An investigation into the impact of aspects of a Learning Intervention Programme, and the use of perceived preferred learning styles, on the effectiveness of learning in a secondary school in Merseyside: a Case Study.

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor in Philosophy by John William Storrar.

June 2008.

DECLARATION AND DISCLAIMER

I, the undersigned, confirm that the work that I have presented as my thesis is entirely my own work.

Reference to, quotation from, and discussion of the work of any other person, has been correctly acknowledged within the work, in accordance with University guidelines for the production of a thesis.

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ABSTRACT

This study investigates, through a systematic and critical analysis, how one school in Merseyside (the Case Study School, CSS) has attempted to introduce, and use, a Learning Intervention Programme (LIP) as part of its overall strategy to raise pupil achievement by aiming to create a climate in its classrooms, which leads to more effective learning. The study suggests that the introduction and use of a six-part lesson-planning cycle at CSS, based on experiential learning cycles, has had an overall positive effect on the climate of learning within the school, particularly when pupils are more actively engaged in their lessons. Pupils were found to appear to respond more favourably to short, engaging activities and were less motivated by long periods of teacher exposition. Positive aspects of the introduction of LIP were often linked to lesson structure and planning: all teachers interviewed agreed, most of them strongly, that LIP has made them think about new teaching strategies and most thought that it had helped them to plan lessons better. There are also some indications that pupils see its importance and there is evidence that pupils value the contribution of 'starters', lesson objectives', 'lesson outcomes' 'recap' and the review of prior learning. The study notes that there is considerable overlap, both with work on Assessment for Learning (AfL) and with the major national projects 'Learning to Learn' (L2L) and 'Learning How to Learn' (LHTL).

The analysis and use of Visual, Auditory and Kinaesthetic (VAK) learning styles is currently the subject of some considerable controversy, with a number of claims and counter-claims being made for its practice. This study presents both a discussion of these claims and counter-claims and offers a teacher and a pupil perspective on VAK learning styles. It also highlights the confusion between the term 'learning style' and 'cognitive style' and attempts to offer some differentiation between them. It appears to be the case that teachers in secondary schools refer to learning rather than cognitive styles, possibly because 'official' guidance documents tend to use that term. Evidence is presented that suggests that the large majority of schools surveyed in this study do analyse, and attempt to use, VAK learning styles and that there is wide teacher support for this, although with the rider that it is necessary to encourage pupils to use all styles. Although there is some evidence in the literature to suggest that the use of preferred VAK learning styles can be beneficial, there is very little to suggest that this has had much, if any, direct influence on pupil learning in the case study school. However, the awareness of pupil learning styles does appear to have encouraged teachers at CSS to use a wider range of multisensory activities to support the delivery section of its lesson-planning cycle.

CONTENTS

ILLUSTRATIONS: Figures, Tables and Charts used within the Thesis

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LIST OF ABBREVIATIONS

AfL	Assessment for Learning
Alite	Accelerated Learning in Training and Education
BERA	British Educational Research Association
CASE	Cognitive Acceleration in Science Education
CDP	Continued Professional Development
CAT	Cognitive Ability Test
CoRT	Cognitive Research Trust
CSS	Case Study School
DfCSF	Department for Children, Schools and Families
DfEE	Department for Education and Employment
DfES	Department for Education and Skills
ESRC	Economic and Social Research Council
GCSE	General Certificate of Secondary Education
IE	Instrumental Enrichment
KS3	Key Stage Three
KS4	Key Stage Four
LHTL	Learning How to Learn
LIP	Learning Intervention Programme
LRSC	Learning and Skills Research Centre
LSDA	Learning and Skills Development Agency
L2L	Learning to Learn
MIP	Multisensory Instructional Packages
NFER	National Foundation for Educational Research
NLP	Neuro-Linguistic Programming
NRC	National Research Council
NSIN	National School Improvement Network
Ofsted	Office for the Standards of Education
PGCE	Postgraduate Certificate in Education
PRT	Piagetian Reasoning Tasks
PSE	Personal and Social Education
QCA	Qualifications and Curriculum Authority
SAT	Standard Assessment Task
SMT	Senior Management Team
TLRP	Teaching and Learning Research Programme
VAK	Visual, Auditory and Kinaesthetic
ZPD	Zone of Proximal Development

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I am indebted to the head teacher, and to the governors of the Case Study School for permission to conduct research at the school. In particular, I owe a huge debt of gratitude to teacher X, who for the purposes of anonymity has to remain unnamed, but who was constantly involved in discussions about the progress of my research. I am grateful to the science teachers at CSS who agreed to take part in interviews and to complete questionnaires - especially those who had the courage to allow me to observe their lessons- and to the science mentors and other teachers in schools in partnership with Liverpool Hope University who completed questionnaires and a survey. I would also wish to acknowledge, and thank, the pupils within the school who accepted my intrusion into their classes and who completed questionnaires and answered interview questions.

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CHAPTER ONE.

Introduction; aims of my research; rationale for research; the scope of my study; the case study school; outline of the thesis.

Introduction

This study investigates, through a systematic and critical analysis, how one school in Merseyside (the Case Study School, CSS) has attempted to introduce, and use, a Learning Intervention Programme (LIP) as part of its overall strategy to raise pupil achievement by aiming to create a climate in its classrooms, which leads to more effective learning.

From initial discussions at CSS, with a member of the school's Senior Management Team, with responsibility for teaching and learning, (teacher X), it was apparent that CSS was effectively trying to 'change the way pupils learn' and was influenced in this, not just by a recognition that they were under external pressure to continue to develop strategies to raise pupil achievement, but by a number of other factors. These included: a number of policy documents on effective learning and learning styles (e.g. Department for Education and Skills, DfES, 2003a; DfES, 2003b and Department for Education and Employment, DfEE, 2000); accelerated learning (Smith, 1996; 1998; Smith *et al*, 2003; Greenhalgh, 2002); and Assessment for Learning (AfL), (e.g. Black and Wiliam, 1998; Assessment Reform Group, 1999; Black *et al*, 2002, DfES, 2004a, Deakin-Crick *et al*, 2005). Accelerated learning has been described as an umbrella term for a series of approaches to learning (Caviglioli and Harris, 2000), which are based, according to Smith (1996), on theories and research about learning styles, how the brain functions and how pupils access different sorts of intelligence to retain and recall information. Although the study of AfL is beyond the scope of my study, there are some aspects of it that do overlap with LIP, particularly those relating to sharing lesson objectives with pupils and the importance of reviewing.

As part of LIP, CSS introduced:

- a six-part lesson-planning model (mind state; connect with prior experience; the big picture; outcomes; delivery (i.e. teaching and learning, including a multi sensory input); review and reflect,based on accelerated learning cycles (Smith, 1996, 1998; Greenhalgh, 2002; Smith *et al*, 2003), in turn based on experiential learning cycles, (e.g. Kolb, 1976; Gregorc, 1982; McCarthy, 1990).
- an 'Enrichment' lesson to all pupils in years 7 and 8, designed to encourage pupils to 'learn how to learn' (e.g. Carnell and Lodge, 2002).
- the analysis and use of preferred pupil learning styles, with an emphasis on VAK, (e.g. Reinert, 1976; Dunn and Dunn, 1978; O'Connor, 2001), and on Multiple Intelligences (e.g. Gardner, 1983; Lazear, 2005);

Teacher X had meetings with key personnel within the school to discuss aspects of LIP, in particular the use of the lesson-planning cycle, and all teachers received some training relating to 'changing the way pupils learn', including what is meant by the term 'effective learners', (DfES, 2003a: 3), and why it had introduced VAK learning styles and aspects of accelerated learning. It was expected that all classrooms would display posters summarising the lesson-planning cycle, that it would be evident within pupil planners and that it should be discussed with pupils in their lessons, specifically within its timetabled 'Enrichment' programme. Long-term aims of LIP included the whole-school implementation of its lesson-planning cycle and the promotion of active learning.

Aims of my Research

The overall aim of my case study research was to work collaboratively with the teachers in CSS, in order to improve professional practice so that benefits of the research could be seen in the classroom. In particular, it examined whether or not there is any evidence to support two hypotheses:

- That LIP will lead to enhanced pupil and teacher perceptions regarding effective learning.
- That the analysis of pupil preferred learning styles, and subsequent use by teachers in lessons, will result in improved pupil motivation.

In order to investigate these hypotheses, I investigated the impact of LIP on the effectiveness of learning; teacher perceptions on the usefulness of the identification and use of preferred VAK learning styles; and the relationship between current research findings into learning styles and effective learning. The evidence is presented and discussed in chapters four, five and six, through two main themes:

1. The introduction and use of a six-part lesson-planning cycle, based on experiential learning cycle models
2. Learning styles, active learning and a wider perspective.

Related to both of these is the extent to which the school is using a range of strategies to engage the pupils in their learning through an active learning approach (e.g. Stephenson, 1992; Briggs and Sommefeldt, 2002). A wider dimension, gained from 87 other teachers in 36 different schools, aimed to seek a comparative view, particularly with regard to the analysis and use of learning styles and to some aspects of accelerated learning.

Rationale for my research

CSS was keen to have an external evaluation of LIP, and had made this known to Liverpool Hope University, where I work as course leader for secondary science within the Post Graduate Certificate in Education (PGCE). A key aspect of my work has been to ensure that I have continued to possess up-to-date knowledge and understanding of recent educational initiatives and pedagogical methods. It seemed apparent, by talking to teachers in schools, and to candidates applying to be trainee teachers, that a large number of schools were attempting to identify, and use, the preferred learning styles of pupils, in terms of VAK, and that many teachers have attended training on accelerated learning techniques.

There are, as Coffield *et al* (2004a), point out, many assumptions about what is 'good practice' and learning styles being made in policy documents and guidelines for teachers (e.g. DfEE, 2000; DfES, 2003a, 2003b, 2005a) and there are pressures on schools to incorporate the messages from such publications, particularly as "some of the learning style literature promises practitioners a simple solution to the complex problems of improving the attainment, motivation, attitudes and attendance of students" (Coffield *et al*, 2004a: 50). Several of the publications make reference to accelerated learning, Multiple Intelligences and to the need to respond to the preferred learning style of pupils, with an emphasis on VAK learners.

There are claims that accelerated learning and the use of VAK learning styles has led to increased attainment in schools (e.g. Wise and Lovatt, 2001; Lucas *et al*, 2002). However, I would argue that, as recent work (e.g. Stahl, 1999; Bedford, 2004; Coffield *et al*, 2004a, 2004b; Coffield, 2005; Geake, 2005; Teaching and Learning Research Programme, (TLRP), 2007) has started to cast doubt over some of the assumptions about learning styles and 'good practice', my study is particularly valid.

For example, Coffield *et al* (2004a) opine that some of the learning styles instruments make extravagant claims of success, which, in their opinion, are not upheld when subjected to scrutiny; they further argue that labelling a pupil may do them more harm than good. Stahl (1999) makes an even more damning statement, claiming that there is an utter failure in the research literature to show that assessing children's learning styles, and matching to instructional methods, has any effect on their learning. There are however, several counter claims made. For example, research by the Learning Skills Development Agency (LSDA, 2004) suggests that students do become more motivated to learn by knowing about their own strengths and weaknesses as learners and, if teachers can respond flexibly to students' individual learning styles, then the quality of teaching and learning is likely to rise. Other arguments to support the use of learning styles include those made by Prashnig, 2004; Gadt-Johnson and Price, 2000; Lovelace, 2005 and Bostrom, 2005.

A number of secondary schools (including CSS) have attempted to identify the preferred learning styles of their pupils and to share this information with teachers and pupils alike so as to impact on pupil learning (e.g. DfES, 2005, Cleland, 2005; McLaughlin *et al,* 2006; and Farmery, 2004). The DfES (2003a) suggest that learning opportunities with suitable challenge can be offered to all and that, in many classrooms, there is a mismatch between the learning opportunities presented to pupils and their preferred learning styles (DfES, 2003b). This is given even greater emphasis in, for example, the science National Curriculum (DfES, 2004b: 40), which places a responsibility upon teachers to provide effective learning opportunities for all pupils, including the use of teaching approaches appropriate to different learning styles and the use of appropriate assessment approaches that allow for different learning styles.

The Scope of my study

The bulk of my research was carried out in CSS, with a main focus on one faculty (science), following a year group of approximately 200 pupils (y7, 2004-5) as they progressed through the school from year 7 through year 8 (2005-6) and into year 9 (2006-7), with 12 pupils from this year group monitored more closely during a sequence of lesson observations. Nine science teachers agreed to participate in my study, primarily because they wished to undergo meaningful professional development. This was then built into the programme and became an important aspect of my work with the school. The teachers completed questionnaires, underwent semi-structured interviews and allowed me to observe their classes. Over the course of my data collection at CSS, I interviewed nine science teachers, nine pupils from year 7 (2004-5), twelve pupils from year 9 (2006-7) at the end of my research, and regularly discussed progress, issues and needs with teacher X and the science staff.

I used a number of questionnaires to support my work. Nine science teachers completed questionnaire 1, which examined aspects of the lesson-planning cycle; and questionnaire 2, which was developed from questionnaire 1 and which included, in addition to further questions relevant to the lesson-planning cycle, questions on LIP, accelerated learning and learning styles. 145 pupils from year 7 (2004-2005) and 78 from year 11 (2004-2005) completed a pupil version of questionnaire 1 (questionnaire 1a). A further 74 pupils in year 8 (2005-6) later completed questionnaire 4, which sought a wider perspective with regard to their learning; twelve of these were then interviewed when they were in year 9, towards the end of my research.

The teachers within the science faculty, pursuing some of the issues emerging from my study, together with some of their own, used a questionnaire (questionnaire 5) with y7 pupils (2007-8), which had much commonality with questionnaires 4 and 1a and hence afforded a useful comparator for the results of my study.

A wider school perspective was gained by discussions with teacher X and by the use of a questionnaire on learning styles (questionnaire 3) involving teachers from curriculum areas other than science. A comparative view was also gained through the use of questionnaire 1 and a modified form of questionnaire 2 (questionnaire 2a, with no specific reference to LIP or to the lesson-planning cycle) with science teachers from eleven other schools and through a survey on learning styles (questionnaire 3) of 87 teachers across the curriculum in 36 schools, mainly in the North West of England.

The Case Study School

The school has been described in a recent Office for the Standards of Education report (Ofsted, 2006), but to maintain anonymity this has not been referenced. Some extracts, which give a useful overview of the character of the school, and which are most relevant to my study are included below:

> The overall level of deprivation is high by national standards and, alongside economic deprivation, the school's community experiences social and cultural deprivation. Unemployment among young people in the area is high and some youngsters live in families where there are three generations of unemployed. The intake of the school is almost 100% white British. The percentage of children eligible for school meals is well above the national average. The percentage of children with learning difficulties and/or disabilities is above the national average. The school provides a satisfactory education for its pupils. Although examination results remain significantly below national averages there is evidence of improvement in achievement and standards. The school recognises that weaknesses in achievement remain and that it needs to continue to tackle them robustly. Teaching is satisfactory, with some lessons that are good and occasionally outstanding. However in the weaker lessons there were too many missed opportunities for challenge and a lack of pace. The school has placed an increasing emphasis on developing teachers' skills and encouraging the sharing of good ideas and practice. The school has the capacity to improve and has appropriate plans for improvement.

The Ofsted report goes on to highlight some areas in which the school can continue to raise standards, and these include two aspects that are pertinent to my study: identifying what is most effective in raising standards and promoting this throughout the school; and further improvement of the quality of teaching and learning.

Outline of the content of the thesis

Chapter one serves to give a general introduction to the thesis and offers a summary account of the aims, the rationale and the scope of the study alongside a brief description of the characteristics of CSS.

Chapter two develops the rationale for my research through a critique of the relevant research, literature and current thinking underpinning my study. It offers an in-depth discussion on the main features of the study, namely experiential learning cycles, cognitive and learning styles and Multiple Intelligences, brain-based learning and effective learning. A consideration of how theories of learning relate to the study is also highly relevant and is therefore included. Within the chapter it notes that helping pupils to become more effective learners is at the heart of a metacognitive approach (e.g. Flavell, 1979; Smith, 1998; National Research Council, NRC, 2005) and also discusses, for example, the notions of 'surface' and 'deep' learning (e.g. Tait and Entwistle, 1996; Campbell *et al*, 2001); 'rote' and 'meaningful' learning (Novak, 1998) and 'working memory' (e.g. Macintosh, 1999; Baddeley, 2000, 2003; Gathercole *et al*, 2004 and Cowan, 1995, 2005).

The two terms 'cognitive style' and 'learning style' are, it is noted, often confused with each other and often overlap; an attempt to clarify this is offered. The emphasis in secondary schools is very much on VAK learning styles, but it is much more difficult to find any meaningful and useful definition of what this really means and the usage is, as noted earlier, the subject of much controversy. The claims and counter claims of the use of learning styles are presented in depth.

Chapter three offers a detailed discussion of my methodological approach to the study. A key feature that underpinned my research methodology was the involvement of the practitioners themselves, i.e. the teachers in CSS, working in partnership with myself. I followed, what could be termed, a participatory action research path, where the research was carried out with (rather than by) the practitioners and it could, perhaps, be argued that it is related to 'emancipatory action research', as, at least to some extent, joint responsibility for practice and process was with the participant group, (Kemmis, in Hammersley, 1993: 187). Some examples of this include their involvement in discussions before and after lesson observations, their involvement in the completion of questionnaires and interviews, the end of research evaluation (appendix 1) and their production and use of questionnaire 5 to further investigate issues that emerged during my research.

Inevitably perhaps, there were some tensions between school development and my research. Some of these tensions originated, partly as a result of the apparently different views from pupils and teachers that emerged during the research, and partly due to the fact that I was involved in a number of different roles: as researcher, as a provider of Continued Professional Development (CPD) for the teachers and as an evaluator of LIP from the school's senior management perspective. These tensions were never, I feel, a serious barrier to the study, partly, I suspect, because my findings were frequently discussed with teacher X and with the science teachers and also because the teachers involved were genuinely interested in aiming to use the findings to seek improvement in practice and to use it as an opportunity for professional development. This is discussed more fully in chapter seven. Although my role would, to some extent, change during the research process, and there were occasions when I was acting more specifically, I consciously attempted to minimise the potential tensions by integrating the roles. For example, working with the science teachers involved in lesson observations, I was careful always to ensure that feedback on the lesson was built into the schedule, so that research linked to CPD. Frequent discussions with teacher X meant that evaluative aspects of my research could be regularly discussed at senior management meetings; key issues emerging from my findings featured in the School Improvement Plan.

Within my case study, I followed a mixed-methods research design (e.g.Tashakkori and Teddlie, 1998; Teddlie and Tashakkori, 2003, 2006; Maxwell and Loomis, 2003, Creswell, 2003; Gorard and Taylor, 2004, Yin, 2006 and Creswell and Plano Clark, 2007), but with a greater emphasis on qualitative, rather than quantitative methods. The methodological approaches that I used were eclectic and broad and I used a number of data-gathering activities: questionnaires, observations of science lessons, (including pupil monitoring) and interviews, with science teachers and pupils. A key feature within the study was the use of 'pupil voice' to offer a pupil perspective on aspects of LIP as a comparator to the teacher view; it also afforded, through an investigation into pupil perceptions of learning, (questionnaires 4 and 5), a comparison with the findings of, for example, Postlethwaite and Haggarty (2002) and Black *et al* (2006). I considered it to be vitally important to include pupils: "schools cannot learn how to become better places for learning without asking the pupils" (Crane, 2001: 54). A fuller discussion of 'pupil voice' may be found within chapter six.

Chapter four presents, and analyses, findings from theme one and addresses the impact of LIP on the effectiveness of learning at CSS. Initial interviews with pupils and science teachers indicated that although a number of features of the lesson-planning model appeared to be incorporated within the science faculty, there was some disparity between the teacher and the pupil perspective. This was pursued through the use of questionnaire 1 with teachers and a pupil version, questionnaire 1a; again some disparity with the pupil view, particularly in relation to the use of objectives and the calmness at the start of a lesson, was evident, There was also some small disparity between the teachers themselves in terms of their interpretation of the lesson-planning model, for example, an inconsistent use of the term 'objective' during lessons, as noted during my period of observation, described in chapter five. The science teachers also responded to a second questionnaire, which addressed aspects of LIP and accelerated learning more comprehensively. A wider comparison with science teachers from a number of different schools revealed general broad agreement with teacher views at CSS. Evidence is also presented from a series of ten lesson observations, which sought to gain a view on the stages of the lesson-planning cycle. Pupils in year 8 also completed a questionnaire, which sought a wider pupil perspective with regard to their learning. Towards the end of my data collection, interviews with year 9 pupils (2006-7) sought to probe responses to this questionnaire more deeply and to revisit earlier questions on LIP. The science teachers later shared their findings from questionnaire 5, which explored some of the emerging issues from the study. This proved to be very valuable, both in confirming some of the findings from the study and also in helping to suggest areas for further research.

Chapter five presents and analyses findings from theme two, in particular to teacher perceptions on the usefulness of the identification and use of preferred VAK learning styles and the use of a range of strategies to actively engage pupils in their learning. The data collection methods largely overlap with those used within theme one, but this chapter also includes the analysis of a wider VAK survey across 37 secondary schools.

Chapter six offers an in-depth discussion of the findings through the two themes presented in chapters four and five and puts them in the context of chapter two's critique of wider research findings. This discussion leads to the formulation of some conclusions, which are presented in chapter seven. The discussion is widened to include some issues that emerged during the research, often through the 'pupil voice', relating, for example, to the apparent pupil preference for collaborative group work, particularly amongst girls. Whilst there are some indications of the benefits of group work (e.g. Webb and Palinscar, 1996; O'Donnell and King, 1999 and Slavin, 2003), there are also conflicting views (e.g. Galton *et al*, 1999; Baines *et al*, 2003; Blatchford *et al*, 2004). Wider research (e.g. Swann and Graddol, 1988; Howe, 1997; Myhill, 2002) allows a discussion of possible differences in pupil interaction by gender and some comments are made with regard to the introduction of single-sex teaching (e.g Warrington and Younger, 2003; Jones and Myhill, 2004; Ponchaud, 2008).

Chapter seven summarises the findings of my study, in particular in relation to the two hypotheses presented in chapter one, highlights the implications for the school and suggests further research opportunities. The value of the research to CSS, both as an evaluative tool, linked to school improvement planning and as a mechanism for providing Continued Professional Development for the teachers is highlighted, partly by reference to the evaluation contained within the appendix. A summary of the findings was also presented to the pupils; their feedback, summarised within the appendix, offers further evidence to corroborate key points from the research study.

Overall, there are indications that the teachers were committed to the introduction of LIP, have a good level of understanding of what it is trying to achieve and that there is some evidence that it has led to more effective pupil learning. There is some support for the use of accelerated learning techniques, for example, the use of a range of activities, some directly related to accelerated learning (Smith, 1996. 1998; Smith *et al*, 2003). The use of shared lesson objectives (e.g. Black and Wiliam, 1998; Assessment Reform Group, 1999; Black *et al*, 2002; DfES, 2004b) appear to have motivated the pupils at CSS. The large majority of teachers within this study appeared to be very supportive of the analysis and use of VAK learning styles (e.g. DfES, 2003b, 2004a; 2004b, 2005a; Cleland, 2005; McLaughlin *et al*, 2006). It is though, questionable whether the use of preferred learning styles has directly led to more effective pupil learning. Instead, I would argue that the use of a range of active learning strategies (possibly as a result of an awareness of the apparent need for a range of multisensory activities), relating to a more constructivist approach (e.g. Dewey, 1933; Bruner, 1966, 1983) has been more beneficial. The chapter concludes with the tentative generation of substantive and formal theoretical propositions in the manner espoused by Glaser and Strauss (1967).

CHAPTER TWO.

Critique of research, literature and current thinking, underpinning the investigation into LIP at CSS.

This chapter discusses the theories and research findings, which underpin this study, and, in particular, how experiential learning cycles, accelerated learning, and learning styles fit into theories of learning.

Experiential learning cycles

The six-part lesson-planning model (Greenhalgh, 2002) used in CSS as part of LIP is based on the original accelerated learning cycle of Smith (1996). It essentially represents a cyclic approach to learning as the final stage emphasises the need to be prepared for the next lesson, as shown in figure 1:

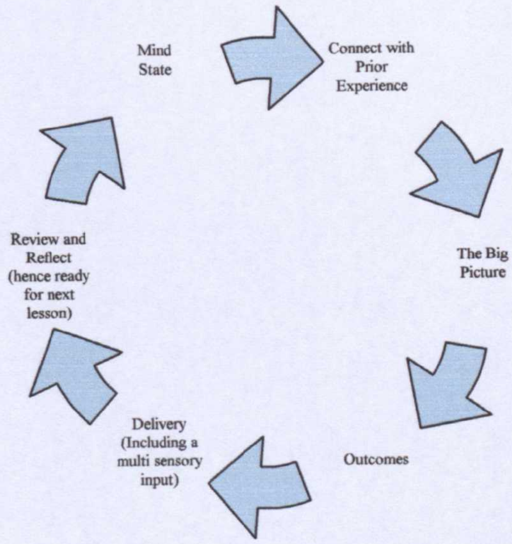

Figure 1: The lesson planning cycle used at CSS

The original accelerated learning cycle of Smith (1996: 11) had seven stages: connect the learning; big picture first; describe the outcomes; input; activity; demonstrate; and review for recall and retention and a pre-stage "create the supportive learning environment". The lesson-planning model adopted at CSS can similarly be considered to have seven stages as stages 5 and 6 are effectively merged into 'Delivery'. Smith has since revised his accelerated learning cycle into four components (Smith *et al*, 2003), as shown in figure 2.

