. It really does reinforce, amazing what a bit of time off can actually do, for, for learning, when you revisit something a second time I think it has	**Some people describe the national curriculum as a spiral curriculum where the topics are revisited several times….how do you feel about this structure?** I wouldn't describe it as a spiral because it has all the cross links. Its more of a 3d naughts and crosses board, different levels all linked, progression and cross links I do see a two yr gap as beneficial say y1, y3, y5. Allows for life development I would like to see a two year gap for topics this would be beneficial as give them a chance to develop language etc. Year on year not my choice-	Bitty, constraints- logistically ks3 **Some people describe the national curriculum as a spiral curriculum where the topics are revisited several times….how do you feel about this structure?** -repetition not a bad thing for low ability pupils***and benefit from those sorts of things -those who are more capable don't like it and therefore its detrimental, "we've done this before" attitude. Call be old fashioned in the good old days of o levels you started in year 7 and you never did the same thing twice, O'levels are equiv to modern A levels Finding the balance is difficult between good	Ks3 is more skills and have moved away from content. "I have no problem as long as when they are revisited, they are revisited for a reason other than just a recap" "when I re-jigged the key stage 3 a couple of years ago I got rid of quite a lot of topics that we repeated for no reason other than they were repeated from yr 7 to 9" **What do you mean reason?** "so that they are building on the information rather than go over the same stuff again" **Why are you against the repeating in particular?**

	a big impact especially when it is revisited in a slightly different way.” ***-potential quote as has big similarities with Bruner’s own description of spiral curriulum***		repletion and bad, now we do separate sciences in yr 9 to try and help, managerially a nightmare	************* “I think especially the high ability kids they get bored and switch off because they know they have done things before, it becomes too easy and they get bored”

Section 4:Teaching and learning methods

4.Did you bring that list of activities for me?	Pilot	Year 5	Year8	Year 9
4a) Thinking about these activities which you completed with year 5, what activities did they enjoy the most?	Modelling Exp with pulse rate **What prompts you to think that?** **How often are you able to use this type of activity in your lessons?** Went to the sports centre to do it, loved it Modelling- not good for all topics, ok for change of state too	Food packets, labels-hands on moving around, competition in finding out things ICT graph work-they like ICT Group work- discuss ideas amongst themselves **What prompts you to think that?** How often are you able to use this type of activity in your lessons? Probably about half the topics I can use equivalent activities	Practical, happy and positive questions But not all kinestetic learners **What prompts you to think that?** Could be every lesson, depends on the time	Report A couple were late Big differences in what they did
	Pilot	Year 5	Year8	Year 9

4b) Which activities were not so successful regarding their enjoyment?	Graph work **What gave you that impression?** **How do you try and engage them if you are required to do this activity?** They wander around, more questions. Try and link it to something to make it more tangible	1 or 2 didn't enjoy-Food diary-over a long weekend Gender differences **What gave you that impression?** **How do you try and engage them if you are required to do this activity?** Incomplete looking Try to pull in things/people from films or sports to catch their imagination	Graphs **What gave you that impression?** **How do you try and engage them if you are required to do this activity?** You cant plot a graph with a smile Relevance of it, exam questions	**As little activities in this topic more general comment** **28.00** Graph work phobia, but its an important skill **What gave you that impression?** **How do you try and engage them if you are required to do this activity**? They tell me! Make it a group activity, use the interactive board.
	Pilot	Year 5	Year8	Year 9
4c) Thinking about your own views, are you happy with they range of activities you are able to complete in class? 46.00 **(dependent on level of prescription of the school)**	With this topic yes definitely **Is there anything you would like to do more/less of?** A pond	Yes for the time we have **Is there anything you would like to do more/less of?** More ICT, tasting food its so difficult with all the health and safety aspects and food allergies-shame	Yes **Is there anything you would like to do more/less of?** More practical work less time restraints	Possibly not, time pressure. **Is there anything you would like to do more/less of?** Tasting foods