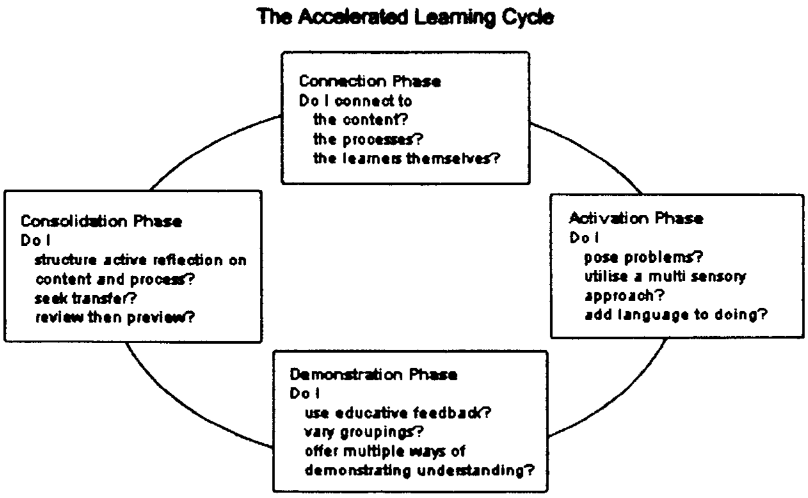

Figure 2: Smith's revised accelerated learning cycle (Smith *et al*, 2003).

The work of both Greenhalgh and Smith has been heavily influenced by Kolb and Fry's experiential cycle (Kolb and Fry, 1975; Kolb, 1976; 1984; 1985). According to Kolb (1984: 38): "Learning is the process whereby knowledge is created through the transformation of experience". Kolb's theory may be considered (Fielding, 1994) to present a way of structuring and sequencing the curriculum, indicating how a session, or a whole course, may be taught to improve student learning; learning is cyclical, involving four stages, sometimes referred to as sensing/feeling, watching/reflecting, thinking, and doing.

The core of Kolb's four-stage model is a simple description of the learning cycle, showing how experience is translated through reflection into concepts, which in turn are used as guides for active experimentation and the choice of new experiences. Kolb refers to these four stages as: concrete experience, reflective observation, abstract conceptualization and active experimentation. Smith (1996: 50) commented that, in this model, effective learning takes place when each stage is completed in sequence, hence learners ignoring one or more stages could not learn effectively. The learning cycle thus provides feedback, which is the basis for new action and evaluation of the consequences of that action. Learners should go through the cycle several times, so it may best be thought of as a spiral of cycles. In brief, Kolb conceptualizes the process of action research as "a spiral of action and research consisting of four major moments: plan, act, observe and reflect " (Zuber-Skerritt 1992: 11).

Kolb's theory asserts that the different stages are associated with distinct learning styles, claiming that individuals differ in their preferred learning styles and that recognising this is the first stage in raising students' awareness of the alternative approaches possible and helping them to become more flexible in meeting the varied demands of learning situations (Gibbs, 1988). Fielding (1994) comments that teachers also need to recognize their own learning styles as a basis for the development of effective teaching and learning strategies as he considers that learning may suffer where there is marked mismatch between the style of the learner and the approach of the teacher. Kolb's experiential cycle is shown in figure 3.

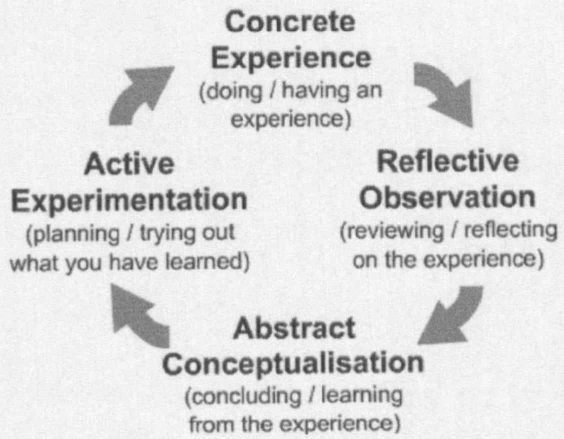

Figure 3: Kolb's Experiential Cycle (Kolb, 1984)

Kolb's theory emphasises the central role that experience plays in the learning process, thus differentiating experiential learning theory from both cognitive and behavioural learning theories, although there is a similarity with the theory of Vygotsky (1978), where the emphasis on cognitive development is through social interactions with peers. Kolb proposed learning styles based on the premise that individuals may prefer one or more stages of the cycle and consequently ignore others. To complement his theory, Kolb developed a learning style preference instrument, (Kolb, 1985), but this was considered to have been hampered by poor psychometric performance (Brew, 2002). Brew did, however, find that, in research on undergraduates, there was some consistency with Kolb's theory for females, but that, for males, the results yielded scores with poor construct validity. Garner (2000) has argued that there are substantial problems with the theoretical basis of Kolb's work and that it is not possible for firm conclusions about the nature of Kolb's learning style to be made.

Since the publication of Kolb and Fry's work on the experiential cycle many researchers have developed the themes of learning through reflection, evaluation, theory generation and practical experimentation. As an example, Honey and Mumford's approach to the diagnosis of 'preferred learning styles' (Honey and Mumford, 1992) is now widely used in both business and education to assess both the appropriateness of different approaches to learning support and to help individuals to develop as learners.

Learning style frameworks have also been developed by a number of other workers. McCarthy (1990) integrated an understanding of learning cycles with left- and right-brain processing preferences, in what she termed a 4MAT cycle. She identified four different learning styles: imaginative learners; analytic learners; commonsense learners and dynamic learners. Her cycle moves from concrete experience to reflective observation to practice and personalisation and finally to the integration of application and experience (Smith, 1996:50). Most neuroscientists however, according to Blakemore and Frith (2005:60), question the validity of categorizing learners in terms of left brain/right brain notions and go on to posit that 'such categorization might even act as an impediment to learning'; this is supported by, for example Byrnes and Fox (1998), Geake and Cooper (2003) and Goswani (2006).

Gregorc (1982) divided thinking styles into four separate groups: concrete sequential; concrete random; abstract random and abstract sequential, hence linking to Kolb's experiential learning cycles. These groups also have links to learning styles, for example, abstract random learners often want to explore their ideas through Visual or Kinaesthetic means (DfES, 2003b: 17).

Theories of Learning

Ausubel's theory of assimilative learning (Ausubel, 1963) is concerned with how individuals learn large amounts of meaningful material from verbal/textual presentations, applying it to reception (expository) learning in a school setting. He distinguishes reception learning from rote and discovery learning; the former because it doesn't involve subsumption (in which new material is related to relevant ideas in the existing cognitive structure on a substantive, non-verbatim basis: this can be clearly linked to the 'prior knowledge' step in the lesson-planning cycle at CSS) and the latter because the learner must discover information through problem solving. According to Ausubel, cognitive structures represent the residue of all learning experiences; forgetting occurs because certain details get integrated and lose their individual identity. A major instructional mechanism proposed by Ausubel is the use of advance organizers (Ausubel 1963: 81), which are effectively widely used in school settings (e.g, Bullock and Wilkeley, 1999; Grimley and Banner, 2005) and elsewhere: all pupils at CSS, for example, have a 'planner' and, in my experience, is common across many of the schools in partnership with Liverpool Hope University.

A large number of studies have been conducted on the effects of advance organizers in learning (e.g., Ausubel, 1978; Ausubel, Novak and Hanesian, 1978) and two key principles emerged from them:

1. The most general ideas of a subject should be presented first and then progressively differentiated in terms of detail and specificity.
2. Instructional materials should attempt to integrate new material with previously presented information through comparisons and cross-referencing of new and old ideas.

Ausubel was apparently influenced by the work of Piaget (e.g. 1969; 1970; Piaget and Inhelder, 1972) on cognitive development, as the concept of cognitive structure is central to his theory. Cognitive structures are patterns of physical or mental action that underlie specific acts of intelligence and correspond to stages of child development. According to Piaget, there are four primary cognitive structures: sensorimotor, preoperations, concrete operations, and formal operations. In the sensorimotor stage (0-2 years), intelligence takes the form of motor actions. Intelligence in the preoperation period (3-7 years) is intuitive in nature. The cognitive structure during the concrete operational stage (8-11 years) is logical but depends upon concrete referents. In the final stage of formal operations (12-15 years), thinking involves abstractions. Applying Piaget's theory results in specific recommendations for a given stage of cognitive development in that children will provide different explanations of reality at different stages of cognitive development.

Two key aspects of Piaget's work that are pertinent to my research at CSS, involving the notion of pupil engagement, include:

- Cognitive development is facilitated by providing activities or situations that engage learners and require adaptation (i.e., assimilation and accommodation)
- It is recommended (Bybee & Sund, 1982; Wadsworth, 1978) to use teaching methods that actively involve students and present challenges.

Bruner's spiral learning model (e.g. 1973; 1983) has similarities with both Ausubel and Piaget. His constructivist theory is a general framework for instruction based upon the study of cognition, with much of it linked to child development research (especially Piaget). A major theme in his theoretical framework is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. Again, therefore, the recurring themes of prior learning and pupil activity are evident. In Bruner's model, the learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so, hence allowing the individual to 'go beyond the information given'. Bruner (1966) states that a theory of instruction should address four major aspects: predisposition towards learning; the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner; the most effective sequences in which to present material; and the nature and pacing of rewards and punishments. In other words, an individual learner must actively build knowledge and skills (e.g., Bruner, 1990) and that information exists within these built constructs rather than in the external environment.

Constructivism is a very broad conceptual framework in philosophy and science, with John Dewey (1933) often regarded as its philosophical founder and Bruner's theory represents only one particular perspective of it. The constructivist approach to teaching and learning is based on a combination of a subset of research within cognitive psychology and a subset of research within social psychology. Advocates of a constructivist approach suggest that educators first consider the knowledge and experiences students bring with them to the learning task. The school curriculum should then be built so that students can expand and develop this knowledge and experience by connecting them to new learning. Advocates of the behavioural approach, on the other hand, advocate first deciding what knowledge or skills students should acquire and then developing curricula that will provide for their development. Making connections between thinking (in terms of knowledge, intellectual skills, attitudes, etc.) and behaviour has, however, proved to be very difficult; it is possible that other factors, such as situational variables, emotions, and consequences, all play an important role in the production of overt, adaptive behaviour: there is therefore a need to measure both behavioural and cognitive change (Doyle, 1997).

Three themes underpin Vygotsky's theory of learning: the importance of culture; the central role of language and the means by which intellectual development takes place. His social cognition learning model asserted that culture is the prime determinant of an individual's development, with culture teaching children both what to think and how to think. Vygotsky argues that, through culture, children acquire much of the content of their thinking, i.e. their knowledge; it also provides the processes or means of their thinking – the tools of intellectual adaptation. Cognitive development results from a dialectical process whereby a child learns through problem-solving experiences shared with someone else, what Vygotsky called the

'Zone of Proximal Development' (ZPD): "the distance between the actual development level as determined by independent problem-solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978: 86). What children can do with the assistance of others is, according to Vygotsky, even more indicative of their mental development than what they can do alone (Vygotsky, 1978: 85). The whole-language approach to teaching reading and writing draws on this notion. As children interact with others at home and at school they develop models of communication; Goodman and Goodman (1990) assert that this social use of language forms the basis for literacy. Vygotsky hypothesised that peer social interactions lead to valuable exchanges of information and skill resulting in cognitive development; from a Piagetian perspective, these social interactions involve an intense scrutiny of one's own competencies and this leads to higher levels of reasoning, learning and internalisation of academic goals, (Piaget and Inhelder, 1972).

Effective learning approaches

The two terms 'effective learning' and 'effective teaching' are, according to Reynolds and Muijs (2001), complementary. They summarise the literature about effective teaching and highlight three main methods to teach higher- order learning: heuristic (problem-solving) strategies, the metacognitive approach and subject-based approaches. Similarly, they describe research into student learning as 'developing along two separate but interlinked paths': one following the description of student learning as following either a deep or surface approach; the second to follow the metacognitive approach to learning derived from cognitive psychology. According to Marton and Saljo (1976), learning can be driven by a desire to acquire facts or a desire to have a deep and integrated understanding of an issue or phenomenon.

Helping pupils become more effective learners is at the heart of a metacognitive, or self-monitoring approach. The term metacognition is used to refer to people's knowledge about themselves as information processors, including knowledge about what they need to do in order to learn and remember information (National Research Council (NRC), 2005: 10)) and has been defined: as "the processes whereby we think about our cognitive machinery and processing mechanisms" (Flavell, 1979). Smith (1998: 159) argues that the beginning of metacognitive development occurs when a learner is able to reflect, not only on outward actions, but also on the thinking patterns, which led to those actions. In other words, the learner is accessing intrapersonal intelligence (Gardner, 1983). Helping pupils to become more metacognitive about their own thinking and learning is closely tied to teaching practices that emphasise self-assessment (e.g., NRC, 2005:12; Assessment Reform Group, 1999). Early work (Thorndike, 1913) demonstrated that feedback is important for learning, although other research has shown conflicting results. Druckman (1998) found that peer feedback had as much (or more) influence in obtaining lasting performance results as teacher feedback; work in Croydon however, seemed to show that children did not want other children to know how good or bad they were at their work (Smith, 1998: 47). This view is not, though, shared by Harrison (2006), who opines that pupils often accept criticisms about their work from one another more readily than from their teachers.

Anderson and Keith (1997) found that large numbers of students are disengaged from their studies and argued that this is likely to lead to low academic achievement. There are also indications that student socialisation experiences with their peers have a powerful influence on student academic motivation and achievement (e.g. Light and Littleton, 1999). The development of peer-assisted learning interventions has aimed at enhancing learning and motivation, and consequently achievement, by effectively engaging students in the learning process. There is evidence that this has led to academic gains across a variety of student populations, academic arrangements and classroom arrangements (Cohen *et al*, 1982). The positive implications of introducing peer and self-assessment schemes into higher education courses have been noted by a number of authors. Stefani (1994) found that students have a realistic perception of their own abilities and can make rational judgements on the achievements of their peers. A study by Falchikov (1995) indicated a close correspondence between lecturer and peer marks. Feedback was perceived to be useful, with its main strength appearing to be related to the enhancement of student learning by means of reflection, analysis and diplomatic criticism. Similar findings were reported by Orsmond *et al* (1996) who reported that students not only liked carrying out peer assessment, they also felt the benefits in terms of developing facets of their learning process and heightening their awareness of their work. Within secondary level school education, peer-assessment represents one key aspect of AfL (e.g. Black *et al,* 2002, 2003; Assessment Reform Group, 1999; Black and Wiliam, 1998; Sadler, 1998). Deakin-Crick *et al* (2005), in an on-going review of the impact of peer- assessment on pupils, regarded it as involving pupils in assessing each other's work through reflection on the learning goals and what it means to achieve them. They also saw a clear link to the intended outcomes of Every Child Matters (DfES, 2003c: DfES, 2005b): be healthy; stay safe; enjoy and achieve; make a positive contribution; and achieve economic well-being.

Marton (1983) has argued that there are three aspects of learning which are related to each other: the way in which the learner conceptualises learning, the way in which the learner experiences the learning situation and the way in which the learning tasks are performed. With co-workers (Marton *et al,* 1993; Marton and Booth, 1997), Marton claims that learners' descriptions of learning can be divided into two broad categories: learning as the acquisition of knowledge and information and learning as the development of understanding and even personal change. These two broad categories of conceptions are equated with 'surface' and 'deep' learning in much of the work of Entwistle and colleagues (e.g. Tait and Entwistle, 1996; Entwistle and Tait, 1990). Entwistle's 'Learning Style Inventory' (Tait and Entwistle, 1996) aims to identify students who are at risk of non-learning as a consequence of their surface approach. Novak (1998) uses different terminology to develop this theme. 'Rote' and 'meaningful' learning are used to differentiate between individuals who acquire information without understanding and those who seek to meaningfully integrate new knowledge with what is already understood, hence building on Ausubel's theory of assimilative learning.

A meta-analytic review of peer- assisted learning interventions with elementary school students was carried out in the United States of America (Rohrbeck *et al,* 2003). This is relevant: if a child is to successfully adapt to school and acquire academic skills and appropriate conduct in the classroom, then the child must integrate into a peer group (Eccles *et al,* 1999). This fits well into the theories of cognitive development of both Piaget and Vygotsky. The interventions in the review appeared to be most effective with younger, urban, low income and ethnic minority students. Interventions that used interdependent rewards, ipsative (i.e. value-added) evaluation procedures and a greater degree of student autonomy had higher positive effect sizes, indicating increases in achievement.

Feuerstein and others (e.g. Feuerstein, Rand, Hoffman, and Miller, 1980) developed a programme of activities or 'instruments', known as 'Instrumental Enrichment' (IE), by which, it was claimed, an adult could intervene and enrich children's learning processes. Within this, it is claimed that each instrument concentrates on a specific set of underlying cognitive functions; as learning becomes more complex, the same concepts and skills are re-introduced, at higher levels of conceptualisation, according to a planned 'spiral curriculum'.

Many of Feuerstein's ideas have influenced work on teaching thinking skills. For example, the 'Somerset Thinking Skills' course (Blagg *et al*, 1988) represents a development of IE, which has been used, with success, in English secondary schools, according to McGuiness (1999). In the United States, Lipman *et al* (1980), through what is termed the Critical Thinking movement, argue that levels of sophistication in thinking are arrived at by practice in appropriate forms of thinking, neither according to biological development, nor to any form of stages of development, such as those identified by Piaget. Both Feuerstein and Lipman hold a similar belief in children's abilities. They consider that through thinking exercises and activities learners can exceed the predicted level of competence, which psychometric or school-based tests may have suggested is their limit. There are some research findings that support such claims. For example, Sharron and Coulter (1994) and Romney and Samuels (2001), quote results of a validation project carried out on over 2,000 children: compared with control children, they made large gains, after a year, for maths, larger gains for English and even larger ones for reasoning. However, Shayer and Beasley (1987), whilst arguing that IE had a substantial effect on pupils' meta-cognition, they also recognised that this effect had not been translated into school achievement. Further, Blagg (1991), reported that, in an evaluation of Feuerstein's IE programme in four schools, there was little quantifiable evidence to suggest that IE had a positive effect on 14- to 16- year old low attaining pupils and no consistent relationship between the IE programme and self-esteem changes on the pupils.

De Bono (1970, 1992) has argued in favour of using an understanding of brain mechanisms in order to construct approaches to learning, and developed a Cognitive Research Trust (CoRT) programme (De Bono, 1976), to be used with children from the age of 12 upwards. Edwards (1991) in a review of a number of evaluations of CoRT, has, though, been critical of their design and a later study (Ritchie and Edwards, 1996) reported that, whilst creative thinking can be taught through this approach, success in CoRT lessons did not significantly affect cognitive ability. Despite this, elements of De Bono's work can be identified in Smith's 'Brain-based approaches' to learning (Smith, 1996; 1998; Smith *et al*, 2003) and Ginnis (2002), in a book recommended by the DfES (2003a), refers extensively to the work of DeBono.

Within the UK, some approaches to 'teaching thinking' (Sternberg and Berg, 1992) have built on the work of Feuerstein, Lipman and DeBono. Some examples across the curriculum include promoting problem-solving (Wallace and Adams, 1993), using advance organisers (McGuinness, 1999) and pedagological strategies (Leat and Higgins, 2002). Within subject areas, some examples include 'Thinking through Geography' (Leat, 1998); 'Thinking Through History' (Fisher, 2002) and, within science, Sprod (1998). In stage three of Smith's accelerated learning cycle, Smith cites three levels of Feuerstein's cognitive functioning: input, elaboration and output, which Smith claims can develop mathematical and logical intelligence, and which are necessary to efficient thinking (Smith, 1998: 170). However, he does not appear to offer any concrete evidence to support this claim.

Work on Cognitive Acceleration in Science Education, (CASE) (e.g. Shayer and Adey, 1981, 2002; Adey and Shayer, 1994; Adey *et al*, 2004, Adey, 2006) has promoted the use of thinking skills in schools and has drawn on the theories of Vygotsky and Piaget. Cognitive conflict (presenting pupils with tasks which challenge their current levels of thinking) and the notion of metacognition (encouraging pupils to reflect on their own thinking) are key elements of the teaching strategies in the CASE lessons. The work on cognitive acceleration employs the use of controlled experiments with the study involving teachers attempting to develop the thinking skills of pupils in the experimental (but not the control) groups. Data on cognitive levels of development were gathered at three points in the study using Piagetian Reasoning Tasks (PRTs) via standard science achievement tests, school examination results and public examination results. Immediately after the intervention, it was claimed that the experimental classes performed better than the control classes on the PRTs, although there was little difference in the achievement in science tests. It was further claimed that, a year after the intervention, the experimental classes performed better in the science exams when compared to the control groups and 2-3 years after the intervention the experimental classes significantly outperformed the control classes in GCSE science, mathematics and English. Jones and Gott (1998) however, questioned these findings, suggesting that more work is necessary to investigate differences in organisation, support and motivation: it may, they argue, just appeal to those pupils who enjoy solving a problem. Keith (1997) found that, after initial confidence by teachers in her school, on implementation of CASE they began to question its value and hence were less likely to continue with it. This had also, apparently, occurred at CSS: discussions with the Head of Science at CSS indicated that partly this was due to a lack of confidence in using the materials and partly due to the lack of criteria to judge short-term success, mirroring Keith's comments. Teachers in Keith's school thought that pupils were confused/uninterested although she did point out that data collected from the pupils and through classroom observations suggested that this was not the case. Further her analysis of pupil performance in National Curriculum tests did indicate improvements in performance following the implementation of CASE.

A series of studies investigated the development and role of metalearning in the learning and study processes of secondary and tertiary students (Biggs, 1985). An intervention model, on improving student learning, links personal and situational factors to performance by three main approaches to learning: deep, achieving and surface (Marton and Saljo, 1976). The results indicated that a range of factors – ability patterns, variety and quality of non-school experiences and extent and kind of motivation- were all involved in the development of metalearning.

A central aim of CSS is to promote active learning. Reference to the link with Piaget has already been made, but, in addition, it is widely proposed (e.g. Stephenson, 1992; Gibbs *et al*, 1994; Hodkinson, 1994) that active learning – where the learner takes control of solving a problem or achieving a goal (Briggs and Sommefeldt, 2002: 42) – can result in the 'deep learning' referred to by Marton and Saljo, where concepts are deeply understood and are of lasting benefit to the individual. The emphasis in these studies tends, though, to be on post-compulsory education and may not be directly applicable to the 11-16 age range. Fazey (1996: 30) also stresses that active learning cannot take place without guidance: "active decision-making has to be accompanied by expert guidance if the learner is to achieve the desired destination".

Research that has examined interventions aimed at changing students' approaches from surface to deep and to raise their metacognitive success has had some, if rather limited, success (Martin and Ramsden, 1987; Norton and Crowley, 1995). The explanation for this may be found by reference, at least partly, to Biggs' (1994) student-based theory of learning, which is one of the models in the deficiency approach to student learning. This, along with two further models by Biggs – teacher-based, with the emphasis on teaching skills and process-based, with the emphasis on cognitive skills- were seen by Biggs as deficit models where poor quality learning is caused by something lacking in the student, or in the teacher or in the process. He suggested that the factors affecting student learning are inextricably interlinked and that any intervention aimed at helping students become more effective learners will be constrained both by factors that influence the teachers and by the institutions that they work in.

A survey was carried out by Campbell *et al* (2001) to try and ascertain pupil approaches to learning and their perceptions of their classroom environment using a Learning Process Questionnaire developed by Biggs (1987). The data indicated that pupils with deep approaches to learning repeatedly demonstrated a more sophisticated understanding of the complexities of the learning and teaching opportunities available to them when compared to pupils with a surface approach. The teachers had used a range of teaching and learning strategies that were pupil-centred and involved a number of active learning situations. Data collected in the survey suggested that pupils with deep approaches to learning had a broader conception of the links between theory and practice: they were more able to understand the purposes of learning, to appreciate the objectives of their teachers and were more likely to take an active role in their own learning. By contrast, pupils having a surface approach to learning usually lacked an understanding of their teacher's attempts to adopt more constructivist teaching and learning strategies and, instead, tended to remain focused on the transmission and reproduction of learning. They tended to see active learning approaches as fun, but did not appreciate their contribution to learning in a serious way. When teachers used traditional expository teaching methods, students with both deep and surface approaches to learning focused on transmission and reproduction. These findings are consistent with those reported by Campbell *et al* (1996), who suggested that children need to be shown how to learn from varied active learning experiences, and Gillies and Ashman (1997) who demonstrated that pupils across a range of ability levels can benefit in terms of learning and achievement from training in cooperative learning. Dart *et al* (1999) found that pupils with surface approaches to learning have lower learner self-concepts; they argued that there is a need to boost pupil confidence and self-belief if they are to make the transition to different modes of learning.

A study, which, in part, examined student orientation to learn using a deep or surface approach (Chin, 1998), also sought to identify the kinds of cognitive and metacognitive strategies that students use as they construct their conceptual knowledge. The results suggested that there was no correlation between the students' learning approach and their conceptual change. An analysis by Chin did, though, appear to reveal differences between the deep and surface learning approaches in terms of generative thinking, the nature of explanations, asking questions, metacognitive activity and the approach to tasks.

At undergraduate level, research on study quality claims to have shown a close relationship between student perception of courses and their approaches to learning

(Lawless and Richardson, 2002). Research comparing different learning environments has indicated that problem-based learning produces more desirable approaches to learning among students: students' adoption of particular approaches to learning is partly dependent upon their perception of the content, the context and the demands of specific learning tasks (Richardson, 2003; Laurillard, 1979; Ramsden, 1979; Marton and Saljo, 1976). Leung and Kember (2003) examined the link between students' approaches to learning and stages of reflective thinking and claimed to have found evidence of a close association between them. Reflective thinking has its origins with the work of Dewey who defined it as: "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (Dewey, 1933: 9).

Leung and Kember used a revised version of Biggs' Questionnaire (Biggs, Kember and Leung, 2001) to measure deep and surface approaches to learning and a Reflection Questionnaire (Kember *et al*, 2000) with four scales corresponding to four levels of reflective thinking: habitual action, understanding, reflection and critical reflection. The habitual action scale was found to correlate significantly to surface learning and there was a correlation between a deep approach to learning (but not a surface approach) and understanding, reflection and critical reflection. Leung and Kember (2003: 68) point out that there is a need to form a greater link between research on reflection frameworks and the student approach to learning (Marton and Saljo, 1976; Biggs, 1985, 1987, 1994) as they consider it would add an extra dimension by giving greater insights into the degree of meaningful personal assimilation.

There is some evidence to suggest that children with behaviour problems are susceptible to low attainment. For example, the Elton report (1989) indicated that pupils with poor behaviour were generally under-achievers with learning support needs that were not being met. A scale developed by Grimley *et al* (2004) attempts to allow teachers to monitor children's conduct, emotional and learning behaviour in order to provide a balance of appropriate behaviour management and programmes of instruction. Research indicates that there is a complex interplay of the independent variables of working memory, cognitive style and behaviour in determining educational outcome. As an example, Riding *et al* (2001) in a study of early secondary pupils claimed that cognitive styles interacted with working memory: analytics performed well if they had a good working memory; wholists were generally unaffected by their working memory.

There are indications of the importance of working memory to effective learning. Macintosh (1999) discussed the strong relationship between working memory, performance and comprehension; and research by Gathercole and Pickering (2000) showed an apparent link between low working memory capacity and failure to achieve at Key Stage 1. Gathercole *et al* (2004) found that children aged 7 and 14 with low working memory under-performed in mathematics and science compared with those having normal to high working memory; Riding *et al* (2003) illustrated that other school subjects (music, technology, art and geography) were also particularly sensitive to working memory differences.

Working memory can be seen as an information-processing system, storing information until it passes into long-term memory. Shah and Miyake (1999) consider that working memory plays an essential role in complex cognition; they regard it as the theoretical construct that refers to the system or mechanism underlying the maintenance of task-relevant information during the performance of a cognitive task. A model proposed by Baddeley and Hitch, (1974) placed an emphasis on active memory and saw working memory as a non-unitary model of short-term memory constituting the central executive having control over both speech based and Visual/spatial information. A revised model (Baddeley, 2000; 2003) includes a further subsystem, the episodic buffer, and focuses attention on the processes of integrating a large amount of findings from work on short-term and working memory. However, criticisms of this revised model have been raised because some details of the findings are not easily explained by the original Baddeley & Hitch model (Jones *et al,* 2004; Nairne, 2002).

Other models of working memory include those by Cowan (1995, 2005) and Ericsson and Kintsch (1995).Cowan regards working memory not as a separate system, but as a part of long-term memory. In Cowan's model, working memory is organized in two embedded levels: the first level consisting of long-term memory representations that are activated; the second level is called the focus of attention, which is regarded as capacity limited and holds up to four of the activated representations. Oberauer (2002) has extended the original Cowan model by adding a third component, a more narrow focus of attention that holds only one chunk of information at a time. Ericsson and Kintsch (1995) have argued that skilled memory is used in most everyday tasks by storing most of what is read in long-term memory, linking them together through retrieval structures. They argue that it is only necessary to hold a few concepts in working memory, which serve as cues to retrieve everything associated to them from by the retrieval structures, what they refer to as 'long-term working memory'.

More recently, the TLRP (2007:17) defined working memory as "our capacity to temporarily hold a limited set of information in our attention when we are processing it" and Pickering (2006) argued that individual limits to working memory are linked to differences in educational achievement.

The structure and organisation of the classroom may influence student motivation and achievement. Self-determination theory (Ryan and Deci, 2000) posits that there is a direct link between student engagement on learning tasks and the degree to which they are motivated to pursue academic goals and that features of the classroom environment play an important role in student achievement. A similar view is held by Astin (1997), who asserts that pupil achievement, and development, are fundamentally related to engagement on tasks. Research on classroom learning environments claims to have identified some key elements of classroom structure that are associated with promoting competence amongst students. Classroom instruction incorporating evaluation techniques, which have an emphasis on self-referenced standards and individual improvement, have, allegedly, resulted in significant academic gains (Ames, 1992; Schunk, 1996; Stipek, 1996). A link between achievement and student self-evaluation and self-reward has also been noted. An emphasis on a teaching structure, which guides and sequences learning activities whilst simultaneously allowing student creativity has been shown to yield higher student motivation and self-worth when compared to rigid or unstructured formats (Fantuzzo *et al*, 1992; Ryan and Stiller, 1991).

A paper by Jones and Moreland (2005) describes a case study of the involvement of a primary school with research on AfL and highlights how the intervention programme has, it is claimed, impacted positively on a school-wide basis. Key elements within the case study centred round enhancing teachers' planning, teaching and assessment knowledge and practices. Teachers' formative interactions and summative assessment practices became focused on encouraging and supporting pupil engagement with key subject ideas. They argued that, for effective learning to occur, it was crucial for teachers to have conversations with their pupils, around these ideas.

Adey and Biddulph (2004) used their findings from small- group interviews with year 8 pupils to elicit strategies to enhance pupils' learning. The interviews aimed to establish pupil perceptions of their learning experiences in history and geography in relation to subject content, interest, teaching styles, effective learning and subject relevance. The interviews built on the findings of a questionnaire survey of over 1,400 pupils in ten secondary schools (Adey and Biddulph, 1999) followed by semi-structured interviews (Biddulph and Adey, 2001). Key findings implied that pupils enjoyed group work, active involvement and investigative approaches; they disliked passive approaches. A similar finding by Hooper (2001) indicated that, in history, 'practical and expressive' activities were most likely to motivate pupils, although Hooper did not clarify what was meant by the terms 'practical' and 'expressive'.

Postlethwaite and Haggarty (2002) explored effective teaching and learning from the perspective of pupils in a secondary comprehensive school on what made them want to learn, what made it difficult for them to learn, and what teachers could do to help them learn. In particular, they investigated the views of pupils identified as under-and over-achievers through the comparison of Cognitive Ability Test (CAT) (NFER, 1986) scores in Year 7 and General Certificate of Education (GCSE) performance, and asserted that two key factors which distinguished under-and over-achievers were: 'conformity to the work and social norms of the classroom', and 'communication with teachers'. Under-achieving and over-achieving students were found to differ in some respects, especially in the extent to which they engaged in behaviours supportive of their learning. They did not appear to differ in the ways in which they perceived teacher behaviour. However, work by Moody (2001), which looked at data from a secondary school, highlights the difficulties in the use of CAT scores, as his findings suggested that the predictive validity and reliability of Key Stage 2 data is seriously open to question as baseline data for either value-added, or target-setting procedures, at Key Stage 3. Indeed, he concluded that the predictive validity for non-core subjects at Key Stage 3 was so low as to be negligible. However, the CAT average score correlated more highly with both teacher assessments and test results at Key Stage 3 in core subjects, although this relationship was not reflected in non-core subjects.

In Postlethwaite and Haggarty's study they found that pupils appeared to be more highly motivated when their lessons were 'fun', when they were able to work at their own pace and when they were not just copying from books. The pupils also made reference to the importance of praise, the importance of marking and to the need to match the work to their abilities; many were very critical of disruptive behaviour. Postlethwaite and Haggarty (2002: 188) point out that such pupil comments are entirely consistent with ideas that can be identified in the literature on pupils and schooling (e.g. Measor and Woods, 1984; Beynon, 1985; Cooper and McIntyre, 1996; Harris and Rudduck, 1993). Black *et al* (2006) similarly explored pupil beliefs and attitudes about a range of issues and practices relevant to their views about learning how to learn. They produced, in their view, a clear overall finding that pupils' opinions in the general area are positive, but did note some decline from year 5 (in primary schools) to year 8 (secondary).

Croll (1986), Edwards and Westgate (1994) and Myhill (2002) investigated patterns of interaction in classroom settings and, in particular, focused on underachieving pupils of either gender. Myhill concluded that, in terms of the willingness of the pupils to participate in a collective, whole-class, response, underachievers are the least likely to join in. There are indications that boys and girls respond, and interact, differently in the classroom. For example, Swann and Graddol (1988) argued that girls appeared to expect a lower participation rate than boys and Howe (1997) claimed that boys contribute more prominently, both verbally and physically, during classroom interactions than do girls. The link between achievement and gender is frequently used to account for boys' underachievement (e.g. Millard 1997; Platten, 1999 and Ofsted, 2003a, 2003b, although other research (Bousted, 1989; Swann and Graddol, 1988) appears to reveal the underachievement of girls, particularly with regard to science and mathematics (Leder 1980; Walkerdine 1989: Murphy and Whitelegg, 2006; Ivinson and Murphy, 2007; Ponchaud, 2008).

Galloway *et al* (1998: 19) reported, perhaps not surprisingly, that there was large variation in the performance of pupils with different teachers within the same school and argued that "motivation is unlikely to be the only factor in these differences, but it would be odd to deny its potential importance". Maslow (1970) included the need for affiliation and affection as part of the basic needs hierarchy in his model of motivation, in other words the notion of fitting into a classroom group, a view echoed in the findings by Rodd, (2002), who reported that classroom climate is enhanced if the whole school culture recognises the need to help pupils create a positive self-image of what is possible. Pedder (2006:198) concluded, in a similar vein, that the key message was that: "the organizational conditions … in terms of school management practices and systems come to influence what happens in classrooms through the mediation of teachers' learning, particularly learning that has a clear basis in classroom activity". A similar emphasis on the need for pupil activity within classrooms was given in guidelines sent to schools (DfES, 2004a), which recommended that teachers provide for different learning styles and intelligences so that they can opt to use their preferred learning style.

A study by Grimley and Banner (2005) examined the complex interplay of variables leading to the prediction of successful outcomes in GCSE examinations with the hope of identifying school intervention measures so as to enhance the experiences of students at GCSE and to allow them to achieve their potential. The attainment of each individual student is, they argue, dependent upon both environmental factors and cognitive factors (Grimley and Banner, 2005:1) and further comment that there is a need to gain information at an early stage if the intervention is to make a difference. Bullock and Wilkeley (1999) evaluated an action-planning initiative, which was targeted at year 9 pupils. Central to the initiative was the use of one-to-one discussions between pupils and tutors to focus on both short- and long-term goals and targets for future development leading to the creation of a personal learning plan, written by the pupil. There is some evidence to suggest that pupils in greatest need of support benefit most from the one-to-one dialogue, which underpins action planning (Bullock *et al*, 1996). They claimed to have found some evidence that pupils in this age group benefited from this approach: pupils gained a greater understanding of their own needs and also showed improved communication and planning skills.

Accelerated learning

What is commonly referred to as accelerated learning has its roots in the early work of Lozanov (1978). Rose (1985) applied accelerated learning into corporation and business management, and has since developed this further (Rose and Goll, 1992; Rose and Nicholl, 1997). Although the growth and expansion of accelerated learning in the UK has largely been due to the work of Smith (1996, 1998) another accelerated learning cycle, and the one effectively adopted by CSS, is due to Greenhalgh (2002).

Much of Smith's accelerated learning cycle is based on what he calls the principles for brain-based learning (Smith, 1998: 29). These principles incorporate MacLean's model of the triune brain (reptilian, limbic system and neo-cortex) (MacLean, 1990), which is based on three separate, but inter-related areas specialising in survival, emotional and rational behaviours. Smith (1996: 19) emphasises the importance of utilising the pattern-making function of the neo-cortex by providing pupils with a range of opportunities to preview new material. Greenfield (2001) claims that the brain is programmed to tune itself in response to experience. All learners are, according to Greenfield, unique in the way that their brain has tuned itself in response to their own experience and that, although a range of developmental factors influence learning, it is alleged that the natural learning ability of the brain can be transformed, either augmented or diminished, as a result of learners' experience. Caine *et al* (1994) argued that learners under stress are likely to have their creativity inhibited and to revert to rote and ritualised activity and Hart (1983) asserted that the absence of threat is utterly essential to effective instruction. Accelerated learning makes much of the need to create an atmosphere of low stress but high challenge – what Lozanov (1978) called 'relaxed alertness' and referred to as 'create the supportive learning environment' by Smith (1998: 24) and 'mind state' by CSS. Work by Jensen (1995) suggested that the maximum 'on task' time for adults is 20-25 minutes, with short breaks in between; for school-aged children it is approximately chronological age plus two. Gazzaniga (1985) suggested that the brain is divided into a huge number of clusters of neurons, which are interconnected and can process complete cognitive functions. Roger Sperry's work on the 'split brain' apparently showed that different sides of the brain controlled different sides of the body and specialised functions. The left side of the brain was seen as 'logical'; the right side as 'creative' (Sperry, 1986). This is incorporated, both in McCarthy's 4MAT model (McCarthy, 1990), and in a pupil glossary of terms relevant to the 'Enrichment' programme at CSS. Kinsella (1995) considered that brain hemisphericity is one of the most significant style elements of learners, a point echoed by Dunn (2003), who considered it to be one of many variables that "significantly differentiate among the learning styles of individuals and groups (Dunn, 2003: 189). It is, according to Smith (1998) necessary to use both hemispheres of the brain to become more proficient; in schools strategies to do this are referred to as 'brain breaks', a result of research into learning and brain function by Dennison and Dennison (1986). This work has, though, since been heavily criticised. For example, Blakemore and Frith (2005:60) argue that categorizing learners in terms of left brain/right brain might act as an impediment to learning, a point echoed by Geake:

> Reports estimate a 1000 UK schools are using brain gym exercises. Unfortunately much of this well-intentioned interest is predicated on an over-simplification of brain research e.g. lateralisation biases mis-interpreted as left- and right-brain thinking ... from results that have been mis-interpreted and not environmentally validated outside the experimental
>
> (Geake 2005:11)

Similarly, while a summary of research into brain processes (NRC, 2000) appears to show that there is growing evidence that both the developing and the mature brain are structurally altered when learning occurs, it also points out that there is often a tenuous scientific basis for the advice that has been incorporated into publications designed for educators, a point echoed more recently by the TLRP (2007: 15). Khanji (2005), though, through the results of a study, which considered the effect of brain hemisphericity on the level of achievement of male undergraduates, has hypothesised that there is a direct relationship between the students' cognitive style and their level of achievement.

There is some, albeit limited, evidence that accelerated learning has had a positive impact in education. Wise and Lovatt (2001) describe how it was introduced into an English school, and offer strategies to repeat this in other schools; however they do not offer much supportive evidence to evaluate its success. Brookfield (2003) highlights the advantages of accelerated learning over traditional programmes in Further Education; Stansbury (2001) presented evidence that 'at-risk' students demonstrated higher self-efficacy through participation in accelerated learning; and Questad (1993) described the apparent reading gains of a small number of middle school students. However, Grinelli ((1989) highlighted that there were problems associated with non-traditional learning environments and that the effectiveness of the course was dependent upon the instructor. A study by Chen (1977) on kindergarten children indicated that newly learned concepts, following an accelerated learning methodology, were easily destroyed even after the successful transfer of learning to new material. This supports Piaget's notion (Piaget, 1949) that the cognitive development of young children is age-related and therefore not easily accelerated by special training.

A feature of any of Smith's texts on accelerated learning is his extensive use of 'mind mapping', which is claimed to have the potential for transforming learning (Caviglioli and Harris, 2000: 14). Mind mapping originated from the work of Buzan (1974; Buzan and Buzan, 1993) and is commonly used as a note-taking, creativity tool and as a memory strategy for examinations (Caviglioli and Harris, 2000:16). A study with adult learners (Williams, 1999) claimed to show that mind mapping had value as a learning strategy. Williams examined the effectiveness of mind mapping as a note-taking device as compared to traditional note-taking; the effect of the mind mapping was measured by pre- and post-tests of control and experimental groups: she reported a significant difference between mean achievement scores of the two groups.

Concept mapping, first developed by Novak (1990), has some commonality with mind mapping in that it is a graphic organisational technique, which can be used to help learners to explore the depth of their knowledge and understanding of a topic. It is, however, both more tightly prescribed and makes more demands on the learner. Hay and Kinchin (2005) consider that concept mapping can be placed in the broader context of learning styles and learning theory and argue that it has considerable use in learning and teaching because concept maps can, they claim, reveal the structure, organisation and elaboration of understanding. The approach has been claimed to be a helpful metacognitive tool, promoting understanding in which new material interacts with the students' existing cognitive structure, to enable the clear identification of superficial learning and the prevalence of misconceptions that appear to hinder learning (e.g. White and Gunstone, 1992; Driver *et al*, 1994) and to be a classroom technique that can enhance learning in the sciences (Horton *et al* 1993; Lawless, Smee and O'Shea, 1998). The use of concept mapping is often linked to the constructivist view of learning as a concept map makes a good starting point for constructivist teaching. Kinchin (2004) investigated students' beliefs about their preferred role as learners and claimed to find an overwhelming preference for a constructivist learning environment. Other reports in the literature describe some alleged advantages of a constructivist approach, including improvement to test results, student attitudes and student enjoyment (Yager, 1995; Lord, 1997).

Learning styles

A recent guidance document (DfES, 2003b: 1) argues that if successful learning is to take place then teachers need to have an understanding of the different learning styles within the class and create learning opportunities through a variety of approaches. In his theory of Multiple Intelligences, Gardner (1983, 1991) built on the work of Piaget (e.g. 1961), viewing Piaget's model of cognitive development as largely a description of the development of the mathematical and logical intelligence (Smith, 1996: 50). Gardner proposed the existence of seven relatively autonomous intelligences or domains: linguistic, logical, musical, spatial, bodily Kinaesthetic, interpersonal, and intrapersonal. More recently he proposed an eighth intelligence, 'naturalistic' (Gardner, 1997). According to the NRC, the first two of these intelligences are those most commonly used in tests and are the most valued in schools (NRC, 2000: 101). This use of Multiple Intelligences in schools can, according to Lazear (2005), lead to the development of higher order thinking skills.

Shearer (2004) has produced evidence, which purports to show that a valid and reliable assessment for the Multiple Intelligences can be created, and that it can enhance instructional practice. Fisher (1998), in a piece of qualitative research, claimed that the use of Gardner's theory impacted on student progress in an indirect way: it served to heighten the awareness of student needs in many different types of classroom settings. Conversely though, a study comparing schools implementing

Multiple Intelligences theory with those that did not, found no significant differences in students' attitudes toward school (Arnold, 2002).

Cuban (2004) in a review of Multiple Intelligences on schooling, has argued that it has had a great influence on educators' beliefs, moderate influence on the formal curriculum but less influence on mainstream teaching and assessment practices. Nolen (2003) does suggest ways for educators to incorporate the intelligences into daily planning so as to meet the individual differences of individual students; she does not, however, produce evidence of the success of her methods. Other research (Denig, 2004; Manner, 2001; Silver and Strong, 1997) has indicated that teachers using a combination of Multiple Intelligences and learning style theories may be able to improve student learning. Klein (2003) argues, however, that both theories have encountered numerous theoretical, empirical and pedagogical difficulties.

A central aspect of the lesson-planning cycle at CSS is the 'mind state' for learning. Goleman's book on emotional intelligence (Goleman, 1995) fits readily into Gardner's theories on interpersonal intelligence. Goleman proposed that the negative effects of emotional trauma in children could be reduced if the more positive elements in their emotional portfolio were to be developed. Bentley (1998: 26) argued that Goleman's work provides powerful evidence that schools can play an important part in supporting the development of emotional literacy. It is based on work by Salovey and Mayer (1990), where they identify five major domains of emotional intelligence: knowing one's emotions; managing emotions; motivating oneself; recognising emotions in others; and handling relationships. Salovey and Mayer define emotional intelligence as:

> The subset of social intelligence that involves the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions.
>
> (Salovey and Mayer, 1990: 189)

Huy (1999: 325) refined this definition, opining that: "an emotionally intelligent individual is able to recognise and use his or her own and others' emotional states to solve problems and regulate behaviour".

There are currently many different methods of identifying learning styles, but Dryden and Voss (2001: 347) argue that, overall, a learning style is a combination of three factors: how information is perceived most easily; how information is organised and processed and how information is stored and retrieved. Hartman (1995) considers that each individual has a preferred style of learning and that an understanding of it can influence students' learning in a positive way. Similarly, Honey and Mumford (1986) suggest that learning styles are a method that can be used to help to organise learning and aid the completion of the learning process. Lisle (2005a: 1) opines that the knowledge of a learning style can lead to an individual focusing on the improvement of weaknesses and hence enhance learning. She further comments that the analysis of learning styles is useful for informing teaching and learning if it is used as a tool to enhance achievement and inclusion. A study of undergraduates by De Jesus *et al* (2005) led them to conclude that it is possible to relate students' questions to their learning styles and approaches to learning based on Kolb's learning Style Inventory (Kolb, 1985).

The terms, 'learning style' and 'cognitive style' are often confused with one another. This is not surprising, as definitions of these terms tend to overlap and have developed, to some extent, concomitantly. 'Learning style' can be considered to deal with characteristic styles or strategies of information processing in a learning situation, whereas 'Cognitive style' can be considered to refer to the characteristic - and consistent- way of an individual's information processing (Messick, 1984: 60).

Learning style has been defined as:

> Natural, habitual and preferred way(s) of absorbing, processing and retaining new information and skills and is comprised of both biological and developmental characteristics that make the identical instructional environments effective for some learners and ineffective for others
>
> Rautopuro and Vaisanen (2003: 2):

and as:

> an individual set of differences that include not only a stated preference for instruction or an association with a particular form of learning activity but also individual differences found in intellectual or personal psychology
>
> Riding and Rayner (1998: 51)

A definition of learning style, due to Dunn and Dunn (1974), cited by Riding and Rayner (1998: 66): "the way in which biological and developmental personal characteristics make different methods of teaching appropriate for some students but not for others", presumes a wide array of different learning styles in any group of learners. If this definition and presumption are true then there is a powerful and important message for teachers.

A 'definitive' description of learning style was adopted by a national task force of educational theorists and school principals in the USA:

> The composite characteristic cognitive, affective and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment.
>
> (Griggs, 1991: 7)

Cognitive style has been defined as: "an individual's way of processing information and operates without individual awareness", (Grigorenko and Sternberg, 1995: 205) and: "an individual's preferred and habitual approach to organising and representing information", (Riding and Rayner, 1998: 9). According to Saracho (1997), cognitive styles identify the ways that learners react to different situations and include 'stable attitudes, preferences, or habitual strategies that distinguish the individual styles of perceiving, remembering, thinking and problem solving'. Riding and Cheema (1991) reviewed the literature on cognitive style and concluded that the majority of cognitive style dimensions could be grouped through one of two constructs: the wholist-analytic dimension (an individual tends to organise information into wholes or parts); and the verbal-imagery dimension (an individual tends to represent information during thinking, either verbally or in mental pictures). Riding and Rayner (1998) suggested that learners have the capacity to use both types of representation, i.e. verbal or Visual, but will have a preference for one or the other. There seems to be at least a tentative link between this approach and VAK learning styles.

Visual (V), Auditory (A) and Kinaesthetic (K) learning styles: VAK.

There appears to be a number of separate, but related, references to VAK in the literature. For example, three of Gardner's Multiple Intelligences form the modalities of VAK and practitioners of Neuro-Linguistic Programming (NLP, a central pillar of accelerated learning, e.g. Reinert, 1976; Keefe, 1989; Byatt and Davies, 1998, O'Connor, 2001) identified Visual, Auditory and Kinaesthetic learners.

The use of VAK has been widely adopted in many UK schools, partly as a result of official recommendations (e.g. DfES, 2003b, 2004a, 2004b) and a number of secondary schools (including CSS) have attempted to identify the preferred learning styles of their pupils (in terms of VAK and/or Multiple Intelligences) and to share this information with teachers and pupils alike so as to impact on pupil learning. For example, Broughton Hall High School, Liverpool (DfES, 2005a), implies that it has had an impact on improvements in external examination results and Higherside School, Knowsley claimed that the use of VAK in language teaching showed some success in implementing one aspect of an accelerated learning cycle, (Farmery, 2004). The findings at Soham Village College (Cleland, 2005; McLaughlin *et al*, 2006) indicated, however, that VAK analyses are not a useful diagnostic tool for determining whole class teaching strategies.

Reid (1987) regarded learning styles as variations among learners in using one or more senses to understand, organise and retain experiences. There were six elements of Reid's typology: Visual (prefer seeing things in writing); Auditory (prefer listening); Kinaesthetic (prefer active participation); Tactile (prefer a "hands-on" approach); Group (prefer studying with others); and Individual (prefer studying alone). Similarly, and the one that appears to have has been promoted most commonly in schools (e.g. DfES, 2003a; 2003b), Dunn's Learning Style Inventory (Dunn, Dunn and Price, 1989) results in the production of a profile of each learner in four major areas, known as perceptual preferences, including Auditory, Visual, Tactile and Kinaesthetic modalities. It must, however, be pointed out that Dunn's learning Style Inventory contains far more elements than VAK in that it considers a learner's response to key stimuli: environmental (light, heat); sociological (peers, pairs, adults, self); emotional (structure, persistence, motivation); physical (Auditory, Visual, Kinaesthetic, Tactile); psychological (global-analytic, impulsive-reflective). Emphasis on just the VAK modalities could therefore be considered as simplistic and incomplete.

Definitions of what is meant by a Visual, Auditory or Kinaesthetic learner are vague and appear simplistic and unhelpful. For example, "Auditory listeners prefer to listen to instruction, Visual learners prefer to use diagrams and pictorial information and Kinaesthetic learners like to do practical tasks" (Lisle, 2005a: 2). In a similar vein, a Visual learner needs to see the big picture and benefits greatly from Visual aids; an Auditory learner absorbs words and sounds and delights in details, statistics and facts; and a Kinaesthetic learner learns best by doing, and utilising hands on practice and small group exercises (Peacock, 2001). There is some attempt to identify the traits of these different learning styles (DfES, 2004a), but again, these appear too simplistic to be of great use.

Indications are that, in general, 35% of people are mainly Visual learners; 40% are mainly Kinaesthetic and only 25% are mainly Auditory (DfES, 2003b: 4). Similar, but not identical, statistics can be found elsewhere. Smith quotes 29% Visual, 34% Auditory and 37% Kinaesthetic (Smith, 1996:10). Lisle (2005a) found, for adults with learning difficulties, the figures were 34% Visual; 34% Auditory; 23% Kinaesthetic and 9% multi-modal. Research by Dunn and Dunn (1988) claimed to show that only 30% of students remember even 75% of what they hear during a normal class period; 15% learn best tactually and another 15% are Kinaesthetic. This was supported by Grinder (1989) who found that up to 20% of a typical class would be 'Visual only', 'Auditory only' or 'Kinaesthetic only' learners. He further pointed out that 'Kinaesthetics learners' make up the vast majority of the dropout rate in schools.