Section 5: Progression

5. In this section I'm	Pilot	Year 5	Year8	Year 9

going to be asking about progression of the curriculum				
5a) What do you understand about by the term progression?	Teaching objectives that build on. Poss quote "I want, I know that some children are going to know a lot about certain topics and I would want to try and progress them from where their at which could easily be beyond what the scheme is telling me" **Is it a term that is often used in school?** **By whom?** **In what context?** Not enough more about attainment, but then the expected level of attainment is high	Moving forward understanding more, increasing depth and breadth but also linking with what has gone before **Is it a term that is often used in school?** **By whom?** **In what context?** Curriculum planning meetings	Adding layers of complexity onto a given topic **Is it a term that is often used in school?** **By whom?** **In what context?** Yes by all teaching staff Especially in between key stages	Building on prior knowledge. **In relation to the curriculum?** I don't know, not sure. Depth of science increasing and the level of skills needed **Is it a term that is often used in school?** **By whom?** **In what context?** Progression? Yeah. Staff meetings etc 32.50 **Have you**. Heard of continuity? Not really
	Pilot	Year 5	Year8	Year 9
5b) Thinking about the food topic how is progression expressed in the national curriculum?	Year 3 stuff shorter and we build on it. Then he admits to revising teeth to make sure they remember	Development of language Development of concepts Food groups moving to balanced diet later	Organ names to organ functions to details of organ design	Ks 3 just look at food groups and effects on body, balanced diet and exercise. Ks4 look at cholesterol blood pressure, overweight,

				malnourished. Higher level thinking really terms. **Adverse effects really?** yeah
	Pilot	Year 5	Year8	Year 9
5c) And in your own scheme of work?	QCA is self organised, activities it generates are more appropriate to older children/higher expectations in year 5 **Objectives?** **Key words?** Everybody, most and some levels in QCA mentioned	Language, key words what you would expect of a y3 pupil is less developed than a y5 pupil. For example in y3 we would expect them to be able to put food into cut and dried groups-bread etc but y5 would know that one food will sit in several groups, also uses of food, lifestyle influences on requirements, pregnancy, disease Cheese protein and fat	Not as explicit as that or as it should be **Elaborate?**, not really linking to past of future but if you had them side by side it definitely adds	Not sure **Objectives?** **Key words?** Objectives are differentiated as are the tasks. But higher and foundation need to know the same
	Pilot	Year 5	Year8	Year 9
5e) Do you use any of the literature available online or in other resources?	Virtual experiments **QCA, DfES, NC Online, Journals?** Scholastics	Supermarket leaflets, adverts Have to be careful though **QCA, DfES, NC Online, Journals?** QCA	**QCA, DfES, NC Online, Journals?** QCA very occasionally, journals, education in science, ASE, focus, catalyst Not keen on	**QCA, DfES, NC Online, Journals** No to above Look up stuff on internet but nothing official.

		NConline dip in too Journals not really CGP key stage 2 book Exploring science by Longman but this is out of print, changing to raising stars. **How did you use this material?** **Why**? Mostly food packaging for this topic	governmental website don't find them helpful	
	Pilot	Year 5	Year8	Year 9
5f) What do you think about progression in the national curriculum?	Ok, maybe even over focus on the practical side. Needs more about understanding quite specific targets	Good for non specialist to cover a range of things	Should be more explicit, general statements The way the government is acting keeping it top secret is mad! (referring to the brief nature of the new curriculum)	Room for every could to get best route available for them to progress, well at least in this school there is going to be in the next few years. **Gcse in yr 9, instant push** *7.20 "I don't think there is very good progression between ks2 and 3, in terms of level descriptors. A childs supposed to come in on a 5b, but when we assess them they are no where near that."

				"levels don't seem to make" Overestimate at 2

<u>Section 6: Activity</u>

"Ok, great. Almost there now. I want to end with an activity. I've had a look at the **objectives** highlighted in the **QCA's schemes of work** in connection with the food topics. Could you have a look at them for me?