Recent reports (Stahl, 1999; Bedford, 2004; Coffield *et al*, 2004a, 2004b; Coffield, 2005; Geake, 2005; Kratzig and Arbuthnott, 2006) have started to cast doubt over some of the assumptions about learning styles and 'good practice'. Geake (2005: 11) warns of the use of VAK learning styles inventories, including that endorsed by the DfES and particularly the brain gym work of, for example, Dennison (1999) describing it as: 'predicated on an over-simplification of brain research leading to unsatisfactory practice'. A study by Kratzig and Arbuthnott (2006) tested the recall of information presented in the three different VAK learning styles and found that there was no apparent benefit from having material presented in one's preferred learning style, concluding that attempts to focus on learning styles were 'wasted effort'.

A review of learning styles literature, with a slant towards Higher Education, was conducted by Bedford (2004) who concluded that claims about the usefulness of information regarding students' learning styles was not based on strong evidence from empirical research studies. It was, however, suggested that there was a case for further investigation of the interactions between learning styles and particular aspects of formal learning environments.

Coffield *et al* (2004a), discovered more than 70 instruments designed to identify people's learning styles and comment that some of the learning styles instruments (including many well-known commercial products) make extravagant claims of success which, according to Coffield *et al* are not upheld when subjected to scrutiny; they further argue that labelling a pupil may do them more harm than good. They undertook rigorous scrutiny of 13 of these instruments and found them to have low reliability, poor validity and a negligible impact on teaching and learning. Further, they concluded that it mattered fundamentally which model was chosen, singling out a business model (Allinson and Hayes, 1996); they were particularly scathing of the Dunn and Dunn model. This model has, however, been used extensively by, for example, Prashnig (1998), who introduced it into New Zealand primary and secondary schools and it has since been used in other countries including the UK, Finland and Sweden.

Lisle (2005a: 3) considers that Coffield *et al* appear to be concerned that the self-fulfilling prophecy of labelling students as Kinaesthetic learners leads to the neglect of different learning styles. She argues that practitioners using VAK learning style assessments should use a variety of instructional strategies that can be adapted to different learning situations. Anderson (in LSDA, 2004) has commented that research suggests that students do become more motivated to learn by knowing about their own strengths and weaknesses as learners. She also suggests that, if teachers can respond flexibly to students' individual learning styles, then the quality of teaching and learning is likely to rise.

Prashnig has responded to the criticism by Coffield and his team (Prashnig, 2004). She has, she claims, developed several new and extended assessment instruments based on the Dunn and Dunn model and asserts that research shows that learning styles change dramatically during primary school years and that a complex learning style profile consists of biological as well as learned or conditioned style features. She also claims to have collected evidence that shows that learning styles do make a difference to academic achievement and further claims (but does not substantiate) that they have often been reported as having the single most impact on intervention that a school could offer. According to Prashnig, what Coffield assessed did not, in her opinion, relate to learning styles at all as they assessed motivation, personality traits or intelligence factors. She defines learning style as: 'the way human beings take in new and/or difficult information, how they process, store and retrieve it' (Prashnig, 2004: 65). While accepting the dichotomy between analytic and holistic styles, she asserts that Coffield and his team compared a wide range of assessment instruments whilst not measuring the same criteria and hence they were not fairly compared; she also questions why they appeared to disregard more complex instruments (her Learning Styles Analysis having 49 different elements in a pyramid model).

Certainly, there has been a significant amount of research aimed at assessing the learning style preferences of students (for example; Carbo, 1983, looking at exceptional children; James and Galbraith, 1984, working with adults and Reed, 1996, who examined vocational aspects). Some research has examined both gender and cultural relationships to learning styles. Hickson and Baltimore (1996) found that females appear to have a higher tendency to prefer Visual learning tasks than males, and Hickson, Land and Aikman (1994) suggested that learning may be influenced by cultural differences as their research, assessing the learning styles of ethnic minorities, revealed 12 variables that, in their opinion, discriminate the learning styles of four ethnic groups.

There is some evidence to support Dunn and Dunn's Learning Style model. Lovelace (2005), in a meta-analysis of experimental research based on the Dunn and Dunn model, claimed that, when responsive instruction was available for diagnosed learning-style preferences, there were indications of increased achievement and improved attitudes. A study by Gadt-Johnson and Price (2000) compared the learning styles differences of students that prefer a Tactile learning environment with those that do not. A person with a Tactile learning style learns best, according to Price and Dunn (1997), through the use of manipulative and three-dimensional models. They prefer to be able to touch and move resources (Semple and Pascale, 1984). Gadt-Johnson and Price asserted that students with a high preference for Tactile learning can be further distinguished from those with a low preference and that this implies that students have additional learning preferences that should be considered when developing teaching strategies. Gadt-Johnson and Price (2000: 1), claim that there is strong relationship between academic achievement and individual learning style. However, others remain more sceptical. Burns, Johnson and Gable, (1998) highlight that weak research designs, the lack of randomly selected samples and a "premature rush into print and marketing with very early and preliminary indications of factor loadings based on one data set" (Curry, 1990: 51) influence the extent to which findings can be generalised to broad student populations. The reliability and validity of some learning style instruments has been questioned (Stahl, 1988), as has the durability of students' learning style preferences (Davidman, 1981).

Many Scandinavian schools use the Dunn and Dunn learning style model as their pedagogical framework, although there has been no well-controlled empirical research or program evaluation published on this model. However, a study in Sweden (Bostrom, 2005) examined the effects of teaching Swedish grammar through traditional versus learning-styles instructional methods. A control group was taught about grammar in a traditional teaching method and the experimental group was taught the same content with Multisensory Instructional Packages (MIP) (Dunn and Dunn, 1993). The Dunn and Dunn model was chosen because, in Bostrom's opinion: "the Dunn and Dunn Learning Style model is one of few comprehensive models with a comprehensive research base" (Bostrom, 2005:3). Curry (1990) and Tendy and Geiser (1998) have, for example, reported the model as having both valid and reliable instrumentation. MIPs were used to present and review the grammar content through Visual, Auditory, Tactile and/or Kinaesthetic instructional strategies. According to Burke (2003), research on MIPs indicates that matching students' learning style preferences with complementary methods increases their achievement significantly when they *begin* with their modality strengths and reinforce new and difficult information through their secondary or tertiary strengths. Her study appeared to support this as students started with their strongest modality, reinforced what they had learned with another modality and then used the knowledge they gained in practice. For example, she claims that "Kinaesthetic" learners mastered the content with games at various in-the-classroom learning stations, by role-playing or by utilising floor games. Variables used in Bostrom's study included participants' attitudes, retention, understanding of the usefulness of grammar and opinions concerning the process itself. Her findings apparently indicate that learning-styles methodology provide a practical, positive means of individualising instruction and simultaneously improving learners' attitudes towards learning grammar. If teaching based on the students' individual learning styles can be used to individualise instruction and encourage motivation then it raises the question of how this can be linked to other aspects of the learning process and whether it is possible to base the choice of learning strategies on an individual learning style (Bostrom and Lassen, 2005).

In the 'Pilots Project' (Thomson *et al*, 1999) pupils were given an inventory in order that they, alongside teachers, could work out what particular learning style they preferred. It was concluded that most pupils were Tactile and Kinaesthetic learners with little Auditory strength. The research suggests that most learners who are underachievers are not Auditory processors, even though information in the classroom is often verbal. The project claims impressive results – after embracing their learning styles 75% passed an exam that they had previously repeatedly failed, although there doesn't seem to be any consideration of, for example, the effect of the degree of familiarity with the examination.

Lisle (2005b) presents an argument that there is supporting evidence for the validity and usefulness of VAK, alongside other brain-based modulatory systems, such as reflective practice (Dewey, 1933). She posits that, as a learning style, reflective practice is a fundamental, what she refers to as "a modality for the acquisition of knowledge and learning that converts into development" and further claims that, as a modality functional to learning, it is unquestioned (Lisle 2005b: 3), but does not appear to support this statement. She argues that the VAK modality system can be shown to be a forerunner to reflective practice and can be integrated with it. She concludes (Lisle, 2005b: 8) that: "doing VAK assessments adds to the learning process. Information, not only of the individual's learning style preference, but also about the other learning styles feeds back into learning - self- reflective learning." She argues that VAK assessments should be used alongside self-reflective practice. However, as her work has been with adults having learning difficulties her preliminary findings may not be transferable to mainstream secondary pupils.

In a study in Finland, Rautopuro and Vaisanen (2003) investigated the effect of students' learning style and learning strategies on their course performance in a statistics course. They used the first four learning styles defined by Reid (1987) - Visual, Auditory, Kinaesthetic and Tactile - but combined Kinaesthetic and Tactile modes into one. They found that the different learning styles had no effect on course success. Earlier work however, contradicted this: in a similar course Bell (1998) found that Visual learners had significantly higher success rate than Auditory and Tactile learners. Rautopuro and Vaisanen suggested that their result could have been due to presenting course information in a variety of modes and/or by balancing their teaching style with students' learning styles. Certainly, Peacock (2001), suggests that a mismatch between teaching and learning styles causes learning failure and frustration. Rautopuro and Vaisanen concluded their paper by recommending that teachers of similar courses to theirs designed their programme to include Visual, Auditory and Kinaesthetic learning opportunities. This comment has been echoed in other work: Kinsella (1995) argued that teachers should help their students to identify their learning style and to become flexible in using them. Rautopuro and Vaisanen also questioned the wisdom of locating students to one learning style group, particularly when the student has similar scores on two or more style preferences. However, Rochford (2003) has argued that it is important to provide instructional strategies that are compatible with a learning style, particularly for less academically successful students and Briggs (2000) and Lisle (2005a: 12) have suggested that younger learners prefer Kinaesthetic learning tasks.

Recent, and on-going, research by *The Campaign for Learning*'s 'Learning to Learn' (L2L) project, (Rodd, 2002, 2003; Lucas *et al*, 2002; Lucas and Greany, 2000; Greany *et al* 2002, Greany and Rodd, 2003; Higgins *et al,* 2007) has explored developing learning skills. Its objective was to evaluate the impact of applying new understandings about 'how we learn' in a number of UK schools, with an emphasis on brain-based teaching and learning. On their mind map of L2L they acknowledge the influences from, for example, Vygotsky (1978), neuroscience, accelerated learning, including VAK, mind mapping and 'Brain Gym'; and Gardner's Multiple Intelligences (Gardner, 1983; 1991; 1997). They claim that: "accelerated learning, as part of a strategy for brain based learning, works at both a motivational and attainment level" (Lucas *et al* 2002: 55). The results from L2L offer, it is claimed, preliminary support to the view that standards rise when pupils are in a safe, comfortable yet stimulating environment, when teachers are aware of pupils' different learning styles and when they help pupils to develop an understanding of how they learn most effectively.

Research into the use of preferred learning styles at one English secondary school, has been described by Lucas *et al* (2002: 18). Two year 8 mixed ability groups were involved in a series of poetry lessons as part of their English syllabus. The 'research' group was identified (although it doesn't say how) as having preferred styles of 3 Auditory, 9 Visual and 13 Kinaesthetic; the 'control' group had 7 Visual and 14 Kinaesthetic. The control group received traditional lessons; the research group were taught via a different lesson structure, which included predominantly Kinaesthetic activities. The claim is made that there was a significant preference for Kinaesthetic learning in both research and control groups. Using a predominantly Kinaesthetic learning style did, it was alleged, enhance both the learning and the interest of pupils. It was further claimed that, in assessments within English lessons, the research group gained higher results than the control group and higher than would be predicted from earlier National Curriculum test scores. Little detail was, however, provided and it may well be that it is far too simplistic to conclude that the predominantly Kinaesthetic style of teaching was responsible for enhanced learning; other factors e.g. pupil involvement in goal setting, pupil summaries and 'warm up' exercises were also part of the lesson structure and, surely, cannot be discounted. The apparent greater interest shown in the pupils by the teachers would also be a factor. The use of control groups also raises questions about the ethics of this study.

A study at a different secondary school with year 7 pupils, described by Lucas *et al* (2002) was designed to explore whether, and if so how, different L2L approaches can help raise standards and create confident and effective lifelong learners. One aspect of the research aimed to examine how an understanding of a preferred learning style and intelligence profile can help pupils learn more effectively. A short tick list questionnaire for VAK and a wheel for Gardner's Multiple Intelligences were used to determine the pupil intelligence profile and preferred learning style. One lesson a week was devoted to L2L (a pattern very similar to that adopted at CSS through the 'Enrichment' programme with years 7 and 8): it was claimed that 87% of the pupils at the school under study found these lessons helpful and that the pupils reported that their increased understanding helped them with a range of studies. The claim is made that "the attainment of pupils with a Kinaesthetic learning style preference improved when teaching style complemented their learning style" (Lucas *et al* 2002: 57). It was, however, noted (Lucas *et al,* 2002: 61) that it is too early to make conclusive statements about L2L and that a longitudinal study was clearly necessary. Further, many schools reported that it was impossible to make a judgement about the impact of L2L on achievement and attainment. They noted that some teachers found that using Kinaesthetic activities resulted in additional noise and disorder; Visual learning was found to require considerable time for preparation and Auditory learning tended to be teacher-centred and regarded as the "boring part of the lessons" by pupils.

Although all of the schools within the L2L project reported that their research raised more questions than provided concrete answers, some key messages were claimed to have emerged. They include:

- Learning styles appear to emerge in a sequential order in young children: Kinaesthetic, Visual then Auditory.
- Visual and Kinaesthetic learning styles appear to be more common than Auditory in young children.
- Some children appear to have a preferred learning style whilst others seem to move comfortably between a range of learning styles.
- Some children always chose the same activities, which were overwhelmingly Kinaesthetic, suggesting that they had a preferred Kinaesthetic learning style.
- Boys often appeared to be more Kinaesthetic in their preferred learning style.
- Many successful children in school are Kinaesthetic learners and some academic strugglers are strongly Auditory.
- Exercise in the forms of brain gym and sport has a positive effect on pupil enjoyment of and motivation for learning.
- The use of music in classrooms has a positive effect on calming and relaxing pupils.

- There are positive effects on standards of achievement by pupils and on the motivation of pupils, teachers and parents when they understand and develop their preferred learning styles.
- Pupils learn best when teachers present information in a range of ways to meet the different learning styles in their classrooms.
- Pupils learn best when they enjoy themselves or have fun, indicating that their emotional state is fundamental to learning.

The final report for phase 3 of the project (Higgins *et al,* 2007) recognised that the range and complexity of the approaches developed under the broad L2L heading made evaluation of the project challenging. It concluded that the impact on pupils is 'clearly positive, with both qualitative and quantitative data to provide evidence of improved learning'. The report does, however, note that, at school level, there is no clear evidence that L2L schools have improved more significantly than others.

A similarly titled project 'Learning How To Learn' (LHTL) (e.g. James *et al*, 2006; Black *et al,* 2006) is relevant as it aims to build on research on formative assessment and AfL, (which, as indicated in chapter 1, overlaps with my research into aspects of LIP). It also aims to explore the relationships between these and other current initiatives, such as L2L and the Assessing Learning to Learn Project in Finland which relates 'learning to learn' to the ability and willingness to adapt to novel tasks, activating one's commitment to thinking' (Hautamaki *et al,* 2002: 38). Black *et al,* (2006: 119) argue against the implication made by L2L that it can generally be applied across all forms of learning. They go on to try and distinguish between LHTL and L2L (Black *et al,* 2006: 121) and refer to earlier work by Dearden (1976) in concluding that LHTL, unlike L2L, marks out ' a family of structures of second-order learning having wide first-order application'. In other words, it relates to metacognition.

The findings from the projects have particular relevance to CSS, as, from September 2007, it will be following a commercial package known as Alite: Accelerated Learning in Training and Education, based on L2L, with all of its year seven pupils. An investigation into this would make a fascinating study, but is, unfortunately, outside the scope of this thesis.

CHAPTER THREE.

Methodology.

Overview of the chapter.

A key feature that underpinned my research methodology was the involvement of the practitioners themselves, i.e. the teachers in CSS, working in partnership with myself. I followed a modified 'action research' path, where the research was carried out with (rather than by) the practitioners. Evidence for this is provided through, for example, the teachers' involvement in discussions after lesson observations, their involvement in the completion of questionnaires and interviews, the end of research evaluation (appendix) and their production and use of questionnaire 5. My research was therefore participatory, as it involved close collaboration between myself (as the researcher), and the practitioners. Conceivably, it could therefore be called 'emancipatory action research', as joint responsibility for practice and process was, at least to a certain extent, with the participant group, (Kemmis, cited in Hammersley, 1993: 187).

The overall aim of my case study research was to work collaboratively with the teachers in CSS, focusing on the six-part lesson-planning model, the use of preferred learning styles and the effectiveness of active learning, in order to improve professional practice so that benefits of the research could be seen in the classroom. I recognised that such change-oriented research was more about a distinct set of goals than a unique approach to research and that there was a need to build in a 'usefulness' indicator into my research (O'Leary, 2004). One of the objectives for the teachers at CSS was the facilitation of change: a measure of success or credibility was how useful my research was in facilitating, driving or implementing that change. It was, I felt, important to build in opportunities for regular review of all of the aspects as the research so that, as suggested by Robson (2002: 81) the final design emerged *during* the study. The needs and ideas of the teachers were seen to be central to the progress of my research so that they became reflective practitioners: "the exchange between research and practice is immediate, and reflection-in-action is its own implementation" (Schön, 1983: 309). Andrews (2003) considered this to be important, provided that it does not skew the research, making the emphasis on dissemination and audience rather than on the research itself. A similar point is made by Ary *et al* (1985): action research will be of most relevance to teachers if it is engaging; if it is disseminated during the project; if it benefits the school(s) during, and at the end of, the research and if it involves a large number of teachers.

Throughout the period of my research, I therefore ensured that regular dissemination was built in to the programme. This was achieved through reflective practice that incorporated evaluative feedback from the teachers, particularly teacher X, with overall school responsibility for teaching and learning within the school and teachers A, B, C and D, who were involved in my lesson observations. This feedback had an impact, both on my methodological approach, and on teacher perceptions of the process and subsequent practice. Two examples are offered in illustration of this. CSS appeared concerned that there were apparent differences in pupil and teacher perceptions about the sharing of lesson objectives and the start of a lesson; both of these were later pursued in more depth through questionnaires, lesson observations and interviews. During discussions of an observed lesson with teacher D, it emerged that it could be beneficial to her practice to develop the use of pace in her lessons by the use of shorter, timed, activities, with frequent use of time indicators to her class. There was some apparent success with this, with pupils appearing to be more engaged and more focused on their tasks (described in lessons D3 and D4, chapter four).

I followed a mixed-methods research design, (e.g. Tashakkori and Teddlie, 1998; Creswell, 2003; Maxwell and Loomis, 2003;Teddlie and Tashakkori, 2003, 2006;

Gorard and Taylor, 2004; Yin, 2006 and Creswell and Plano Clark, 2007), but with a greater emphasis on qualitative, rather than quantitative methods. It was, I felt, necessary to heed the following advice:

> It is important to emphasise that there is no strategy which is always going to be appropriate for every piece of research undertaken. It is very much a matter of... fitting the method or technique to what is being investigated.
> (Campbell *et al* 2004:5)

Throughout my research, I considered it to be vitally important to include pupils: "schools cannot learn how to become better places for learning without asking the pupils" (Crane, 2001: 54). The concept of 'pupil voice' has, as highlighted by Lundy (2007) received increasing attention in recent years, mainly attributable, according to Noyes (2005: 533), to the ratification of the United Nations Convention on the Rights of the Child which states (Article 12) that the views of the child should be given due weight in accordance with the age and maturity of the child. Whilst the use of 'pupil voice' during my research at CSS was something of a challenge, partly because of the tensions it revealed in terms of some differing views expressed by pupils and teachers, I agree with the view of Groundwater-Smith (2004), that it is worthwhile, primarily because it allowed both myself, and the school, to consider the teacher and the pupil perspective; differences were found and helped to shape the research as it proceeded, hence contributing to the participatory-emancipatory action research approach. This gives some support to the view of Flutter and Ruddock (2004) that consulting with pupils has benefits for teachers as it helps them understand how to support pupil engagement and build more open, collaborative, and communicative relationships with their pupils.

Quantitative v. qualitative methodology

Methodology refers to the analysis and description of the data and its purpose has been outlined as:

> to describe and analyse...methods, throwing light on their limitations and resources, clarifying their presuppositions and consequences, relating their potentialities to the twilight zone at the frontiers of knowledge. It is to venture generalizations from the success of particular techniques, suggesting new applications, and to unfold the bearings of logical and metaphysical principles on concrete problems, suggesting new formulations
>
> (Kaplan, 1973)

The obvious distinction between quantitative and qualitative research methods is that the former "deals with numbers and usually employs statistical techniques, whereas the latter does not, or does so only to a minor degree" (Open University, 2001: 26). Equally simplistically, quantitative work "refers to counts and measures of things", whereas qualitative work "predominantly uses words" (Gorard and Taylor, 2004: 13) Almost identically, O'Leary opines that qualitative research uses data represented through words, pictures or icons and is analysed using thematic exploration (O'Leary, 2004: 99). Cohen *et al* (2000: 30) point out that most educational research methods are descriptive, with the majority of educational studies cited in the literature being descriptive rather than experimental.

A definition of quantitative research methods, used by Aliaga and Gunderson (2002) is considered by Muijs (2004: 1) as being well suited: "explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics)". Measurement is, according to Gorard and Taylor (2004:15), the basis for all quantitative analysis. However, they also argue that quantitative analysis is predicated on prior qualitative work: the process of measurement, which they see as the foundation of quantitative work, is based on qualitative work and urge the consideration of the use of a mixed approach to research. Quantitative data needs to use numbers that are used as a proper quantity and this will depend on the clear identification of a relationship between what is being measured and what is being studied. Berka (1993) identified three stages in this: first, the need for an accurate comparison of the characteristics of a set of objects; second, the need to sort the measurements and, third, to identify a relationship.

Muijs (2004) describes two main types of quantitative research design: experimental and non-experimental. He opines that an experiment is a test under controlled conditions, made to demonstrate a known truth, or examine the validity of a hypothesis, with the key element being control; he further comments that in non-experimental quantitative research it is not possible to remove extraneous influences. There are advantages associated with the use of experimental designs, with the main one being the degree of control over external factors, which would allow for a stronger claim to have discovered causality. Smith (1991: 177), for example, has argued that it is the only method that directly concerns itself with causality.

Muijs (2004: 7) also outlines four main types of research question that are particularly applicable to quantitative research: when a quantitative answer is required; when numerical change is the basis of the study; for the explanation of a phenomenon; and for the testing of hypotheses. My research title would indicate that a quantitative approach should, at least in part, be used. If I am examining effective learning, then I am, realistically, examining changes in pupil achievement over time; this would appear within the third of Muijs' typology; equally, as I am seeking to examine any correlation between an intervention programme and the use of learning styles and effective learning then I am effectively testing a hypothesis.

Within experimental research, it is necessary to change the value of one variable (the independent variable) and observe or measure the effect of that change on a second variable (the dependent variable) (Ary *et al*, 1985: 31). In my research study, for example, the dependent variable (the object of the study) would be the effectiveness of learning; the active, independent, variable would be LIP. Within my case study, with an emphasis on questionnaires, lesson observations and interviews, I did not feel that an experimental design was appropriate, largely because of the large number of contextual factors and influences that would make effective control impossible. As a later development to my research, (beyond the scope of this thesis) there may be specific elements from my findings that would be worth investigating through this manner. For example, it may be possible to analyse data to identify any causal link between effective learning and perceived preferred learning styles, how teaching has been adapted to accommodate them and pupil achievements via SAT/GCSE results (e.g. Postlethwaite and Haggarty, 2002; Grimley and Banner, 2005).

Most empirical studies within an education setting are, according to Cohen *et al* (2000: 212) quasi-experimental, rather than truly experimental. Quasi-experiments are used because, according to Muijs (2004: 27), the random allocation of pupils needed for experimentation is neither possible nor practical within a school setting. A control, or comparison, group is used to attempt to give as much control as possible. Controlled experiments (e.g. Shayer and Adey, 1981) may possibly have a role to play, but do pose problems in terms of the ethics of that type of approach and hence would need to be considered very carefully. In addition, there would still remain a substantial number of variables that may affect outcomes within an educational setting. For these reasons I decided not to use them, although there have been apparently successful examples of their use, for example a report by Veenman *et al*

(1996) on the evaluation of an initiative to improve teaching in Dutch secondary schools.

There has been concern, particularly in the USA, about the quality of evidence regarding the effectiveness of educational policies, for example, "about the wide dissemination of flawed, untested, educational initiatives that can be detrimental to children" (Boruch and Mosteller, 2002:1) The use of randomised control trials (RCTs: a research method used to estimate the effect of an intervention on a particular outcome of interest (NRC, 2004: 1)) may, as suggested by, for example, Oakley (2000) and Slavin (2002), be explored as a way of strengthening the research findings by enabling claims about cause and effect to be made with confidence. RCTs are widely used in medicine, but less so in education, possibly because, as Hammersley (2001) has argued, it is less problematic to measure outcomes in medicine than in education.

There have been some instances of the use of RCTs in education. Goodson (1999), for example, using randomised testing with year 2 pupils, found that pupils performed better when tested in an informal normal working environment, rather than in more formal test conditions. Butler (1988) placed students randomly into three groups and investigated the use of feedback about their test results. It was claimed that those receiving just comments, rather than numerical scores, performed better in subsequent tests. In a comparison of RCTs in health and education, Torgerson *et al* (2005) noted that there was a poor quality of reporting of educational trials as compared to health, and that this has been in decline in recent years. Further, as Glenn (2004) reports, there are many education researchers who have serious concerns about the use of RCTs, with a fear that they are based on a false analogy with health studies and that have little external validity. Consequently, I do not plan to use RCTs in my research.

The main features of qualitative research are, according to the Open University (2001: 49): a focus on natural settings; an interest in meanings, perspectives and understandings; an emphasis on process; inductive analysis and grounded theory. Qualitative data can be considered to be descriptive and concerned with conditions or relationships that exist; practices that prevail; beliefs, points of view or attitudes that are held; processes that are going on; effects that are being felt or trends that are developing, (Best, 1970: 315). Stake (2005:449) gives a simple, but practical, piece of advice about conducting qualitative research, which I found to be very valuable and which can be summed up as 'get into the thick of things', linking well to the need for depth of study in a case study approach; further Stake stresses that "whilst there will be an emphasis on observation, it is more important to be reflective".

Muijs (2004: 9) outlines some settings where a more qualitative approach is particularly useful: when the setting needs exploring in depth; when a hypothesis needs developing; when the issues are complex (for example a case study); and when cause and effect (causality) is being investigated. In my opinion, my case study setting requires in-depth, qualitative study, supported by quantitative approaches; in other words I feel it is appropriate to use a mixed methods design, as suggested by Gorard and Taylor (2004), in which I use both quantitative and qualitative methods.

Mixed methods

Croll, (1986: 174) suggested that: "it is possible to move from qualitative to quantitative approaches in the early stages of a study…and from quantitative to qualitative methods in the final stages". I felt that it would be advantageous to effectively integrate quantitative and qualitative methodology via the use of a mixed methods approach. As Greene (2008) points out, there has been considerable development in the area of mixed methods design (for example: Tashakkori and Teddlie, 1998; Teddlie and Tashakkori, 2006; Maxwell and Loomis, 2003, Creswell, 2003; Creswell and Plano Clark, 2007 and Yin, 2006).

'Mixed methodology' research usually refers to studies that include elements of both qualitative and quantitative methods in their design. Teddlie and Tashakkori (2003) refer to 'mixed methods'; Creswell (2003) refers to 'multi-method' or 'integrated' research and Gorard and Taylor (2004) talk about 'combined methods'. Essentially though, they are all concerned with what can be considered as a third methodological movement, considered by Johnson and Onwuegbuzie (2004) to offer a logical and practical alternative to either qualitative or quantitative approaches, although it is only seen by Greene (2008: 17) as having the potential to be a distinct methodology. Mixed methodology has been defined as:

> the collection or analysis of both quantitative and qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the integration of data in one or more stages in the process of research
>
> (Creswell *et al*, 2003: 212).

And, similarly, as:

> the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study.
>
> (Johnson and Onwuegbuzie, 2004: 17)

Gorard and Taylor (2004: 1) suggest that it is practical to combine evidence collected using a variety of different methods, in particular, the combination of evidence derived from both 'qualitative' and 'quantitative' methods. They argue that both of these methods have strengths and that "even greater strength can come from their appropriate combination"; a view, supported by Robson (2002) and reinforced by the NRC (2002), commenting that research claims are stronger when they are based on a variety of methods. This view is not, however, held by all researchers. Sale *et al* (2002:43), for example, claim that quantitative and qualitative methods cannot be combined for cross-validation or triangulation purposes because these two paradigms do not study the same phenomena.

Commentators such as Bryman (1988) and Tashakkori and Teddlie (1998) have demonstrated that there can be advantages in combining qualitative and quantitative approaches. Tashakkori and Teddlie further argue that the qualitative/quantitative debate has become increasingly unproductive. Bryman has opined that the differences between the two traditions are not really found in practice:

> The suggestion that quantitative research is associated with the testing of theories, whilst qualitative research is associated with the generation of theories, can be viewed as a convention that has little to do with either the practices of many researchers within the two traditions or the methods of data collection themselves
>
> (Bryman, 1988: 172).

Some workers, such as Brewer and Hunter (1989) have adopted a pragmatic approach, using both qualitative and quantitative methods. Reichardt and Rallis (1994: 85) contend that this pragmatic approach is feasible, arguing that the fundamental values of quantitative and qualitative researchers are currently compatible. Hanson *et al* (2005) argue that, when both quantitative and qualitative data are included in a study, then researchers are able to both generalize results from a sample to a wider population and to gain a deeper understanding of their area of study. Gray and Densten (1998) consider that it is better to consider qualitative and quantitative approaches as being on a continuum rather, than as a dichotomy.

Gorard and Taylor (2004) describe two of the most common ways in which data derived from different methods are combined – triangulation between methods in one study and the combination of results across a number of studies using different methods. This was an approach that was adopted by Mehanna (2005), who found it necessary for her research to employ, what she referred to as the two research paradigms – qualitative and quantitative – in a consecutive, staged manner. She found that mixing the two methods within each stage not only helped her to answer her research questions, but also facilitated the triangulation, both within and between, the stages. She concluded that the inductive and deductive approaches are compatible and could complement each other. Such a pragmatic approach to methodology is echoed by Tashakkori and Teddlie (2003). They argue that the research question, rather than the method, should be of paramount importance.

Greene *et al* (1989) identified five purposes, or rationales, for conducting mixed-methods research: triangulation (seeking convergence and corroboration of results, discussed later), complementarity (seeking elaboration, enhancement, illustration and clarification of the results from different methods), development (using findings from one method to help to inform another), initiation (discovering paradoxes and contradictions that help to re-frame the research question) and expansion (seeking to expand the breadth and range of research by using different methods for different inquiry components). Some recommendations for the design of a mixed methods study are given by Hanson *et al* (2005: 11). These include the need to attend to the theoretical and paradigmatic issues of the study and to the priority that is assigned to the quantitative and qualitative data. My design will have an emphasis on qualitative aspects and, although it will tend to a more constructivist paradigm, it will also have a postpositivist slant if one considers Creswell and Miller's (2000) interpretations. They see the postpositivist position as assuming that qualitative research consists of rigorous methods and systematic forms of enquiry; the constructivist, or interpretive, position is more pluralistic, open-ended and contextualised. The main rationale for using both quantitative and qualitative methods within my research is to triangulate, or converge, the results: Creswell (1999) suggests that, if this is the case, then the data may therefore be collected concurrently, a point echoed by Mertens (2003) and Punch (1998), who suggested that mixed methods investigations may be used to better understand a research problem by converging numeric trends from quantitative data and specific details from qualitative data. It may, following Glaser and Strauss's (1967: 132) discussion of formal and substantive theory, be possible to extend the empirical research in my study, at least tentatively, in order to suggest some key propositions that may be applicable in a wider field. Glaser and Strauss's work is discussed more fully at the end of this chapter.

Case Study

My decision to use a case study did not, in principle, dictate which method (or methods) to use. Denscombe (2003: 32) has argued that, properly conceived, case study research is "a matter of research *strategy* not research methods". In his opinion, one of the strengths of a case study approach is that it allows for the use of a range of methods, which can relate to the specific requirements of the situation being investigated. Case study research investigates in-depth and tends to have a focus on relationships and processes within a natural setting. I recognised that my aim of investigating within a natural setting would be hard to achieve, as the pupils that I will observe might behave differently from normal, simply because they are being observed - what Denscombe (2003: 65) calls 'the observer effect': there is a danger that myself, as researcher can come to have an effect on the researched and vice versa. He suggests that this problem can be overcome by spending time on site, and hence becoming a familiar face, and also by having minimal interaction with those being observed. I was already well known to both the senior management team and the science department at CSS, partly because I was previously a Deputy Head teacher and teacher of science within the same Local Education Authority as CSS, and partly because CSS was a partnership school with Liverpool Hope University's PGCE science course. I was a frequent visitor to CSS and it is difficult to be precise about the time that I spent there, but would estimate it to be of the order of 200 hours, spread over the period of my research.

It was harder to achieve minimal interaction with the pupils being observed, partly because many of the pupils at CSS are naturally inquisitive and questioned my presence, and partly because I found it difficult at times not to help the pupils in their work (the consequence of being a teacher for many years perhaps). I explained, to all of the classes that I was involved with, that I was in CSS to work with their teachers in order to help to improve their learning- they appeared to accept, and indeed be heartened, by this. My presence did not, therefore, appear to cause a tension within the classrooms.

The distinguishing feature of a case study, according to Sturman (1994: 61) is the belief that human systems develop a characteristic wholeness or integrity and are not simply a loose collection of traits. As a result, to understand a case requires an in-depth investigation of the interdependences of parts and the patterns that emerge. O'Leary (2004:115) comments that a case study is often referred to as methodology but, literally, the term refers to the form and shape of the participants. The methodological approaches associated with case studies are, she argues, eclectic and broad and can involve any number of data-gathering methods – surveys, interviews, observation, document analysis etc.

According to Cohen *et al* (2000), the case study researcher typically observes the characteristics of an individual unit – a child, a clique, a class, a school or a community. The purpose of such observation, they point out, is to probe deeply and to analyse intensively the multifarious phenomena that constitute the life cycle of the unit, with a view to establishing generalisations about the wider population to which that unit belongs. Creswell (1999) compares, and contrasts, the case study approach with that used in ethnography. He views case studies as developing an in-depth analysis, as opposed to the interpretation of a cultural or social group, as in ethnography. Although case studies involve multiple sources, they commonly involve the use of observation and interviews, which are the principal method of data collection in ethnographic studies.

Adelmann *et al* (1980) outline a number of possible advantages of a case study approach. These include they are 'strong on reality' and, because they are contribute to, and are part of, a 'world of action' their insights may be directly interpreted and put to use. Yin (1994:13) argued that the essence of case study is that it is enquiry in a real-life context, as opposed to the contrived contexts of experiment or survey. He wrote that case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. A case study inquiry relies on multiple sources of evidence with data needing to converge in a triangulating fashion and benefits from the prior development of theoretical propositions to guide data collection and analysis. Yin's work tends towards the positivist (or scientific) paradigm whereas some commentators (e.g., Stake, 1995; Merriam, 1988) see case study research as being essentially qualitative. For example, Stake (1995: xi), writing firmly within the interpretive paradigm, described case study as " the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances". He continues, arguing that case studies "help persons toward further understandings ......in a way that accommodates their present understandings" (Stake, 1995:5).

More recently, Stake (2000) has argued that, what is important is trying to understand the complexities of a case study, and argued that there was little to be learnt from "control or reference cases chosen only for comparison" (Stake, 2000: 444). He further opines that there is a danger in generalising as it can distract from features that are important in order to understand a particular case. This tends to contradict the views of Gorard (2002), who suggests that the use of 'natural experiments' in educational research where controls (or, at the least, comparisons) form an essential part of research design in order to strengthen the conclusions. Lincoln and Guba (1985) had earlier argued that context-specific factors will always hinder the process of generalisation, echoing the comment by Cronbach (1975) that 'the working hypothesis' is a more helpful way to conceptualise generalisation. Williams (2002), in agreement with Gorard, suggests that generalisation is "both necessary and inevitable in interpretive research" (Williams, 2002: 138). Armour *et al* (2002) summarised the debate on generalisation by concluding that there is a broad agreement that "traditional notions of generalisability are difficult to apply in case study research, particularly where it uses qualitative methods" (Armour *et al*, 2002: 4). Following on from this comment, it may, perhaps, be the case that a mixed methods approach is more able to offer a generalised view, although I recognise that researchers, such as myself, need to be cautious about making generalisations, as the data obtained in one group situation may not be valid for other groups and other settings. Similarly, there are difficulties in replication; even within a single school one cannot reproduce a given situation in its entirety and with precision (Ary *et al* 1985: 20).

Grounded theory:

A grounded theory study seeks to generate a theory which relates to the particular situation forming the focus of the study; theory is emergent and must arise from particular situations and should be 'grounded' on the data generated by the research (Glaser and Strauss, 1967). In theory generation it is, according to Glaser and Strauss, important to seek out, not only confirming cases, but also to weigh the significance of any disconfirming cases. Glaser and Strauss (1967: 6) comment that: "generating a theory from data means that most hypotheses and concepts not only come from the data, but are systematically worked out in relation to the data during the course of the research". There is, it seems to me, at least a tentative relationship between this view and the notion of the case study evolving during the research (Robson, 2002: 81). Glaser and Strauss (1967: 33) go on to argue that a researcher should study an area without any preconceived theory that dictates, prior to the research, 'relevancies' in concepts and hypotheses. LeCompte and Preissle (1993: 270) suggest that, because interpretations of the data are grounded in the data, results that fail to support an original hypothesis are neither discarded nor discredited; rather it is the hypotheses themselves that must be modified to accommodate the data. As Lincoln and Guba (1985: 205) point out, grounded theory must fit the situation that is being researched.

There are two types of theory that can be generated using the grounded theory approach: substantive (setting specific), closely linked to the empirical situation that has been the subject of study (in their definition of substantive theory, Glaser and Strauss (1967: 32) include 'professional education') and formal, which is more conceptual, with more general coverage and applications beyond particular settings (Locke, 2001: 35). This tends to contradict the traditional model of research, where the researcher chooses a theoretical framework, and only then applies this model to the studied phenomenon.

There has since been a divergence in the methodology of grounded theory (Strauss, 1987; Strauss and Corbin, 1990; Glaser, 1992), which Kelle (2005) views as being dependent upon whether a researcher uses a well defined coding paradigm, looking systematically for causal conditions, phenomena/context, intervening conditions, action strategies and consequences, or whether theoretical codes are employed as they emerge in the same way as substantive codes emerge, but drawing on a huge fund of coding families.

Critics of grounded theory have, though, questioned its claim to use and develop inductive knowledge. For example, Layder (1993) suggests that the need for grounded theory to be recognizable to the people studied can place a constraint on analysis; Haig (1995) queried whether or not the reliance of grounded theory on a 'naïve' model of scientific induction was inappropriate to qualitative inquiry; and Thomas and James (2006) warn that the significance of interpretation, narrative and reflection can be undermined in the procedures of grounded theory. However, Dey (1999) whilst offering many criticisms of grounded theory, appeared broadly supportive of it.

Denscombe (2003: 113) points out four kinds of research for which grounded theory is, in his opinion, well suited:

- Qualitative research, (although Glaser (1978: 6) claimed that 'it transcends specific data collection methods').
- Exploratory research, particularly when the topic of interest has been relatively ignored in the literature or has received only superficial attention (Goulding, 2002: 55).
- Studies of human interaction, particularly when the participants' point of view is explored (Layder, 1993).
- Small-scale research.

Robson (2002: 192), argues that there is no reason, in principle, why some form of quantitative data collection cannot also be used, echoing the view of Strauss and Corbin (1998) who claim that grounded theory is a general method that can be used in both quantitative and qualitative studies. Thomas and James (2006) make a similar point, commenting that it is especially highly regarded as a method of social analysis in education and that its use can validate the findings of a study (e.g. Harry *et al*, 2005). Grounded theory has, according to Denscombe (2003: 109) become a popular choice of methodology recently, particularly for small-scale projects using qualitative data for the study of human interaction, and for exploratory research, focused on particular settings; it would, therefore, have relevance to my case study, with its focus on CSS, particularly when one considers the comment below:

> Grounded theory's affinity with qualitative research, its desire to generate explanations from the study of particular instances, its need for detailed data about activities and practice and its value for exploratory research, combine to make it an approach that is well suited to small-scale research conducted by individual researchers operating within the constraints of a tight budget.
>
> (Denscombe, 2003: 114)

Action research

The term 'action research' was first used by Lewin (1946), and applied to educational research by, for example, Stenhouse (1975) and Kemmis (1988). Action research relies chiefly on observation and behavioural data and is therefore empirical in nature. It can be argued (Somekh, 1995: 340) that action research is designed to bridge the gap between research and practice, so that it strives to overcome the perceived failure of research to impact on, or improve, practice. It has been defined as: 'small-scale intervention in the functioning of the real world and a close examination of the effects of such intervention' (Halsey, 1972), as: 'a research strategy that pursues action and knowledge in an integrated fashion through a cyclical and participatory process', and, a definition recommended by Lomax (2002):

> Action research is a self-reflective, self-critical and critical enquiry undertaken by professionals to improve the rationality and justice of their own practices, their understanding of these practices and the wider contexts of their practice
>
> (Carr and Kemmis, 1986)

Cohen *et al* (2000) identify a number of features of action research: it is situational-context specific; it is normally collaborative, with practitioners and researchers working together; it is participatory, with practitioners playing a role, often indirectly, in the research; and it is self-evaluative – the ultimate aim being to improve practice. They indicate that its prime feature is that it is an 'on-the spot' procedure and that it is designed to deal with a concrete problem located in an immediate situation. Consequently, the process needs to be constantly monitored by a variety of mechanisms, such as questionnaires, diaries, interviews and case studies, so that feedback can result in appropriate modifications to bring about lasting benefit. They continue their argument by considering that action research is appropriate whenever specific knowledge is required for a specific problem in a specific situation, with the rider that there needs to be suitable mechanisms available for monitoring progress and providing feedback and outline a number of broad categories where action research is applicable to the classroom situation, hence echoing the point I made in my overview to this chapter. Their categories include: a means of remedying a problem or providing some type of improvement; a means of in-service training; a way of injecting additional or innovatory approaches to learning and teaching; and a means to improve communications between the practising teacher and the researcher. The first and third points are particularly relevant to the research within my case study setting, but the second and fourth points are also relevant, particularly as the teachers indicated that they saw my presence in their classrooms as a way of gaining professional development and indicated that they valued my contribution.

O'Leary (2004) points out that not all research questions can be easily converted into a hypothesis. In 'action research', methodology is, according to O'Leary, both collaborative and emergent, making predetermined hypotheses impractical to use. She outlines some basic tenets of action research, including the addressing of practical problems, often used where the goal is to improve professional practice; the need for collaboration between researchers, practitioners and other interested stakeholders; and its cyclical nature, based on evaluative practice that alters between action and critical reflection, with a need to continually refine methods, data and interpretation in the light of the understanding developed in earlier cycles.

The participatory nature of action research can, O'Leary argues, lead to a number of management issues, all of which I found to occur during my study:

1. The ultimate direction is not in my hands; but decisions about ultimate direction and outcomes should be collective
2. It is difficult to control the pace, e.g. arranging key meetings or change in personnel
3. Facilitating collaboration is not easy
4. As a researcher, I carry the burden of ethical responsibility
5. I need to negotiate the ownership of the outcomes and the rights to publish

It was agreed at the outset that the school would have total freedom in terms of how they reacted to any of my findings, especially as they had to view them in the broader context of their whole-school planning. They were, however, very keen that their work was seen to be evaluated, partly because they were involved in continuous school self-review, related to external inspection. The second point was certainly found to be true: pressures on time (both mine and teachers at CSS) meant that it was quite common for scheduled meetings, and observations, to be cancelled then re-arranged. It was difficult to maintain communication and the pace of my research during my period of illness (January – April 2005), although I was able to maintain some contact and was able to analyse and interpret data. Very fortunately, there was very little change to personnel during the period of my research, although teacher B did leave in July 2006. The ethical issues in my study were discussed with the school and it was agreed that I could write up my findings in a thesis, provided anonymity was assured. It was also agreed that CSS would be able to use any of my work to help them with their self-evaluation.

There are some other issues with regard to action research. Halsey (1972) argued that there is an incompatibility between action and research and that this can potentially cause problems. Research places an emphasis on values such as precision, control and replication and attempts to generalise from specific events; conversely teaching, with an emphasis on action and doing things, tends to translate generalisations into specific events. As an example, Marris and Rein (1967) came to the conclusion that the principles of action and experienced research are mutually exclusive and that attempts to fuse them can produce conflict and the subordination of one of them to the other. Certainly, as I have argued previously, researchers, such as myself, need to be cautious about making generalisations, as the data obtained in one group situation may not be valid for other groups and other settings. Similarly, there are difficulties in replication; even within a single school one cannot reproduce a given situation in its entirety and with precision (Ary *et al* (1985: 20). The use of action research leads to the production of restricted data – i.e. data that cannot claim to be generally representative. The difficulty of carrying out an interpretive analysis on such data was seen, by Winter (1982), as a problem: the unique context of the action research does not remove questions about the validity of the data. The validity aspects of my research are discussed in a later section in this chapter.

Methods

The methodological approaches that I used were eclectic and broad involving: discussions, particularly with teacher X, interviews and two questionnaires with nine teachers from one faculty (science), four of which were involved in a series of lesson observations, and a questionnaire with fifteen teachers from other curriculum areas. Additionally, my study followed a year group of approximately 200 pupils (y7, 2004-5) as they progressed through the school (interviews, questionnaires and lesson observations, feedback on the results of my study); twelve pupils were involved in initial interviews, ten pupils were observed more closely during lessons and a further twelve participated in final interviews. As a comparator, year 11 pupils (2004-5) completed a questionnaire. Further, I analysed the schools' returns, which sought to determine all pupils' preferred VAK learning styles. The use of a questionnaire (questionnaire 5), developed by the science teachers in response to some of the issues that had emerged from my research, afforded the opportunity to add an interesting, comparative, perspective.

A wider view was sought through the use of modified questionnaires with eleven science teachers from other schools and through a survey into the analysis and use of preferred learning styles, with eighty-seven respondents from thirty-six schools. This was valuable in acting as a comparator with practice at CSS; some similarities and differences were noted. The methods for analysing my data are discussed at the end of this chapter.

1. Interviews

These are a research tool and vary from formal interviews, with set questions asked and recorded, through to the completely informal interview, where key issues are raised in conversation. The research interview has been considered by Cannel and Kahn (1968) to be a two-person conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information and to be focused on content specified by research objectives of systematic description, prediction or explanation. Interviews involve a set of assumptions and understandings about a situation, which are not normally associated with a casual conversation (Denscombe, 1983; Silverman, 1985).

The interview is seen, not just a device for collecting data, but also as "a process of constructing reality to which both parties contribute and by which both are affected", (Open University, 2001: 58) and can serve a number of other functions, for example as a way of testing hypotheses and as an explanatory device to help identify relationships and variables.

I decided to use interviews as a data collection tool for a number of reasons. They:

- allowed for a more in-depth response to my research, used in triangulation with other data collection methods
- allowed me to investigate the emotions, experiences and feelings of teachers and pupils involved: "the nature of emotions, experiences and feelings is such that they need to be explored rather than simply reported in a word or two." (Denscombe, 2003: 165)
- enabled me to gain access to data based on privileged information, involving the teachers instigating the intervention programmes and the pupils receiving them
- were feasible as I was granted access to key players.

Cohen *et al* (2000) identify four kinds of research interviews: structured; unstructured; non-directive and focused. In the structured interview, the content and procedures are arranged in advance; hence it is a closed situation, as opposed to the unstructured interview, which is open and has more flexibility and autonomy. The non-directive interview is characterised by the freedom given to the respondent in expressing his/her feelings as fully and openly as is desired, with the course of the interview being largely guided by the interviewee. Such an approach is typically used by a phenomenological researcher i.e. one who is interested in seeing things from a member of a particular group's point of view (Denscombe, 1983); this could well prove useful in my gaining an in-depth view of a teachers' or pupils' perspective. A phenomenological approach has apparently proved valuable in helping researchers to understand the thinking of pupils and teachers (van Manen, 1990). Certainly, a phenomenological approach does lend itself to small-scale, low budget research such as mine, where the main resource is myself as researcher. However, such an approach, with an emphasis on subjectivity, description and interpretation can be considered to lack scientific vigour in contrast with the scientific emphasis on objectivity, analysis and measurement (Denscombe, 2003: 106).

The interviews I conducted were effectively semi-structured in that the same questions were used with each group of respondents, but with a reference frame for respondents that allowed for a deeper response. They were of the one-to-one variety with teachers as I considered that these were much easier to arrange than group interviews with busy personnel; they had the added advantages of being easier to control, easier to monitor and of allowing me to locate specific ideas with specific people. Interviews with pupils were largely of the group, or pair, type, although as discussed later, two pupils were interviewed individually. There are a number of reasons why I opted for group/pair pupil interviews, not least being the safety of both pupil and researcher. Craig *et al* (2000) stress the importance of avoiding being placed in a compromising situation in which there might be accusations of improper behaviour; this could be high risk in a one-to-one interview situation with a pupil. I have acted on the findings of Hopkins (2002: 109) who discovered that group interviews with 3-4 students, was the most productive as they didn't inhibit each other, instead they 'sparked' themselves into sensitive, perceptive discussion.

Lewis also highlighted several advantages of group, over individual, interviews:

> they help to reveal consensus views, may generate richer responses by allowing participants to challenge one another's views, may be used to verify research ideas of data gained through other methods and may enhance the reliability of...... responses
>
> (Lewis, 1992: 413)

There are a number of issues concerning the use of interviews as a research tool, with a central one being validity; studies by Cannell and Kahn (1968) indicated this to be a common problem. The direct verbal interaction within an interview allows for greater depth than the questionnaire, which has only a recorded response, but is prone to subjectivity and bias on the part of the interviewer (Borg, 1963). In conducting my interviews I followed Tuckman's (1972) review of the procedures to adopt. These include briefing the respondent to the purpose of the interview and explaining how the responses will be recorded. Clearly, as an interviewer I will have had an effect on how people respond. For example, Denscombe, (2003: 169) points out that the gender, age and ethnic origins will all have a bearing on the amount of information that people are willing to divulge and their honesty about what they reveal. Obviously, any interviews will need to be recorded by some method, otherwise the information will be quickly forgotten and clearly, respondents will need to have given permission in advance. The recording can be done via field notes, written during the interview. Inevitably, this will result in an interpretation of the response rather than a fully objective record of the discussion; an agreed summary of the expressed views can help to minimise this problem. Audio tape-recording offers a permanent and complete record of the interview; field notes can be used in conjunction with this, for example, to record any non-verbal response or to comment on the context of the interview. Denscombe (2003: 183) considers that it is necessary to transcribe any tape as a valuable part of the research as it brings the researcher "close to the data"; he also argues that the process of transcribing should be seen as a substantial part of the method of interviewing. However, as this would be a long and laborious process, and because it was not intended to be my only, or indeed my main, method of data collection, I decided not to transcribe the tapes, but to use them as reminders to complement my field notes. Although it is difficult to be precise with regard to the extent to which I did this, it was frequent and it did prove to be helpful, particularly during the analysis of the interviews as I could refer to precise replies to clarify my notes as relevant. Perhaps, with hindsight, the transcription of the tapes might have led to a more efficient use of my time. The use of tapes was considered to be less important because I considered them to be, primarily, of value in supporting both the initial interviews in order to produce more focused questionnaires and the end of research interviews, which were primarily seeking, to what extent, earlier findings could be confirmed.

2. Questionnaires

The use of questionnaires for both pupil and teacher survey was chosen partly because it is an efficient use of time (Munn and Drever, 1990): the manageability of my part-time research was a key issue for me. In constructing my questionnaires, I considered some advice from the literature. Selltiz *et al* (1976) have detailed a guide to the construction of a questionnaire, which can be summarised under four main headings: decisions about question content; decisions about question wording; decisions about form of response to the question; decisions about the place of the question in the sequence. According to Denscombe (2003: 144) a research questionnaire should fulfill three main criteria: they should be designed to collect information, which can be used as data for analysis; they should consist of a written list of questions and they should gather information directly from participants. Munn and Drever (1990: 19) suggested that questionnaires should be: “attractive to look at, brief, easy to understand and reasonably quick to complete". They also outlined some limitations in the use of questionnaires: the information can be superficial, can be descriptive, rather than explanatory; and there is often inadequate preparation (Munn and Drever, 1990: 5).