(Yr 1 not shown) that we need to eat and drink to stay alive, (Yr 2 not shown) that humans need water and food to stay alive, (Yr 3 not shown) that all animals, including humans, need to feed

	Pilot	Year 5	Year8	Year 9
6a) Do you have any thoughts on them?	Quite basic, Quote; "I would hope every child in key stage 2 would you know take for granted almost. And there is quite a lot of similarity between them isn't there?"	Feed? What does that mean? Do you mean solids, liquids? Humans need water and food to stay alive-don't have a problem with that but its alive not healthy Eat and drink to stay alive- not so happy with that one	Very general statements, 2 mention food and water to stay alive other need to feed but doesn't say why, Feed basic	"if those are objectives to me I wouldn't call them objectives. So I'm critical of the QCA. I don't think they are prescriptive enough. I think an objective should have some sort of measure against it." "so the child you be able to do something to prove" 40.10 "also they are really quite repetitive. All three of them mean the same thing."
	Pilot	Year 5	Year8	Year 9
6b) Could you put them	*"Its quite difficult 'cos*	Basic	Animals	We need and humans

in order for me to illustrate how you think about progression?	*they are so similar those two are virtually the same (drums table again), I, I'm not even sure they demonstrate progression"* humans, we, animals **Can you explain to me the reasons behind this order?** **If they have illustrated progression in terms of we, humans, all animals;** **Removing those terms from the statements, is there anything in the remainder of the statements you could illustrate progression with?** "bottom to top and I would say that I would hope that the children lower down the school recognises that at least everybody eats, so they would see it as a need **yeah** um and that's the only reason I made a distinction between that	We need All animals Humans More advanced **Can you explain to me the reasons behind this order?** **If they have illustrated progression in terms of we, humans, all animals;** **Removing those terms from the statements, is there anything in the remainder of the statements you could illustrate progression with?** The we (yourself) branches out in the statement all animals because they often don't think of humans as animals. I put the human one last because it uses water and therefore is more in depth than drink. Food aspects only-	We Humans But the last two are not really professional **Can you explain to me the reasons behind this order?** **If they have illustrated progression in terms of we, humans, all animals;** **Removing those terms from the statements, is there anything in the remainder of the statements you could illustrate progression with?** All animals lowest ability because only mentions feeding, so most basic ks2, Next one we has the addition of drink also says we. Then humans and food But again "its so ridiculously nit picky" "its like im going to give you a full stop now and maybe next week I will	need are the same. All animals is different cos you are linking that humans are animals. But all in all they do not show much progression in those statements. We and humans together and all animals as the 3rd one. **Ignoring all other aspects and just concentrating on the food terms could you separate them in terms of progression?** eat and drink before water and food possibly, I keep changing my mind. Not 100% convinced.

	one (gesture to the year 3) and these two (Year 1 and 2), which actually acknowledge that if you don't do it you are gonna die. **Right, Right so so tell me again, which way, you've got this as the most basic** basic, **basic** yeah **Ok so hang on a second 'cos I've written then down wrong, basic** (exclaims) it could have just as easily been the other way but there you go. **And the reason is because this is just saying it needs to feed whereas these are saying they have some sort of negative aspect?** Consequences yeah **consequences** yeah I would hope that at least the younger children would at least know that everybody eats…"	nutrition and feeding- maybe the wrong way round (2nd 3rd)	give you a comma" "I would think this is wasting my time just tell me the whole damn lot in one go" "I feel like a member of Mi5 rather than a school teacher"	
	Pilot	Year 5	Year8	Year 9
6c) They are from three separate years. Do you	all in key stage one 2, 1, reception (order	2,3,5	7,8,9	We need- some thing in primary

have any thought on which years they might be?	shown is 2, 1, year 3) **What makes you think this way?** (Because) I cant believe they are older	**What makes you think this way?** Language really and some are the more specific in detail	**What makes you think this way?** Ks2 or 3 definitely or maybe a cross over 6,7,8. not ks 4 at not complex enough	Humans in between. um late primary All animals year 9**3 consecutive years (if applicable)** Bridging two key stages. 7, 8, 9 (no hesitation) **What makes you think this way?** Its mainly the last one the all animals, that's drawing on other knowledge. I think it's the language too eat and drink is easier.
If incorrect reveal the QCA order and years	Pilot	Year 5	Year8	Year 9
6d) How easy did you find it coming up with the order?	Really hard **So it has gone from we, humans to animals** Quote; "just identifying distinctions between um us needing to eat and drink and humans needing water and food I don't think I really see how that is progressive **yeah** Its er the steps you could do that in one lesson couldn't you"	Hard- they are not my years Is there anything in particular you found confusing? **So it has gone from we, humans to animals** Right I can see that (the logic) but I still feel the specific term water is more complex	"Its ridiculous" **Is there anything in particular you found confusing?** "yeah all of it the wording" "The difference between the words is so nit picky, its stupid" "I feel as if I'm in the wrong job now, not only am I	**Right order just wrong years** Oh fantastic completely wrong then. The order was ok in the end because of we, humans and animals, eat to feed. **Is there anything in particular you found confusing?**