The questionnaires were initially piloted with nine y7 pupils prior to its subsequent use with the test population during the period of initial interviewing; this helped to clarify the foci for later use. My use of questionnaires was as a complement to other methods, as explanations, and a fuller response, could be elicited by interviews, lesson observations and follow-up questionnaires (this also helped to ensure that, in preparing a questionnaire, I was able to reflect on earlier findings and to target my questions more accurately).

Denscombe (2003: 159) has outlined some advantages and disadvantages of the use of questionnaires as a research tool. Questionnaires are economical, are quite easy to arrange and they provide standardised, pre-coded answers which can be analysed, but they can bias the findings towards the researcher's rather than the respondent's views and do not readily offer the opportunity to check the truthfulness of any answers. It was important, to ensure consistency, that each respondent read an identical set of questions or statements. In using questionnaires, my intention was to use standardised questions in order that the stimulus presented to all respondents could be controlled. The questions can be of the closed type – allowing only the answers that I have established in advance, or of the open type, where the respondent can decide the extent of the answer. Closed questions lend themselves to the production of quantitative data, which, although they can be easily analysed, they do not allow for respondents to expand their views and provide a more detailed response, i.e. they can lack depth. Kumar (1999) opined that using closed questions can lead, not just to lack of depth, but that the investigator can be accused of bias as the pattern of responses could just represent an investigator's own interest. Open questions, conversely, produce raw data, which can be difficult to analyse but have the advantage of allowing the respondent to produce a more reflective answer to each question; Kumar (1999) for instance, described how a wealth of valuable information could be collected using open-ended questions.

My initial questionnaires only included closed questions, but it was obvious via discussion with some of the teacher respondents that they felt frustrated by the inability to expand or clarify their answers or to put them into their own personal context. Indeed a large number of teachers annotated their replies: this was neither asked for, nor expected, but proved useful in adding context and detail. It was evident that there was a need to build in scope for the respondents to amplify their answers if they so wished: later questionnaires did this.

It was recognised that there could be some difficulty in terms of the participants recognising words or phrases used within my questionnaires. Many, if not all, of the terms used in the questionnaires had been covered with the science teachers during their initial interviews: the questionnaires were essentially investigating further the issues that had emerged during these (and pupil) interviews. The use of questionnaires across the full ability range of pupils in a comprehensive school does raise the issue of whether all of the pupils are able to read and understand the questions. To attempt to minimise this, the wording of the questions in my pupil questionnaires needed careful consideration; I discussed these with teacher X, with an emphasis on how readily she thought that the pupils would understand or recognise terms; as a result of these discussions, some amendments were made. It was, I felt, important that all questionnaires were completed in lesson time in order that the teachers involved could give, as necessary, any help in reading or interpretation. The use of lesson time should have ensured a good return as, theoretically, all of the pupils present in each class should have responded. However, this was not the case for the pupil perception questionnaire (questionnaire 4) distributed during my illness: this emphasises the importance of regular communication to maintain pace.

Within my questionnaires, I have essentially been seeking teacher or pupil attitudes towards aspects of my study. The term, attitude, has been defined by Ary *et al* (1985: 194) as: "a positive or negative affect towards a particular group, institution, concept or social object"; they also describe four main types of attitude scale: summated rating scales (Likert); equal-appearing interval scales (Thurstone); cumulative scales (Guttman); and semantic differential scales. The Thurstone scale (Thurstone and Chave, 1929) assigns specific scale values to attitude items; the respondents only indicate the statements with which they agree. The biggest disadvantage of the use of this, according to Ary *et al*, is the amount of work in its construction, a view echoed by Robson (2002: 198): I consider the use of this scale to be unmanageable for my small-scale research project. I used a five-point Likert attitude scale (a set of values, which allow for the use of numerical, quantitative, analysis), (Likert, 1932), essentially because of its relative ease of use with school children and its manageability, as I was not there to administer the tests. Ary *et al* comment that several studies have shown the use of such a scale to be more reliable, (Ary *et al*, 1985: 200) and Robson (2002: 293) reports that it is widely used, easy to develop and that people enjoy completing them. A Likert scale assesses attitudes toward a topic by asking the respondents to consider whether they strongly agree, agree, are undecided, disagree or strongly disagree with each of a series of statements (some negative, some positive) about a topic.

I have also used the type of questionnaire suggested by Groundwater-Smith and Mockler (2003), which, because it only offers four possible responses (strongly agree/agree/disagree/strongly disagree) forces an opinion. This can also, by allocating points to each response, be analysed quantitatively, but it was found that, in using this type with teachers, they felt a little constrained and often wanted to 'sit on the fence' and present the neutral answer; many of them did, in fact, as mentioned earlier, annotate their responses.

3. Observation

The use of observation as a data collection tool has a number of advantages, but I recognise that there are inherent problems associated with it: the observational data produced will be affected by my powers of observation, by my powers of recall and by my level of commitment – these would, inevitably, be different for different observations and could therefore lead to my findings lacking consistency; equally it is impossible to remember all that is observed in a classroom (Denscombe, 2003: 193). Cohen *et al* (2000: 186) comment that, at the heart of every case study lies a method of observation; they identify two types of observation– participant and non-participant: in the former the observer engages in the very activities s/he sets out to observe; in the latter the observer is not part of the group. Non-participant observation can also be termed systematic observation: it tends to produce quantitative data, which can be pre-coded and suitable for analysis; participant observation, which is associated with ethnographic techniques, usually produces qualitative data. There has been debate about the appropriateness of these two approaches. Ethnographic researchers have argued that the 'objectivity' of systematic observations is largely spurious and that a concentration on what can be measured can lead to more important aspects of a classroom being missed (Hamilton and Delamont, 1974; Delamont and

Hamilton, 1984). The alternative view, that qualitative approaches can be subjective and unreliable, has been expressed by, for example, Croll (1981) and McIntyre and MacLeod (1978). Bailey (1978) identified a number of advantages to the participant observation approach, including the ability of the observer to discern ongoing behaviour as it happens, and to make notes about its salient features; and the development of a more intimate and informal relationship with those being observed.

Systematic observation is a research method, which uses an observation schedule to attempt to minimise some of the problems outlined above. One of its key elements is that the observation procedures are carefully defined and highly explicit so that "the idiosyncracies in an individual's selection and perception of events are eliminated" (Croll, 1986: *ix*). The observation schedule can produce objective observations and eliminate bias and can be used by more than one researcher, hence allowing reliability to be achieved; it is used to monitor a number of selected items and record, for example, their frequency of occurrence. This can, however, lead to recording things out of context, (Galton *et al*, 1980), and I wanted to avoid this. There are some concerns regarding the use of systematic classroom observation. One of the major issues is related to the use of pre-defined categories for describing activities within the classroom which will result in only a partial view being obtained, (Croll, 1986: 161). Further, Croll comments that it can be considered to be an inflexible research instrument because of the inherent constraints produced by the categories.

I felt that, to avoid my presence in the classroom unduly influencing the reactions of the pupils, I would essentially follow a non-participatory role. This was not always possible: as I have already commented, at times I did find myself helping the pupils. In many ways it could be said that I used several strands normally associated with a participant observer, particularly as I was conscious that the teachers saw one of my roles as developmental: I did not want to be seen as 'Inspectoral'. My observations were deliberately descriptive, rather than statistical, although some statistical information was obtained, for example, the number of times that lesson objectives were shared with pupils in lessons. The aims were to get an overall feel for the situation as a complement to my findings from other methods; to concentrate on any areas that were either contradictory or unexpected; and to use observations to try and identify the issues and problems that the participants themselves view as important. (Denscombe, 2003:204).

Smith (2005) has used a technique, developed as a pilot by the National College of School Leadership (NCSL, 2003) and known as Networked Research Lesson Study within a science department of an English secondary school to investigate the impact of teaching 'thinking skills'. One aspect of the methodology has involved the use a planning template, available via the NCSL, to help to focus observations on case study pupils. The template gives advice, which I found to be valuable, on how to plan such observations and includes the need to have prior discussions and to make decisions about how to capture, analyse, and interpret the data.

My main priority for my observation was to preserve the naturalness of the setting and minimize the degree of disruption. This was aided by following the advice of Denscombe (2003: 204), who stressed that good (participant) observation demands considerable time allocation to fieldwork in order to gain trust, establish rapport and foster insights. I was a frequent visitor to CSS, spending, as I mentioned earlier, of the order of 200 hours on site. Because I focused primarily on a small number of pupils within each lesson, I would argue that the nature of my observation allowed a greater emphasis on the depth, rather than the breadth, of data.

Authenticity: validity, reliability, trustworthiness.

Validity and reliability are terms usually associated with a quantitative approach to research, but have also been used within qualitative studies. According to Bush (2002: 66) there are two main distinctions that have been identified in terms of validity: internal and external validity. Internal validity refers to the degree by which findings from research can be considered to represent the phenomena being investigated. (Brock-Utne, 1996: 615) defined it as: "how correctly the research portrays the phenomenon it is supposed to portray"; she also considered external validity to refer to the extent to which any research findings can be usefully applied to a more general setting.

LeCompte and Goetz (1982a), working within an ethnographic framework, suggest that the external validity of data can be enhanced by a consideration of, for example, researcher status position and data collection and analytical techniques (discussed later in this chapter). They comment that, because any conclusions drawn in a study need to be qualified by the investigator's social role within the research site, they may be only narrowly applicable; however, they also opine that the conclusions are, nonetheless legitimate, a point also made by Glaser and Strauss (1967), who argue that the individual facets of a study, when added together, contribute to the whole picture. Perhaps the results from my study may be regarded as supplemental to the wider educational picture, rather than being directly replicable. It may, as in McPherson's study of schools (McPherson, 1972), represent the relatively narrow perspective of one researcher, but can, according to LeCompte and Goetz (1982a), be replicated by researchers, but only if they assume comparable roles, i.e. if they have similar status. I would add here the comment that, whilst my extensive experience, both as a school teacher and as a deputy head teacher within the same Local

Education Authority as CSS, would perhaps add significantly to my status and 'credibility' within a school setting, it could also pose some issues, in terms of direct comparability of status, if the research were to be replicated by a second researcher.

Although Hammersley (1987) has claimed that there are no widely accepted definitions of validity or reliability, there are some definitions to be found in the literature. For example, validity has been defined as: "the degree to which what is observed or measured is the same as what was purported to be observed or measured" (Robson, 2002: 553), and, according to LeCompte and Goetz (1982a: 35), "necessitates demonstration that the propositions generated, refined, or tested match the causal conditions which obtain in human life". Reliability has been defined as: "the extent to which a test or procedure produces similar results under constant conditions on all occasions" (Bell, 1993: 64) and as: " the extent to which studies can be replicated" (LeCompte and Goetz, 1982a: 35). LeCompte and Goetz further opine, though, that no study can ever be replicated exactly, because human behaviour is never static. Bush (2002: 60) points out that there is wide support for considering a research method as reliable if it produces identical or similar results when repeated. Quantitative data can be considered to have a higher validity through the use of careful sampling, appropriate instrumentation and appropriate statistical treatment; standard error is inbuilt and has to be acknowledged (Cohen *et al,* 2000: 105).

Denzin and Lincoln (1998) are sceptical about the applicability of external validity to qualitative methodology, seeing it as more relevant to positivist research and Easterby-Smith *et al* (1994: 89) commented that there has been a degree of reluctance to apply these terms to phenomenological research because "they might imply acceptance of one absolute (positivist) reality". Hammersley (1987: 73), however, holds a counter view, pointing out that these notions are used by researchers with both a positive and an interpretive viewpoint, an opinion echoed by Brock-Utne (1996: 612): "the questions of validity and reliability within research are just as important within qualitative as within quantitative methods". LeCompte and Goetz (1982a: 43) opine that, in an ethnographic setting, the uniqueness of the setting may mean that external reliability is approached, rather than attained. However, they also argue that, unlike reliability, validity may be a major strength of any ethnographic work, partly because of the data collection and analytical techniques used.

According to the Open University (2001: 60), the validity of qualitative research commonly rests upon three main features: unobtrusive measures to ensure that the data collected does reflect the scene studied; respondent validation; and triangulation. Qualitative studies are often accused of being "impressionistic, subjective, biased, idiosyncratic and lacking in precision" (Open University, 2001: 67). It is important, therefore, that rigorous procedures, such as triangulation, due attention to sampling, documentation and appropriate claims, reflectivity, and tightness of fit between data collection, analysis and theory, are adopted to overcome that charge.

Creswell and Miller (2000) point out that there are a multitude of terms that can be used for 'validity' within the qualitative paradigm, these include: authenticity, goodness, verisimilitude, adequacy, plausibility, robustness, validation and credibility. They do, however, comment that there is a general consensus, within qualitative researchers, of the need to demonstrate that findings within a study are credible. Bassey (1999: 74) argues that the concepts of reliability and validity are not vital concepts in case study research; instead he supports the alternative concept of trustworthiness suggested by Lincoln and Guba (1985) as, in his opinion, it more successfully highlights the respect for truth in case study research. Further, Bassey proposes a series of eight questions (based on Lincoln and Guba's work), which, he suggests, need answering if a study can claim to be trustworthy. Many of these are discussed later, and overlap with the work of other commentators. They include the need for prolonged engagement with data sources; persistent observation of emerging issues; the adequate checking of raw data; triangulation; hypothesis testing; peer debriefing and the use of an audit trail.

Lincoln and Guba (1985) argued that the prime standard for qualitative research is that the findings and interpretations of the research are credible to those who are involved – this should involve the pupils as well as the teachers. This reinforces the need for feedback and evaluation of the research programme. However, respondent validation is not always appropriate, particularly where the subject of the research is school processes rather than perspectives. I was careful to avoid the problems that plagued Scarth (1985: 78) when, in attempting to report findings of his research to a group of teachers, it became too personal and future meetings had to be cancelled.

There is, I believe, a need to examine data on a fairly regular basis to see if any major themes, issues or categories are emerging – this is particularly true when considering the need for regular feedback. An identification of such themes, issues or categories will, in turn, direct future data collection in a process called 'progressive focusing' (Open University, 2001: 67). There is a need to continuously examine the data, to think about it and to interact with it. My immersion in the data has been aided by my compilation of a field diary, where a running commentary on the research, with reflections on my own personal involvement, has been kept. This diary also served as a way of recording comparisons and contrasts with other material, any relevance to the literature, any interconnections between the data, any notes on reliability and validity and possible theories and concepts. Science teachers at CSS also kept records of their lessons through both formal lesson plans and their own evaluations, which served as a useful reference point for later discussions.

Maxwell (1992) has presented a typology of the kinds of understanding involved in qualitative research: description, interpretation and theory. Each of these types has a threat to its validity, which needs to be recognised and countered. The main issue to presenting a valid description concerns the degree of accuracy or completeness of the data. Interpretation, according to Maxwell, refers specifically to interpretation of the meaning and perspective of participants; to minimise the threat to validity it is important to interpret what emerges from the research, rather than having a pre-conceived framework. It is, of course, essential to continually consider alternative explanations or understandings of any of my findings to counter the threat to the validity of 'theory'.

Lincoln and Guba (1985) outline three main areas, which posed threats to the validity of my research design: reactivity, respondent bias and researcher bias. The first of these concerns the possible interference with the research setting. As a researcher, I recognised that I could interfere in some way with the classroom setting, particularly the behaviour of the people involved (teacher and pupil). Equally, I appreciated that I could have a degree of bias and could bring assumptions and preconceptions to the situation, which would then affect my behaviour in the research setting, for example in my selection of people for interview or observation, the kinds of questions I ask, or my selection of data. The respondents too, could have a degree of bias in a number of forms, for example, they could give answers that they think I (or the school) would want to hear, or they could, in the current school climate of accountability, see me as a threat.

Typically, there is a close relationship between the researcher and both the setting and the respondents. McCormick and James (1983) comment that, in qualitative research, where there is a great deal of subjective interpretation, validation can be achieved when others, notably the subjects of the research, recognise the authenticity of the work – what is referred to as respondent validation.

It was, I felt, important that I was aware of the ways in which I may have had an impact on the research process. Ahern (1999: 408), for example, stresses the need to be reflexive, arguing that this can help to "put aside personal feelings and preconceptions". Padgett (1988) discusses a range of strategies, which can be used to overcome the threats to validity:

- Prolonged involvement. This is a strategy that is usually related to a more ethnographic approach. It can help to reduce the threat of reactivity as "researchers who spend a long time in the setting tend to become accepted and any initial reactivity reduces", (Robson, 2002: 173) and, similarly, help to develop trust between teachers and pupils and myself as researcher. However, I accept that continued involvement in the case study setting could easily lead to an increased bias on my part if I became too involved with the school, or conversely, I could develop a negative bias later in my research by becoming antipathetic. In reality, the problems of organising meetings and lesson observations, did obviously affect my ability to have 'prolonged involvement'.
- Peer debriefing. Essentially this stresses the importance of discussing my findings with interested colleagues. Lincoln and Guba (1985) see the key role of a peer reviewer as providing support by asking hard questions about methods and interpretations. The 'touching base' sessions at Liverpool Hope University, my regular tutorials with my supervisors, my regular involvement

in research seminars, and the opportunity to present aspects of my work, all helped to reduce the threat of researcher bias.

- Mentor checking. This is also referred to as member checking by Lincoln and Guba (1985: 314): they describe it as "the most crucial technique for establishing credibility". The feedback and joint evaluations of progress within CSS will also contribute to reducing the threats posed by reactivity and respondent bias. This is, I feel, an important aspect of my methodology as it allows a shared understanding of the process and is a way of showing that I "value their perceptions and contributions" (Robson, 2002: 175). Inevitably, there were different perceptions, but I viewed this as healthy debate; what was important was the need to negotiate discussions so as to respond to any concerns raised, and to consider the needs of the study.
- Negative case analysis. It is important to search for any alternatives to any theory or pattern that appears to be emerging from my study as a further way of reducing researcher bias. Miles and Huberman (1994) refer to this as disconfirming,or negative, evidence. This was of particular concern during my analysis and interpretation of data.
- Audit trail. A further way of reducing researcher bias was to ensure that I kept a full record of all of my activities. My *Personal Development Record* (PDR) at Liverpool University provided a formalised record of the overview of my activities, complemented by keeping all of my raw data and by the use of reflective writing via the use of my research diary. Todd (2005) saw such a diary as valuable, not just because it allowed her to log and monitor her studies, but also because it gave her the opportunity to reflect on situations that had occurred within her research setting.

- Triangulation. This can help to counter all of the threats to validity and hence is potentially powerful (Robson, 2002:175). It is dealt with more fully later in this chapter.

Creswell and Miller (2000) discuss some other factors that can affect validity: these include researcher reflexivity, collaboration and thick, rich, description. They describe the possible use of the participants in a study as a method of establishing the validity of an account. It was, I feel, important that this happened in my case study setting in order that the participants felt respected and supported, rather than marginalized. They may not have recognised themselves as 'action researchers', but, effectively, that is what they were.

In reflexivity the researcher reflects on the social, cultural or historical sources that might shape an interpretation and, as such, is positioned within the critical paradigm. According to Creswell and Miller, credible data comes from close collaboration with participants due to their (informal) involvement as co-researchers. In my opinion, the notion of collaboration needs to be integrated with 'mentor or member checking', so that there is a climate of openness and trust within my research setting: I regard this as vital.

The description of the setting, the participants, and the themes of a qualitative study in rich detail, can also be used as a procedure to establish credibility through a constructivist perspective, which adds context. Denscombe (2003: 233) regards thick descriptions as necessary within a qualitative approach because they convey the complexity of the situation and enable others to decide whether the findings can be applied to other settings. Denzin (1989: 83) describes thick descriptions as "deep, dense, detailed accounts" in contrast with thin descriptions, which "lack detail and simply report facts". It seemed evident to me that this depth of detail should apply to my case study setting and that I should follow the advice of Denscombe (2003: 38): "the case study ... encourages the use of multiple methods in order to capture the complex reality under scrutiny".

Triangulation

A case study inquiry relies on multiple sources of evidence with data needing to converge in a triangulating fashion and benefits from the prior development of theoretical propositions to guide data collection and analysis. Adelman *et al* (1980) stressed that triangulation is at the heart of the case study approach as there is a need for the researcher to respond to the multiplicity of perspectives present in such a social situation. A number of reasons have been suggested for the use of combined methods triangulation. These include: increasing the concurrent, convergent and construct validity of research; the enhancement of the 'trustworthiness' of an analysis; reducing bias; and in testing hypotheses (Perlesz and Lindsay, 2003).

Essentially, triangulation refers to the use of two or more methods of data collection and hence can be referred to as a multi-method approach. Creswell and Miller (2000: 127) see triangulation as: "a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study". As early as 1953, Boring was arguing that the use of triangular techniques would help to overcome reliance on one type of method:

> As long as a new construct has only the single operational definition..... it is just a construct. When it gets two alternative operational definitions, it is beginning to be validated. When the defining operations, because of proven correlations, are many, then it becomes reified.
>
> (Boring, 1953)

Denzin (1970) extended the view of triangulation into a number of types, of which methodological triangulation (using either the same method on different occasions or different methods on the same object of study) has, perhaps, the greatest relevance to my study. Some early examples of the use of triangulation in schools include Hargreaves *et al* (1975) who investigated how pupils and pupils think about school rules by asking teachers and pupils about rules and also by observing lessons; and Woods (1979) who combined interviews with observations.

Moran-Ellis *et al* (2006a) differentiated between the terms 'triangulation' and 'integration', which they noted were frequently confused with each other, commenting that researchers who advocate the use of multiple methods often write interchangeably about 'integrating', 'combining' and 'mixing' methods, sometimes eliding these descriptors with 'triangulation', which itself encompasses several meanings. They argue that such interchangeability is problematic since, in their view, it obscures both the difference between the processes by which methods are brought into relationship with each other and the claims made for the epistemological status of the resulting knowledge. They concluded that, at the very least, integration should be understood as separate to triangulation. Integration was described by them as: "a relationship between methods brought about by decisions to operationalise and implement the research" (Moran-Ellis *et al*, 2006a: 2), whilst triangulation described an epistemological claim (i.e. a theory of knowledge, especially with regard to its methods and validation; Moran-Ellis *et al*, 2006b).

The term 'triangulation' is, as has also been noted by Kelle (2001), a source of some confusion. Most sources explain that triangulation involves only a minimum of two datasets, or vantage points, to give information about a third phenomenon (Gorard and Taylor, 2004: 43) and can be understood by using the analogy of trigonometry in land surveys. However, the use of this analogy has limitations for social and educational research. Gorard and Taylor (2004:45) argue that it rules out both the positivist and relativistic views and that it cannot be used be as confirmation or validation of two observations or methods. They further opine that triangulation is about complementarity, i.e. they should complement each other, producing different dimensions of the situation being investigated, but has nothing to do with mutual validation. It can, they suggest, be used to test any theories, which are being offered to explain any the findings. Essentially, I feel this fits best with my practice as, throughout my research, I have attempted to complement, reinforce or deny my findings by the cross-referencing of interviews, questionnaires and observations.

Analytical methods

Analysis is, according to Denscombe (2003: 119), the separation of complex things in order to identify their basic elements; put even more simplistically, analysis is rather like taking apart puzzles and reassembling them, (LeCompte *et al*, 1993). Within the multimethod approach of my research it is, as Robson (2002: 456) comments, appropriate to include qualitative data and these may be dealt with using content analysis. He further notes that qualitative data may well be useful in supplementing and illustrating the quantitative data obtained from a survey for example. LeCompte (2000) comments that quantitative data, such as test scores, are relatively easy to analyse by, for example, the use of a computer. The quantitative ordinal data in my study, i.e. data based on counts of things assigned to specific categories, standing in an ordered, ranked, relationship (Denscombe, 2003: 237), was generated through the use of questionnaires using either a five-point Likert scale (Likert, 1932), commonly used according to Robson (2002: 293) or a four-point scale, as suggested by Groundwater-Smith and Mockler (2003). The data resulting from responses to the questionnaires were analysed with the aid of an Excel spreadsheet. In order to gain more meaningful comparisons across the findings from different questionnaires, the responses to the questions were first categorised by means of a weighting scale (+2, +1, 0, -1, -2, according to the level of agreement), second the responses to each statement from each type of respondent were summed and then compared to the maximum/minimum score possible and finally converted into a percentage, which I refer to, in the tables presented in chapters four and five, as 'weighted percentage agreement'. It was possible to compare the results of questionnaires using the five-point scale with those using a four-point scale as the weightings used on the four-point scale (+2, +1, -1, –2) can, I would argue, be considered to be mathematically equivalent to the five-point scale if the neutral point (represented mathematically by zero) is considered to be one of the points (+2, +1, 0, -1, -2). Although I recognise that the two scales cannot be considered to be identical, I would argue that it does allow for some degree of meaningful comparison.

In order to attempt to try and maintain a consistency of judgement and interpretation, my definition of agreement scales, used with the findings presented in chapters four and five, relates to the following percentage range:

- very strong agreement, + 70 or more;
- strong agreement, + 60 to +69;
- fairly strong agreement, +40 to +59;
- some agreement, +20 to +39;
- little agreement +1 to +19.

The descriptions for disagreement would have the same numerical values, but would be negative. I recognise that these are somewhat arbitrary, but attempt to add a descriptive dimension to the quantitative analysis; and, as argued by Robson (2002: 295), such systematic procedures do help to ensure internal consistency.

As LeCompte (2000) has commented, the analysis of qualitative data is both more complex, and more ambiguous, than the analysis of quantitative data. Further, LeCompte and Goetz (1982a: 40) warn that a serious issue, for both external and internal reliability, is the identification of general strategies for analysis, and comment that analytical processes in ethnographic research are often vague, intuitive and personalistic. However, Creswell (2003: 182) points out that, within any qualitative design, a researcher needs to filter the data through a personal lens: the personal interpretation brought to qualitative data analysis is inescapable.