		Now I can see it so it doesn't seem confusing but at the time the words suggest to me	supposed to deliver meaningful science but I'm also supposed to be an English analysist" All, wording, difficult, stupid, nit picking	"All mean the same thing, nothing to stop a kid in yr 1 understanding the objective for year 3"
	Pilot	Year 5	Year8	Year 9
6e) How do you think these objectives show progression?	I suppose on that one they've, the year 1 child can relate to themselves and know that they eat, this one they recognise that others do it **yeah** and in this one they recognize that its not just humans but animals do it as well.	Themselves-humans-animals Again I said it earlier on doing it year on year is wrong, you need a two year gap	They don't show progression really not for the bulk standard teacher, we don't have the time for this analysis, I'm not an English teacher, it needs to be done for us	N/A
	Pilot	Year 5	Year8	Year 9
6f) How easy do you think it is to come up with lesson material that ensures progression based on these objectives?	"Um, I think quite difficult if you are doing them all in the same week! (laugh) **(laugh)** um but I think its quite, I, I, think its very difficult to actually demonstrate progressive, I, I, think the activity would have to be more demanding in other ways **yep** you would have to have additional	Difficult-due to the differing knowledge of the teachers, discussion amongst teachers needed	Easy for a select government committee! But they are the ones who need to do their job properly and provide us with what we need. I cant see where the difference is Only difference is animals, humans and we, nothing to do with food	"based on those objectives I would find it really difficult" **Considering the objectives in years 2 and 3, and that these cross key st 1 and 2.** ****** "Yeah there is hardly any difference there at all. Not that much progression between those 2 at all" more than

	objectives" **Considering the objectives in years 2 and 3, and that these cross key st 1 and 2.** I think with these, at least what you can do with that is you can at least investigate animals and that that would demand some kind of research which I would think at least the year 3's would at least be more likely to be engaged in			between 1 and 2 though.
	Pilot	Year 5	Year8	Year 9
6g) Could you off the top of you head come up with lesson material that would show progression based on these objectives?	"only in the year 1 you could say you could get them to do their own dietary, what they've had in a week **yeah** then in year 2 you could get them to do what their mum has eaten in a week **yeah** I can't think that how else, I think it's a fairly vague distinction **yeah** In some ways"	Not easily, also based on children involved	n/a	Hard, no.

(Yr 5 not shown) that to stay healthy we need an adequate and varied diet, (Yr 8 not shown) that a healthy diet contains a balance of foodstuffs, (Yr 9 not shown) that a balanced diet requires nutrients, including vitamins, in the correct quantities

	Pilot	Year 5	Year 8	Year 9
7a) Do you have any thoughts on them?		**Rushed section due to lack of time** Quantities definitely most complex, Changes order of adequate diet and balance 1.11 Think the yr 8 statement is simpler than the yr 5. Confusion between balance and adequate. May be it's a simpler statement because they have done it before. But then I talk about quantities with yr 5.	Stay healthy varied diet Healthy diet introducing the word balance Balanced diet introduces the quantities There is progression in the terms used	Similar comments, not very prescriptive. They are more of a need to know statement Healthy diet Balanced diet Adequate and varied ?
	Pilot	Year 5	Year8	Year 9
7b) Could you put them in order for me to illustrate how you think about progression?			See above	Healthy diet contains a balance of foodstuffs Balanced and vitamins Adequate
	Pilot	Year 5	Year8	Year 9
7c) They are from three separate years. Do you have any thought on which years they might be?		n/a	1-3, ks 2, ks 3	Healthy diet 8 or 9 7,8,9 Or 8,9,10 What makes you think this way? balanced is, is more