Goetz and LeCompte (1984) provide advice, which I found to be helpful, on data-collection strategies and the analysis and interpretation of data, for example, the use of field notes, interview transcripts and researcher diaries. Miles and Huberman (1994) provide a general framework for conceptualising qualitative data analysis, which, in essence, aims to account for events, rather than simply documenting them in sequence, and which claims to be a powerful method for assessing causality. Within this framework, analysis is considered as consisting of three elements: data reduction, data display and conclusion drawing or verification. Miles and Huberman emphasise that data reduction, i.e. the production of summaries, and abstracts etc., is part of analysis: decisions about what to select and to summarise and how to organise are analytic choices. Data display relates to the use of charts, matrices etc. in order to have a clearer means of organising the data. The framework of Myles and Huberman is, according to Robson (2002: 473) particularly useful in case studies, for example those by Asmussen and Creswell (1995, cited in Creswell, 1998), which used semi-structured interviews, observational data, documents and visual materials, and Silverman (2000), which used Miles and Huberman techniques, together with ethnographic and grounded theory aspects.

Grounded theory (Glaser and Strauss, 1967) has systematic steps for data analysis; these involve generating categories of information (open coding), selecting one of the categories and positioning it within a theoretical model (axial coding) and then explicating an account from the interconnection of these categories (selective coding). The analysis of data in the grounded theory approach adheres closely to the aim of discovering the key components or general principles underlying a particular phenomenon so that these can be used to provide a clearer understanding of it. In order to do this, Denscombe (2003: 271) opines that it requires an analytical process that first identifies the core elements of that phenomenon and then arrives at the underlying principles that explain it. This will then allow, through the use of selective coding, the identification of the key concepts that help to explain the phenomenon. Strauss and Corbin (1990) regard concepts as the basis of analysis in grounded theory, with all grounded theory procedures aimed at identifying, developing, and relating concepts. Goetz and LeCompte (1981) advise that units of analysis should be identified clearly, to show where they begin and end and, as appropriate, what variables form the framework for data analysis and collection.

Hanson *et al* (2005) comment that, in mixed methods studies, data analysis and integration may occur at any point in time, although Onwuegbuzie and Teddlie (2003) note that the point at which data analysis begins and ends is dependent upon the type of data collected, the sample size, the research design and the purpose of the research. Greene (2008) notes that there has been some work in the area of integrated mixed methods data analysis and cites, for example, Teddlie and Tashakkori (2003), McConney, Rudd and Ayres (2002) and Lee and Greene (2007). Onwuegbuzie and Teddlie (2003) conceptualised a seven-stage mixed methods data analysis process: data reduction, data display, data transformation, data correlation, data consolidation, data comparison and data integration. It clearly has similarities with the framework of

Miles and Huberman (1984), and may, perhaps, be considered to be an expansion of it.

Moran-Ellis *et al* (2006a) suggest how integration can occur during the analytical stage of a research study. They suggest that, where multiple data analysis is integrated, each method should contribute data from its own epistemological frame, and individual method integrity should be preserved and propose an approach consisting of what they called four key steps. Initially, each data set needs to be analysed so that emerging questions and further analytic questions are identified; any emerging issues may be followed through into other data sets, which are juxtaposed to form a data repertoire and finally, the findings can then be synthesised to build up empirical and theoretical understandings. In effect, this was the approach that I followed. There seems, to me, to be at least a tentative link between the four key steps of Moran-Ellis *et al* and the grounded theory approach of Glaser and Strauss (1967), as, in both, the analysis of data relevant to a specific situation leads to an emerging theoretical understanding.

My analytical procedure involved what Romagnano (1991, cited in LeCompte, 2000) referred to as 'tidying up', which I found an absolutely necessary first step to coding and analysing data. This involved, for example, making copies of all data and putting all field notes, interviews, questionnaires, surveys into chronological order: this was greatly aided by my use of a field diary. Each piece of my raw data material was identified with a unique serial number or code for reference purposes, for example the responses from each teacher to the survey in questionnaire 3 were separately recorded. Within my preparation of qualitative data for analysis, I used record cards of the same size, which helped when I was sifting through the materials. For example, after each interview session, I summarised, onto a single sheet, what issues had been covered, the relevance to my research questions, any new hypotheses suggested and implications for subsequent data collection. The use of colour coding and the use of a simple matrix, proved to be valuable in spotting patterns, irregularities, making contrasts and comparisons and suggestions for future work. This was particularly useful in checking for consistency of data from different sources. The importance of triangulation as noted by Miles and Huberman (1994: 267) proved to be invaluable: "triangulation is not so much a tactic as a way of life. If you self-consciously set out to collect and double check-findings, using multiple sources and modes of evidence, the verification process will largely be built into data collection as you go".

Through the use of open coding, I split my data into discrete units, for example, data as an example of using learning objectives. The main aim of this was "to discover, name and categorize phenomena (and) to develop categories in terms of their properties and dimensions" (Strauss and Corbin, 1990: 181). At this stage of the analytical procedure, I added comments and reflections into my field diary, referenced alongside my field notes. This served both as a crucial reminder of facets of my study and as a log to illustrate my developing line of thinking; such reflections helped in my attempt to identify 'patterns and processes, commonalities and differences' (Miles and Huberman: 1994:9). This was further developed through axial or theoretical coding, so as to "build a model of the phenomena that includes the conditions under which it occurs (or does not occur), the context in which it occurs, the action and interactional strategies that describe the phenomena, and the consequences of these actions" (Mertens, 1998: 352).

Whilst the mechanical task of managing the data was aided by the use of a word processing computer package, particularly in the storage, the coding, and the retrieval of data, it was still necessary to judge, interpret and make decisions. As Tesch (1993: 25) points out: "the computer does not make conceptual decisions, such as which words or themes are important to focus on, or which analytical step to take next."

An important step in my analytical method was to seek to create a pattern. Identifying patterns within my findings involved "seeing how taxonomies can be clumped together in meaningful ways"; locating patterns involved "reassembling them in ways that begin to resemble a coherent explanation or description of the program, event, or phenomenon under study" (LeCompte, 2000: 151). In assembling patterns, I looked for evidence of corroboration, or triangulation, that the existence of a pattern was confirmed by other pieces of data or information. As a result, it was then possible to assemble my findings into groups of related, or linked, patterns that, taken together, built into an overall description of my study and enabled the formulation of some tentative, but perhaps profitable, substantive and formal theoretical propositions in the manner espoused by Glaser and Strauss (1967), presented in the final chapter of this thesis.

Ethics

Gorman (2007) comments that ethics is not about simplistic solutions, rather it provides a framework for asking meaningful questions and is at the very heart of good scholarship. It is, of course, as Campbell *et al* (2004: 81) point out, important to consider ethical matters and the social context of research in the workplace, particularly when related to raising achievement. I recognised that much of my research methodology was intrusive and hence had the potential to be distressing to those involved. Equally, I was aware of the view that fully ethical research is impossible and that there is no solution to this (Burgess, 1989: 8). Certainly I needed to make decisions about how to make my research process as ethical as possible, recognising, as Busher (2002) points out, the constraints of time and finance. Day and Townsend (2007) stressed the need for researchers like myself, who work over a sustained period of time but whose interventions are relatively brief and temporary in relation to their working lives to: " hold and display a clear set of ethical principles within a particularly complex accountability". They go on to point out that:

> the nature of inquiry based work, intended to stimulate the growth of schools as learning communities, is itself problematic, since it produces tensions between the desire for more democratic practices which focus on teaching and learning and the need to produce measurable value added pupil attainments.
>
> (Day and Townsend, 2007: 80)

Inevitably, there were tensions between school development and my research. I recognised the likelihood of a dilemma between accurately representing the findings of my research and being sensitive to the needs of CSS. As mentioned in the introduction to this thesis, the advice by Groundwater-Smith and Mockler (2003: 34): 'approach it with authenticity and concern for both teachers and students, trusting in your own professional judgement to guide you' proved to be invaluable in overcoming this.

Day and Townsend also gave relevant advice on dealing with such inevitable tensions. The findings of my study, although discussed with individuals, were intended to be of benefit to the whole school – this might, as Day and Townsend point out, suppress the interests and ownership of individual inquirers. I was careful to try and ensure that there was a consideration of the whole school context through dialogue with the teachers themselves. This is reinforced by Fullan (2000: 225) who states that: "most research shows that external consultants are effective only when they are in an internal… team that supports their activities … [and so consultants]… should establish some ongoing relationship with [staff] who will act collectively to follow through change".

Ethics has been defined (Pring, 2000: 141) as "the philosophical enquiry into the basis of morals or moral judgements"; Pring contrasts this to 'morals', which are more concerned with matters of right or wrong. Educational researchers, like social researchers, should be ethical and are expected to: "respect the rights and dignities of the participants, avoid any harm to them and to operate with honesty and integrity" (Denscombe, 2003: 134). Christians (2005: 145) has argued that the need to ensure confidentiality is of paramount importance and that the disclosure of private knowledge, which could potentially be damaging to any subjects in the study, is "the single most likely source of harm in a social science inquiry". This is a view supported by Pring (2000: 143) who sees the underlying principles of educational research as being a respect for the dignity and privacy of the subjects of the study. Denscombe stresses that participation in research should be voluntary and occur with the participants' consent and where, as in my situation, the research is lengthy and ongoing, there is a need to get consent in writing. He gives some advice on the items that could be included on a form to gain written consent. These include the identity of the researcher, information about the research, expectations about the participant's contribution, their right to withdraw and a statement about confidentiality and anonymity (Denscombe, 2003: 139).

I discussed with CSS whether it was desirable or practical to obtain written consent from the parents of the pupils whom I intended to monitor closely. The school considered that it has generic permission for all pupils to be involved in interviews and meetings, which have the best interests of the pupil and/or the whole school at heart and that it is the responsibility of the Head teacher as part of her overall professional standards and practice. This view is supported by Lindsay (2000) who comments that, where information is not released on any individual child, consent may be obtained from the school, rather than the parent, and by Fine and Sandstrom, (1988) who considered that the consent of the Head teachers is sufficient unless the children are involved in an extreme form of research. Seiber (1992) passed a similar comment, arguing that permission may be waived when the research will have no adverse effect on the children involved in it, and, in the United Nations Convention on the Rights of the Child (United Nations, 1989, article 12): "children who are capable of forming their own views should be granted the right to express their own views freely … children should therefore be facilitated to give fully informed consent". It was, in any case, agreed that it was unmanageable to try and gain written consent from all parents of all pupils involved in completing the questionnaires – these will remain anonymous.

I certainly followed the advice given in the BERA ethics guidelines, where it is evident that maintaining confidentiality is considered the norm for educational research:

> participants have the right to be informed (about likely publication of findings)… and to give their informed consent before participating in research"; "care should be taken when interviewing children .. up to school leaving age; permission should be obtained from the school, and if they so suggest, the parents.
>
> BERA (2004)

As I have previously mentioned, I considered it an essential part of my methodology to involve pupils. This is reinforced by Groundwater-Smith (in Campbell and Groundwater-Smith, 207: 221) who points out that by consulting students, we may put them in positions of vulnerability, but she continues: 'if we do not consult them, we risk overlooking the important contribution that they can make'. More comments on the impact of 'pupil voice' within my study may be found in chapter six.

Jones and Stanley (2008) argue that educational researchers, particularly when working with children, can be restricted by ethical regulations as they try to exercise the "moral autonomy and professional discretion required to negotiate the complex, potentially conflicting imperatives confronting them: (Jones and Stanley, 2008: 31), supporting the view of Bell and Bryman (2007) who considered that a 'bureaucratisation of research ethics' could minimise the scope for a more reflexive approach and negotiation. A paper by Poole and Maclean (2005) specifically addresses ethics in pedagogical research. As they point out, there is a real dilemma in pedagogical research, which is usually carried out with the express aim of improving the quality of student learning, but in doing that research, we are inevitably interfering with, or affecting, the students' learning itself.

To conclude this chapter, it is, I feel, worth noting Dahlberg and Moss's (2005) suggestion that ethics cannot deal with certainties. Ethical questions are, they say, ambivalent and uncertain, often having to be addressed in the field; they are: 'contextual, emergent and situational, dependent upon the relationship between the researcher and the participants and what is mutually discovered through the process'. Thus, during my research I attempted to be flexible in my approach, was prepared to work reflexively in the field (Etherington, 2004) and acknowledged that additional skills, such as effective listening and caring for the people before them are essential parts of my tool bag as an ethical researcher (Dahlberg and Moss, 2005). As a final comment, I paraphrase Groundwater-Smith (2007: 225): the employment of mixed methods not only lends authenticity through triangulation, but also allows for voices to be expressed through a variety of methodological media.

CHAPTER FOUR.

Research findings 1.

Theme one: the introduction and use of a six-part lesson-planning model, based on experiential learning cycle models.

Introduction

This chapter offers evidence relating to theme one, the introduction and use of a six-part lesson-planning model, based on experiential learning cycle models. It presents findings that explore to what extent aspects of the six part lesson-planning model are being used across lessons at CSS and how effective they are. The six parts of the lesson-planning model (Greenhalgh, 2002, figure 1, chapter two) are: mind state; connect with prior experience; the big picture; outcomes; delivery (including a multi sensory input); review and reflect. The 'mind state' is seen by CSS as important in order to establish appropriate conditions for learning to occur; 'connect with prior experience' and 'the big picture' relate to putting the lesson into the context of previous and future learning; 'outcomes' implies that the pupils need to be aware of what the lesson will be about and what is expected of them and 'review and reflect' to the expectation that pupils will be given the opportunity to think about their learning. The 'delivery' (teaching) step is more related to theme two and the findings from this are presented in chapter five.

Initial semi-structured interviews, with twelve year 7 pupils (seven boys, five girls), and nine teachers from the science faculty, were primarily used to provide background data on the use of LIP at the start of the study and helped to determine the future direction of the research. The science teachers had a range of experience and there was a wide age profile. Of the five males, two had no more than 2 years teaching experience, the other three had posts of responsibility within the school; within the four females, one was the Head of Faculty, a second was deputy Head teacher and the other two had no more than two years experience. Four of these teachers were later involved in a sequence of lesson observations.

A number of issues arose as a result of analysing the results of these initial interviews. Whilst there was general agreement between the teacher and pupil perspectives in a number of areas, there were also examples where there appeared to be significant differences. The findings from the interviews were therefore pursued in more depth through questionnaires 1 and 1a, with the aim of eliciting how much of the lesson-planning model was actually being followed within the Science Faculty, from both the teacher and the pupil perspective. Whole year groups of pupils from year 7 and year 11 responded: this allowed useful comparisons to be made, as pupils in y7 had been part of the 'Enrichment' programme whereas those in y11 had not.

The science teachers at CSS completed a second questionnaire (questionnaire 2), which was designed to complement, and develop, the questions from questionnaire 1. It consisted of 51 questions related to theme one (LIP and the lesson-planning model) and also to theme two (accelerated learning and learning styles, presented in chapter five). To complement the teacher perspective and to have regard to the 'pupil voice' and learning, I also used a pupil perceptions questionnaire (questionnaire 4; adapted from Greenhalgh, undated) with year 8 pupils (2005-6). A sequence of ten lesson observations focused on the extent to which the steps of the lesson-planning model were being followed within the science faculty and the reactions of twelve pupils during these lessons. At the end of the data collection step of my research, I interviewed twelve y9 pupils (2006-7) in order to seek deeper responses to those the pupils made in earlier questionnaires and interviews in relation to both theme one, the six-part lesson-planning model, and to theme two, activities and learning styles (covered in chapter five). The analysis of questionnaire 5, instigated by CSS and used with y7 pupils (2007-8), provided an interesting dimension to complement some of the issues that had emerged from my study.

From the outset, I felt it to be appropriate to have a wider perspective, primarily to compare practice at CSS with a number of other schools within its local area. Consequently, mentors from other schools (i.e. science teachers, in partnership with Liverpool Hope University, monitoring the progress of trainee teachers on their school placements) also responded to questionnaire 1 and, as presented under theme two in chapter five, to a modified form of questionnaire 2, (questionnaire 2a) focusing on accelerated learning and learning styles.

Findings from theme one: the introduction and use of a six-part lesson-planning model, based on experiential learning cycle models.

1. Initial interviews.

The questions, put to both teachers and pupils, were:

- Describe how a typical lesson starts;
- How do you know what the lesson is going to be about?
- How often are you asked questions and when does this happen?
- Describe how a typical lesson ends
- What do you think could be done to improve learning?

It was expected that responses to 'describe how a typical lesson starts' would include some discussion of the 'mind state' and 'connect with prior experience' steps from the lesson-planning model. There was a common consensus that a starter activity was normal, often as a recap of the previous lesson, although teachers reported that this was less prevalent with y10 & 11 classes and most common, and more successful, in y7. The reason for this related to a perceived lack of time: there was an awareness of the need to cover the syllabus in limited time and this was seen as much more of an issue in KS4. One girl, when asked why she thought that the starter was used replied: "to get you into the right frame of mind", clearly echoing what she had been taught in

'Enrichment' lessons. Five pupils commented on the degree of 'messing about' at the start of a lesson.

The use of lesson objectives appeared to be common, although two of the pupils commented that they didn't always know what the words meant. There was a general feeling amongst the teachers that too much time could be spent on setting objectives. Expected lesson outcomes were not usually shared at the beginning of a lesson, but could sometimes be explained during it. It was generally felt, by the teachers, that this was an area where more work was needed.

The pupils reported that the use of whole-class questions, particularly at the end of a lesson, was common, although this was an area that three of the teachers highlighted as in need of development. The teachers reported that the use of questioning varied and was dependent upon the ability and age of the pupils: many closed, factual recall, questions were used, with some more open ones, especially in the starter activities or with older/more able pupils, who reportedly responded well. Peer assessment was reported as being used sometimes and three staff mentioned the overlap with AfL.

All respondents mentioned a review or recap, with the time for this varying from five to fifteen minutes. Most of the pupils (eight of the twelve), and all teachers, considered that a review is important, for example one boy replied: "it keeps you up to date". A number of teachers (six of the nine interviewed) stated that they revisit the objectives at the end of a lesson and that they included a plenary or review, often as a recap rather than as an application of new knowledge. One teacher had a preference for a quiz-type activity within the plenary, although behaviour was said to limit this with some staff. Reported teacher fatigue, related to behaviour issues, meant that there was less teacher energy available for this type of activity: "it's easier not to do it" (female respondent). There was frequently, as shown through six of the responses, insufficient time for a review. The time spent clearing equipment away was commented on by three of the teachers.

The pupils were very thoughtful when asked: 'What do you think could be done to improve learning?' It was apparent to me, through both their general comments and through their general attitude, that they wanted to learn. Responses included: calmer atmosphere in the classroom; play more games ('it makes it fun and it stays in your head') and a greater use of computers, particularly for research or homework. The teachers highlighted improved classroom management; greater sharing of resources; team teaching; smaller group sizes; greater use of praise, and a greater link to the 'Enrichment' programme.

The teachers were also asked additional questions related to LIP:

- How aware of the learning intervention programme are you and how did you find out about it?
- How well would you say that you apply the principles of the learning intervention programme into your lessons? Does this depend on the age and/or ability of the pupils?

All four of the relatively newly qualified teachers (two male, two female) reported that LIP fits well into the theories and practices covered within a teacher- training course and aspects of LIP are covered via the school induction programme for newly qualified teachers. Three of the science teachers teach on the 'Enrichment' programme and so are very aware of the aims of LIP and recognised that this started after whole-school training on accelerated learning. Newly qualified teachers also commented that LIP was reinforcing much of what they had been taught whilst training, although their application of it at CSS was, they reported, to be more common with younger pupils. More experienced staff also commented that they tried to incorporate LIP into years 7 and 8, but were less inclined to do so with older pupils; the lesson plan was seen to be most useful to year 7 pupils. Teachers who taught on the 'Enrichment' programme were better placed to transfer the overall aims of it to science, but didn't always do so; teachers not teaching on this course were largely unaware of its content. Five of the staff cited behaviour issues as preventing the effective use of LIP: "Set 4s don't do a mind state!" (female teacher, with over 10 years experience). Lower sets do not, it was reported by four teachers, settle easily to a starter and they were felt to be more productive with more able pupils. In general, it was felt that LIP was harder to implement with lower ability classes. All staff commented on what they perceived as pressure in KS4, for example, deadlines, syllabus content, emphasis on passing exams – and this led, in some cases, to "the lesson plan being the first to go" (male teacher, over 10 years experience).

The analysis of these initial interviews indicated that a number of features of the lesson-planning model were being incorporated within the science faculty and, more widely, across the school. However, there were some aspects of it, in particular, the use of reviews that appeared less widespread. Three of the teachers had indicated that, in their view, pupils did not have a clear view about what the lesson-planning model was trying to achieve. There were also some indications that aspects of it were being used more with younger pupils, although it was not clear whether this was due to the introduction of LIP, or whether it was because the teachers viewed some aspects of teaching and learning to be more applicable to younger pupils. There were indications that both could play a part and this, I felt, warranted further investigation.

2. Questionnaires 1 and 1a.

To investigate some of these issues emerging from the initial interviews more deeply, I designed and used a questionnaire with teachers (questionnaire 1) and a 'pupil-friendly' version (questionnaire 1a). Nine teachers from CSS and eleven mentors from schools in partnership with Liverpool Hope University completed Staff

Questionnaire 1. This was to allow a comparison of the opinions of teachers in the science faculty at CSS with science teachers (mentors) in other schools. In addition, 69 boys and 76 girls from year 7 (2004-2005) and 44 boys and 34 girls from year 11 (2004-2005) completed the pupil version of the questionnaire Again the main purpose of this was to act as a comparator with the views of the teachers at CSS. It also aimed to give a direct comparison of pupils in y7, who have had regular involvement with 'Enrichment' lessons, with those in y11 who have not had this level of involvement. It can also be used to ascertain which, if any, aspects of the lesson-planning model are being used across these two, different, year groups, and which are more applicable to only one of them. The results were sub-divided by gender to examine any possible differences there. A similar sub-division by gender for teachers and mentors was not performed, partly because it was felt that the sample size was rather small; with hindsight this would have provided a potentially valuable comparison. The identification of gender was added to questionnaire 3.

The questions on questionnaire 1(1a) were arranged under a series of broad headings, all directly related to aspects of the lesson-planning model. For each question the respondents had to answer on a five-point Likert scale (Likert, 1932) varying from 0 (never used within a lesson) to 4 (used in every lesson). The analysis is summarised in tables 1.1 –1.4. (The questionnaires also examined the use of learning styles and a range of activities: these are more relevant to theme two and are discussed in chapter five).

In table 1.1, the questions relate to the first step in the lesson-planning model, the mind state for learning, and include, as examples, the use of appropriate music, handing out resources on entry and greeting by name. In the lesson -planning model, 'Connect with prior knowledge' is the next step after 'Mind State'; its intention is, according to CSS, to indicate where the lesson fits in to the earlier learning. It is seen as important, with guidance to staff asking them to remind the pupils that "learning not reviewed is learning lost for ever" (quote from CSS guidance to staff) and this is shown in table 1.2

Table 1.3 corresponds to step three of the lesson- planning model, used, according to CSS, to 'sell' the lessons to the pupils, with an indication of its benefit to them. It is put across in guidance to staff as a general overview. In many ways this step reinforces lesson recap and hence the questions in this section can be used to confirm earlier responses. Questions in this section also relate to step four (agree outcomes), which addresses what pupils are expected to know/have done by the end of the lesson). Tables 1.3 and 1.4 refer to stages 5 and 6 of the lesson-planning model. Stage five refers to the 'Delivery' i.e. "the actual teaching part where V, A or K techniques can be used to help us to learn; this is the part where we complete activities, listen, talk etc." (taken from an 'Enrichment' lesson at CSS for the week beginning 14th March 2005; years 7&8). The questions in this section refer to some examples of teaching and learning activities, which are suggested in some of the KS3 National Strategy documentation (e.g. DfES, 2002b, 2003a, 2003b, 2004). It also includes the position of starter and plenary activities (part of the "Three Part Lesson" suggested as good practice by the DfES, (DfES, 2002a, 2003a)). In the view of the DfES (2002a: 26) starter activities must: engage pupils, state purpose, be quick and clarify objectives; plenary activities are used to take stock of learning and to direct the pupils to the next phase of learning (DfES, 2002a: 43). It is also stressed that a plenary should be part of the process of formative assessment. Stage six of the lesson-planning model uses the term Review, rather than plenary and stresses the need to check what the lesson was about. Guidance to staff at CSS highlights the need for a multi sensory input into the lesson, by which it means the use of VAK. (Pupils had, as discussed earlier, completed a simple VAK analysis to identify their preferred learning style).

In order to gain a more meaningful comparison across these tables I undertook a deeper analysis, using a five-point weighting scale, to correspond to the depth of response. The numeric values were: never, -2; hardly ever, -1; sometimes, 0; most lessons, +1; every lesson, +2. They were then, as discussed in chapter three, summed, compared to the maximum/minimum score possible and finally converted into a percentage in order to provide a relative value: the weighted percentage agreement. For example, if all 44 y11 boys had responded 'never' to a question, the overall score would be –88, which converted to a percentage, would give –100%. The results for this analysis are shown in table 2 and chart 1.

Tables 1.1 - 1.4: Summary of questionnaires 1 and 1a, the lesson-planning model at CSS:

Table 1.1: Entering your classroom.

1.1.1 How often is music playing when the pupils (you) enter the classroom?

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	9 (100)	2 (18)	65 (94)	72 (95)	40 (91)	31 (91)
1(hardly ever)	0 (0)	6 (55)	4 (6)	3 (4)	3 (7)	3 (9)
2 (sometimes)	0 (0)	2 (18)	0 (0)	0 (0)	1 (2)	0 (0)
3 (most lessons)	0 (0)	1 (9)	0 (0)	0 (0)	0 (0)	0 (0)
4 (every lesson)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)

1.1.2 How often do you hand out resources when the pupils enter the room (how often does your teacher hand you resources)?