				prescriptive, then goes less prescriptive?
If incorrect reveal the QCA order and years.	Pilot	Year 5	Year8	Year 9
7d) How easy did you find it coming up with the order?		Quantities is the easy one. The other two need greater consideration.	Easy, there was a natural order to it Not confusing as progressional	Oh wow. Completely wrong. Really difficult **Is there anything in particular you found confusing?** Language not different, quite surprised that a year 5, would have words like adequate because I think its quite complex, especially compared to the year 8 one.
	Pilot	Year 5	Year8	Year 9
7e) How do you think these objectives show progression? (If applicable)			See above	5- don't need to know balanced, year 8 brings in balanced and in year 9, the introduction of the terms nutrients and vitamins. **Do you think they wouldn't have covered vitamins before yr 9 then based on that?** Down to the teacher, but looking at that you

				would say not. But I would imagine even a kid in year 5 would have heard vitamin before.
	Pilot	Year 5	Year8	Year 9
7f) How easy do you think it is to come up with lesson material that ensures progression based on these objectives?		Its kind of irrelevant because the senior schools are getting pupils from so many feeder schools they have to start again 1.11 **Do you think this is required because there is no guarantee that pupils have covered concepts?** yes	More easy than the last set	Easier than before, cos theres a bit more in those objectives to guide you towards what needs to be covered
	Pilot	Year 5	Year8	Year 9
7g) Could you off the top of you head come up with lesson material that would show progression based on these objectives?				
	Pilot	Year 5	Year8	Year 9
	Informal section in pilot **Out of interest do you want to have a look at**		**Are you surprised they cover it in all those years?** Not especially, it does seem a bit diluted,	“I think a lot kids get turned off by repeating the stuff”

	the other ones? Yeah go on then **these are err for I won't spoil it but they are older aged objectives** from key stage 2? **I'm not going to let you, I almost let it slip then!** Ok, **but these are for teachers that have got older aged children** Ok, that looks like what we are doing almost, I not sure if it is one of ours but it looks like one of ours, it could be, that is definitely one of ours, that is a year 5 one surely, they are almost all stuff we are doing … I think so, I'm sure they are not, I'm sure you are going to tell me they are not, when we do food and healthy living ,but when we do it I would hope that all of ours would know before the end of it **Yeah** The top one, requires nutria (sic), nutrients in the correct		Could lump year 1,2,3 all together. "in my view for primary schools to make there experience more pleasant they are nicking all the ks3 practicals, so when the kids get here they find it dead boring, and we are up a gum tree, you see this is where prescription would be, is essential" **now its vague its only going to happen more because people don't know what been covered**	

	quantities that might, but I'm not sure about that last bit for ours but that last bit for ours, **so which one's do you think are year 5** Its just I'm not quite sure how much they are supposed to know in year 3 on this one, but one of them is going to be a year 3 isn't it? **I'm not giving you any clues** correct quantities we do a pyramid **yeah** where they have to have the right amount of each stuff so that could be, could be a year 5 one, it's just that vitamins bit that's making me think. To stay healthy we need an adequate and varied diet, contains a balance…that's probably the lowest one, probably that's a year 3, but they only do it in years 3 and 5, so does that mean unless some of these is beyond year			

	5, which I could n't believe, **There is something beyond year 5,** is there? **Yeah** Maybe its that, maybe that's the top one then. I don't know, I will put it in that order, I don't know what to do with those two, but, that's the bottom one I think **yep** (actually places year 8 at bottom) one of these is a year 5 and one is beyond year 5 in correct quantities, (drums table) I'm going to go for that. **Right guess the year!** 3, **(reveals)** 8! That's ridiculous, 'cos the top one is 5, **Guess what this one is!** That would be 5, **(reveals)** 9! Don't be, I suppose that's the 5 then is it, **yeah**. That's crazy is n't it! **Yep** That is absolutely ridiculous, 'cos we do that, we definitely do that			

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