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	1 (11)	1 (9)	19 (28)	12 (16)	11 (25)	13 (38)
1(hardly ever)	1 (11)	1 (9)	2 (3)	18 (24)	13 (30)	3 (9)
2 (sometimes)	5 (56)	7 (64)	19 (28)	31 (41)	13 (30)	9 (26)
3 (most lessons)	1 (11)	2 (18)	18 (25)	12 (16)	2 (4)	6 (18)
4 (every lesson)	1 (11)	0 (0)	11 (15)	3 (4)	5 (11)	3 (9)

1.1.3 How often do you greet the pupils by name (how often are you greeted by name)?

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	9 (13)	7 (9)	2 (5)	3 (9)
1(hardly ever)	0 (0)	0 (0)	9 (13)	18 (24)	5 (11)	3 (9)
2 (sometimes)	1 (11)	3 (27)	22 (32)	27 (36)	14 (32)	17 (50)
3 (most lessons)	2 (22)	4 (36)	17 (25)	18 (24)	13 (30)	7 (21)
4 (every lesson)	6 (67)	4 (36)	12 (17)	6 (8)	10 (23)	4 (12)

1.1.4 How often does your lesson start calmly?

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	10 (14)	16 (12)	6 (14)	8 (24)
1(hardly ever)	0 (0)	0 (0)	22 (32)	19 (25)	8 (16)	7 (21)
2 (sometimes)	5 (56)	0 (0)	21 (30)	38 (50)	23 (52)	13 (35)
3 (most lessons)	3 (33)	7 (64)	15 (22)	10 (13)	6 (16)	6 (18)
4 (every lesson)	1 (11)	4 (36)	1 (1)	0 (0)	1 (2)	0 (0)

Table 1.2: Prior learning.

1.2.1 How often does your lesson recap what happened last time?

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	3 (4)	2 (3)	5 (11)	1 (3)
1(hardly ever)	0 (0)	0 (0)	6 (9)	3 (4)	4 (9)	11 (32)
2 (sometimes)	0 (0)	1 (9)	23 (32)	33 (43)	13 (30)	8 (24)
3 (most lessons)	7 (78)	5 (45)	26 (38)	35 (46)	15 (34)	13 (38)
4 (every lesson)	2 (22)	5 (45)	11 (16)	3 (4)	7 (16)	1 (3)

1.2.2 How often do you ask the pupils (how often are you asked) what they (you) already know about a topic?

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	3 (6)	3 (4)	3 (7)	2 (6)
1(hardly ever)	0 (0)	0 (0)	7 (10)	6 (9)	5 (11)	2 (6)
2 (sometimes)	0 (0)	5 (45)	23 (32)	38 (50)	19 (41)	20 (59)
3 (most lessons)	6 (67)	3 (27)	32 (46)	24 (30)	13 (30)	8 (23)
4 (every lesson)	3 (33)	3 (27)	4 (7)	5 (7)	4 (9)	2 (6)

Table 1.3: The big picture.

1.3.1 How often do you tell the pupils (are you told) what the lesson is going to be about?

Response/ No.(%)	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
0(never)	0 (0)	0 (0)	3 (4)	0 (0)	1 (2)	2 (6)
1(hardly ever)	0 (0)	0 (0)	3 (4)	3 (4)	1 (2)	1 (3)
2 (sometimes)	2 (22)	0 (0)	4 (7)	14 (18)	6 (14)	5 (15)
3 (most lessons)	3 (33)	4 (36)	26 (37)	29 (38)	15 (36)	16 (47)
4 (every lesson)	4 (45)	7 (64)	33 (48)	30 (40)	21 (46)	10 (29)

1.3.2 How often do you tell the pupils (are you told) what the topic is about?

Response/ No.(%)	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
0(never)	0 (0)	0 (0)	2 (3)	1 (1)	1 (2)	1 (3)
1(hardly ever)	0 (0)	0 (0)	1 (1)	2 (3)	1 (2)	3 (9)
2 (sometimes)	2 (22)	1 (9)	13 (19)	10 (13)	4 (10)	9 (26)
3 (most lessons)	3 (33)	3 (27)	23 (34)	32 (42)	19 (43)	13 (38)
4 (every lesson)	4 (45)	7 (64)	30 (43)	31 (41)	19 (43)	8 (23)

1.3.3 How often do you tell the pupils (are you told) about where the lesson fits into the rest of their (your) science lessons?

Response/ No.(%)	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
0(never)	0 (0)	0 (0)	12 (17)	5 (7)	11 (25)	6 (18)
1(hardly ever)	0 (0)	0 (0)	10 (14)	9 (12)	3 (7)	5 (15)
2 (sometimes)	6 (67)	7 (64)	20 (29)	40 (53)	16 (36)	13 (38)
3 (most lessons)	2 (22)	4 (36)	21 (31)	18 (22)	10 (23)	9 (26)
4 (every lesson)	1 (11)	0 (0)	6 (9)	4 (5)	4 (9)	1 (3)

1.3.4 How often do you share the lesson objectives with the pupils (how often are the lesson objectives shared with you)?

Response/ No.(%)	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
0(never)	0 (0)	0 (0)	9 (13)	0 (0)	8 (18)	8 (24)
1(hardly ever)	0 (0)	0 (0)	4 (7)	7 (9)	5 (11)	2 (6)
2 (sometimes)	0 (0)	3 (27)	16 (23)	17 (23)	17 (39)	12 (35)
3 (most lessons)	3 (33)	1 (9)	18 (26)	28 (37)	8 (18)	5 (15)
4 (every lesson)	6 (67)	7 (64)	22 (32)	24 (32)	6 (14)	7 (21)

1.3.5 How often do you make it clear what the pupils are expected to DO by the end of the lesson (how often is it made clear what you are expected to DO by the end of the lesson)?

Response/ No.(%)	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
0(never)	0 (0)	0 (0)	7 (10)	0 (0)	3 (7)	3 (9)
1(hardly ever)	0 (0)	0 (0)	4 (6)	8 (11)	2 (5)	4 (12)
2 (sometimes)	2 (22)	2 (18)	9 (14)	12 (16)	13 (30)	1 (3)
3 (most lessons)	2 (22)	5 (45)	28 (41)	28 (37)	16 (36)	16 (47)
4 (every lesson)	5 (56)	4 (36)	21 (30)	28 (37)	10 (23)	10 (29)

1.3.6 How often do you make it clear what the pupils are expected to KNOW by the end of the lesson (how often is it made clear what you are expected to KNOW by the end of the lesson)?

Response/ No.(%)	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
0(never)	0 (0)	0 (0)	7 (10)	0 (0)	3 (7)	4 (12)
1(hardly ever)	1 (11)	0 (0)	0 (0)	3 (4)	4 (9)	4 (12)
2 (sometimes)	1 (11)	3 (27)	18 (26)	19 (25)	7 (16)	3 (9)
3 (most lessons)	4 (44)	3 (27)	27 (39)	26 (34)	24 (55)	18 (53)
4 (every lesson)	3 (33)	5 (45)	17 (25)	28 (37)	6 (14)	5 (15)

Table 1.4: How often are these activities used in your science lessons?

1.4.1 A Starter

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	5 (7)	2 (3)	17 (39)	13 (38)
1(hardly ever)	0 (0)	0 (0)	8 (12)	6 (8)	4 (9)	3 (9)
2 (sometimes)	3 (33)	2 (18)	11 (16)	11 (14)	7 (16)	1 (3)
3 (most lessons)	3 (33)	5 (45)	10 (14)	21 (28)	7 (16)	5 (15)
4 (every lesson	3 (33)	4 (36)	35 (51)	36 (47)	9 (20)	12 (36)

1.4.2 A Review (or Plenary) at the end of the lesson

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	12 (17)	6 (8)	13 (30)	14 (41)
1(hardly ever)	0 (0)	0 (0)	6 (9)	10 (13)	12 (27)	2 (6)
2 (sometimes)	2 (22)	2 (18)	11 (16)	19 (25)	8 (18)	10 (29)
3 (most lessons)	5 (56)	5 (45)	16 (23)	24 (32)	8 (18)	7 (21)
4 (every lesson	2 (22)	4 (36)	22 (32)	17 (22)	3 (7)	1 (3)

(Other aspects of findings from 'activities' are presented in chapter 5.)

Question code/ Weighted score (weighted percentage agreement)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
1.1.1	-18 (-100)	-9 (-41)	-134 (-97)	-145 (-95)	-83 (-94)	-65 (-96)
1.1.2	0 (0)	-1 (-5)	0 (0)	-24 (-17)	-23 (-26)	-17 (-25)
1.1.3	+14 (+78)	+12 (+55)	+14 (+10)	-12 (-8)	+22 (+25)	+8 (+12)
1.1.4	+5 (+28)	+15 (+68)	-25 (-18)	-41 (-27)	-14 (-16)	-17 (-25)
1.2.1	+11 (+61)	+15 (+68)	+ 36 (+26)	+31 (+20)	+23 (+26)	+2 (+3)
1.2.2	+12 (+67)	+9 (+41)	+27 (+20)	+17 (+11)	+10 (+11)	+14 (+21)
1.3.1	+11 (+61)	+18 (+82)	+83 (+60)	+86 (+57)	+54 (+61)	+31 (+46)
1.3.2	+11 (+61)	+17 (+77)	+78 (+57)	+90 (+59)	+54 (+61)	+24 (+35)
1.3.3	+4 (+22)	+4 (+18)	-3 (-2)	+7 (+46)	-7 (-8)	-8 (-12)
1.3.4	+15 (+83)	+15 (+68)	+40 (+29)	+69 (+45)	-1 (-1)	-1 (-1)
1.3.5	+12 (+67)	+13 (+59)	+52 (+38)	+76 (+50)	+28 (+32)	+26 (+38)
1.3.6	+10 (+56)	+13 (+59)	+47 (+34)	+82 (+54)	+25 (+28)	+16 (+24)
1.4.1	+9 (+50)	+13 (+59)	+62 (+45)	+81 (+53)	-13 (-15)	0 (0)
1.4.2	+9 (+50)	+13 (+59)	+60 (+43)	+36 (+24)	-14 (-16)	-21 (-31)

Table 2: responses to questionnaires 1 and 1a, the lesson-planning model at CSS, showing summed weighted scores and weighted percentage agreement.

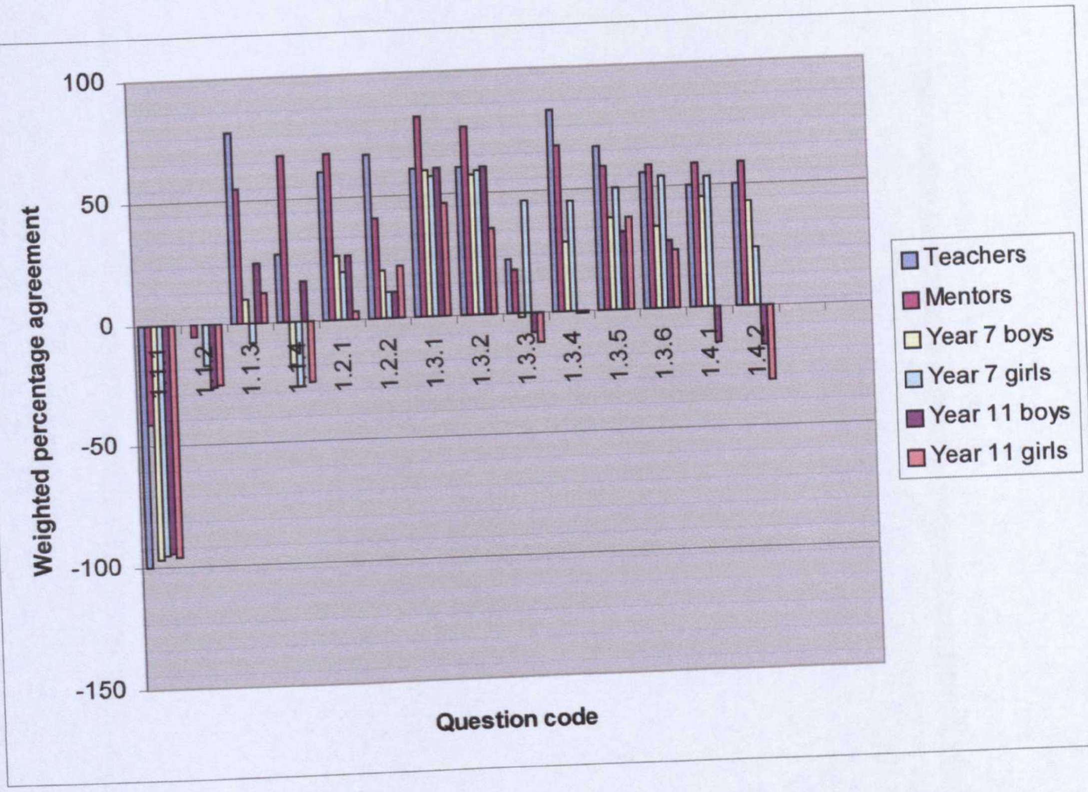

Chart 1: **responses to questionnaires 1 and 1a, the lesson-planning model at CSS, by weighted percentage agreement.**

Clearly, the use of music as an aid to helping to set the mind state at the beginning of the lesson (1.1.1) is not currently used at CSS. It is apparently used, according to the mentor replies, to a small extent, in other schools, although the benefits of this have yet to be explored. There is an interesting difference in perception between teachers and pupils, and indeed ages of pupils, when considering the use of greeting at the start of a lesson (1.1.3). Teachers and mentors closely coincided, most claiming that they regularly greeted pupils by name; a lower figure was evident from y7 pupils whereas in y11 the figures were noticeably higher, perhaps indicating a greater degree of familiarity between teacher and pupil. Overall, the indications appear to be that teachers think that they greet pupils by name more frequently than they actually do.

All of the mentors claimed that most or every lesson started calmly - a higher figure than reported by teachers at CSS (+68 and +28 respectively, table 2, 1.1.4), although none of the teachers, and none of the mentors, reported that the lessons hardly ever, or indeed never, failed to start calmly. The figure provided by the pupils however, painted a different picture, as the negative values for the weighted percentage agreement in table 2 (1.1.4) reveal, across all categories of pupils. Table 1 (1.1.4) also indicates this as, in y7, a third of the boys considered that the lessons never, or at least hardly ever, started calmly. Although slightly fewer y7 girls reported such a start, with only about one in eight replying that most or all lessons started calmly. These findings are broadly in line with the y11 findings, although the figure of nearly 50% of the girls reporting that most lessons never/hardly ever start calmly is noticeably higher than the corresponding figure for y7.

The response from teachers and mentors to the question on recap (1.2.1) was almost identical, with a strong indication that they recap the work from the last lesson on a regular basis. This was not as obvious to all pupils at CSS, however, as the weighted percentage agreement values in table 2 (1.2.1) are less positive across all of the pupils as compared to teachers/mentors. For each group of pupils, there is a noticeable number in table 1.2, (14 y7 pupils and 25 y11 pupils), who indicate that recap never, or hardly ever, happen. This is higher with y11 girls, with about one third of them (12, 35%) indicating a more negative response, producing an almost neutral value (+3) on the weighted percentage agreement scale in table 2, as opposed to 'some agreement' (+26, +20 and +26) from the other groups of pupils.

All of the teachers at CSS indicated that they asked pupils about earlier learning relevant to a topic in every lesson (1.2.2). This is much higher than the figure for both the mentors and the pupils (weighted percentage agreements: teachers, +67; mentors +42; pupils (average) +16). In the question covering 'what the lesson is going to be about (1.3.1), there is a fairly close similarity between the teachers' and mentors' answers, with both indicating that pupils are told in most/every lesson, although 'sometimes' does occur. This similarity is also shown in the pupil responses across all pupil groups. The response to sharing lesson objectives (1.3.4) is, in effect, being used as a confirmation of the responses to this first question. Again there is close agreement between teachers and mentors, but the variety of pupil response suggests that pupils may have a lower perception of the objectives of a lesson. A number of boys in y7 (11 out of 69) also indicated that learning objectives were never, or hardly ever, shared in lessons, although there were no year 7 girls who indicated that objectives were never shared and only 6 (out of 76) who replied "hardly ever". There is a slight gender imbalance here which is not repeated in y11, instead, however, there is a fairly large percentage of both boys and girls (29% boys, 30% girls) who did not think that lesson objectives were being shared, or, at least, were hardly ever shared. It is likely that some teachers share objectives with y7 classes on a more regular basis than they do with pupils in y11. A possible reason for the discrepancy between the question on 'what the lesson is going to be about' and 'sharing objectives' could simply be that the term lesson objective is not consistently used: this was pursued later through discussions and lesson observations. There appears to be quite a large difference in perception between pupils and teachers (including mentors) about how frequently pupils are told where a lesson fits into the rest of the science scheme (1.3.3). Fairly high percentages of pupils (29% y7 boys; 19% y7 girls; 32% y11 boys; 33% y11 girls) consider that they are hardly ever, or never, told about this; this in marked contrast with the teacher/mentor view where the corresponding percentage is zero.

The questions referring to what pupils are expected to do/know by the end of a lesson (1.3.5 and 1.3.6) are, of course, related to the 'agree outcomes' step from the lesson-planning model, which implies that the outcomes are discussed with pupils. A similar discrepancy between teacher and pupil perception to that noted above is apparent, but much less so with y7 girls and more markedly with y11. In interviews with the science teachers, the need to address the outcomes from a lesson more frequently was often commented upon.

3. Questionnaire 2

The nine science teachers at CSS completed a second questionnaire consisting of 51 statements, which was designed to complement, and develop, the responses from questionnaire 1. The statements were decided as a result of consultation with teacher X, and aimed to investigate more fully the issues that were emerging from both the analysis of questionnaire 1(1a) and the pupil and teacher interviews; they also aimed to include aspects of LIP that teacher X thought important.

The teachers were asked to respond to a number of statements by either strongly agreeing, agreeing, disagreeing or strongly disagreeing; they were not given the option of opting out of an answer, i.e. they were forced to give an opinion, in line with the suggestion of Groundwater-Smith and Mockler (2003). In order to have a consistency of approach, as argued in chapter three (analytical methods), the opinions were weighted: +2, strongly agreeing; +1, agreeing; 0, which represents, effectively, the neutral stance (although I recognise that they were not given this option) -1, disagreeing; -2 strongly disagreeing. The scores for each statement were then totalled and converted to percentage figures, the weighted percentage agreement, to give an overview of the depth of feeling for each question. A number of questions were effectively repeated, using different language or as a 'negative' question. This was deliberate, seeking to act as a confirmer of other responses.

Aspects of this questionnaire relating to theme two (learning styles and activities) are presented, and compared to the views of teachers from other schools, in chapter five. Whilst a fuller discussion may be found in chapter six, the main points relating to theme one (LIP and the lesson-planning model) are highlighted below, with a summary in table 3.

Statement	Weighted Percentage Agreement (n = 9)
1 The Learning Intervention Programme (LIP) aims to improve overall attainment levels	+89
2 LIP is motivating pupils	+17
3 LIP helps me to focus more on key aspects of my lessons	+39
4 LIP has improved the behaviour of pupils	0
5 A Starter activity should be used in every lesson	+83
6 LIP has made me think about the use of new teaching strategies	+83
7 Playing music to pupils unsettles them	+6
8 LIP will not improve the attainment levels of pupils	-76
9 The school should respond positively to external guidelines (eg via DfES)	+60
10 LIP has made me a better teacher	+22
11 Using a range of activities in my lessons helps to motivate my pupils	+72
12 It is important that I know the prior knowledge of my pupils	+89
13 LIP has helped me to plan my lessons better	+44
14 The pupils in my lessons spend most of their time listening to me	-56
15 LIP aims to increase pupil motivation	+56
16 The LIP has made the lessons more interesting for the pupils	+33
17 LIP has improved the atmosphere in my classroom	+33
18 It is important that my pupils know what they have to do in the lesson	+94
19 Pupil attendance in my lessons has increased since the introduction of LIP	-33
20 It is vital that I spend time reviewing the work with the pupils at the end of each lesson	+67
21 LIP has made my job easier	-11
22 LIP aims to improve pupil attendance	-17
23 External guidelines (eg by DfES) aim to improve pupil attainment levels	+61
24 Starter activities motivate the pupils	+28
25 The more activities I use, the more likely the pupils are to misbehave	-22
26 Pupils who are "Kinaesthetic" learners do not learn by reading	-38
27 Pupils who follow an Accelerated Learning programme will make better progress than those that do not	+17
28 Pupils learn best by 'doing'	+56
29 LIP has increased my work load	-6
30 It is important that pupils are calm during my lessons	+56
31 My pupils behave better when they are writing	-6
32 Starter activities do not calm the pupils down	-38
33 I only need to review the work with the pupils occasionally	-61
34 Playing educational games in my lessons makes the pupils more likely to misbehave	-27
35 I am committed to making LIP work	+56
36 It is important that I know the preferred learning styles of all of my pupils	+50
37 It is important that my pupils know their preferred learning styles	+38
38 Pupils only learn when they are quiet	-44
39 Accelerated Learning will only work in Primary schools	-61
40 Pupils will benefit from LIP	+72
41 It is important that my teaching is adjusted to account for the learning styles of pupils	+72
42 Pupils respond well to educational games	+50
43 Pupils who are "Kinaesthetic learners" are more likely to misbehave	-11
44 Playing music to my pupils helps to calm them down	-11
45 LIP has improved the discipline in my lessons	-11
46 If I match my teaching to the pupils' preferred learning styles then I will raise achievement	+67
47 Pupils understand what LIP is trying to do	-6
48 I have a good understanding of what the LIP is trying to do	+61
49 LIP is based on Accelerated Learning	+50
50 Since introducing LIP I have noticed a better atmosphere in my classroom	0
51 It is important that the school analyses pupil learning styles in terms of VAK	+44
52 LIP will benefit the pupils	+78

Table 3: Summary of questionnaire 2, CSS. ***(Weighted percentage agreement).*** ***Nine respondents, n =9.***

From the perspective of the science teachers in CSS, there appears to be a very strong agreement that LIP aims to improve overall attainment levels: statements 1, 40 and 52, in table 3 have weighted percentage agreements of +89, +72 and +78; statement 8 represents an example of a 'negative' question; its value of –76 helps to confirm these results. A similar, but slightly less positive message is evident with regard to the introduction of DfES guidelines, with statements 9 and 23 indicating a strong level of support (+60 and +61). The teachers appear to have a good level of commitment to LIP and appear confident that they understand what it is trying to achieve (statements 35 and 47). Positive aspects of the introduction of LIP were often linked to lesson structure and planning: all teachers agreed, most of them strongly, that LIP has made them think about new teaching strategies (statement 6) and most (seven teachers, 78%) thought that it had helped them to plan lessons better. There was very strong agreement (+94) that pupils need to know what they have to do in the lesson (statement 18) supporting the findings from Questionnaire 1 (although this was not fully supported by the pupil view). There was a clear indication that the teachers thought that it was important to review work with the pupils (statements 20 and 33) and there was very strong agreement (+89) with the need for the teachers to know the prior knowledge of the pupils (statement 12). There was, though, some degree of ambivalence in the responses to the use of starters (statements 5 and 24): although there was very strong agreement (+83) that starters should be used in every lesson, there was only some agreement (+28) with the view that they motivated pupils.

The pair of comparable statements 4 and 50 from table 3 produced identical responses of zero, i.e. a neutral response. This was discussed with teacher X, who considered that the main aim of LIP was not to address pupil behaviour, rather to address issues of lesson structure and planning and the engagement of pupils within the lessons. However, it could be argued that it was having some impact on pupil behaviour as other statements (25 and 27), linking behaviour to activities, i.e. to the delivery stage of the six part lesson-planning model at CSS, showed at least some support to the view that pupils behave better if they are actively engaged.

4. Lesson observations at CSS

The main purposes of the observations were to consolidate my position as 'researcher' in the school by making a series of visits to the school, and to the science faculty in particular, and to follow on from my earlier work investigating the introduction of LIP within that faculty. Following theme one, I explored how the six-part lesson-planning model was being implemented into the lessons, and what impact it was having on teaching and learning. I further wished to explore the results from questionnaires 1 and 1a: in particular, to what extent lessons started calmly and the use of shared lesson objectives and outcomes.

The teachers involved varied in terms of their age, experience, responsibility and teaching style, but all appeared committed to the introduction of LIP and all were willing participants: teacher A: male, holder of responsibility post, approximately 10 years experience, all in CSS; teacher B: male, holder of responsibility post, second position, in place since 1999; teacher C: female, newly qualified teacher, first teaching post; teacher D: female, second year of teaching, first teaching post. It was recognised that the composition of this sample was gender problematic as the female teachers were both relatively inexperienced and, unlike their male counterparts, did not hold positions of responsibility.

The pupils were selected by the teachers, using their professional knowledge of the pupils, to give a cross sample of pupils within the classes. Although the classes were all of relatively high ability compared to the overall school intake, there was, as may be seen in table 4, a spread of ability and potential in achieving examination success. The information in table 4, which was provided by the school, gives an overview of the pupils in terms of their overall abilities based on their Cognitive Abilities Test (CAT) scores (NFER, 1986; Moody, 2001). It was not my main intention to use this information alongside my observations, rather it was used to supplement more descriptive comments made by the teachers. The codes for the pupils are given randomly, although the letter refers to the teacher, e.g. pupil 01D would be taught by teacher D; in the descriptions of the lessons, the pupils are identified by number only.

Code	Gender	Verbal SAS	Quantit - ative SAS	Non Verbal SAS	Mean SAS	Predicted KS3 Eng	Predicted KS3 Maths	KS2 English Level	KS2 English Dec Level	KS2 Maths Level	KS2 Maths Dec Level	KS2 Science Level
01D	M	117	111	105	111	6B	6A	5	5.3	5	5.1	5
02D	M	113	117	104	111	6B	6A	5	5.6	5	5.5	5
03B	M	87	105	118	103	4A	6C	B		B		3
04B	M	114	113	122	116	6B	7B	5	5	5	5.5	5
05B	F	100	100	88	96	5A	5B	4	4.2	4	4.5	4
06A	M	135	120	130	128	7C	8					5
07D	F	105	118	111	111	6C	6A	5	5.2	4	4.9	5
08C	M	110	116	100	109	6C	6A	4	4.8	4	4.9	5
09A	F	107	124	110	114	6C	7C	5	5	5	5.2	4
10C	F	111	112	106	110	6B	6A	5	5	5	5.5	5
11C	M	104	105	88	98	5	5B	4	4.0	4	4.4	4
12A	F	110	118	105	111	6B	6A	5	5.4	5	5.2	5

Table 4: Information on the twelve pupils monitored during lesson observations, provided by courtesy of CSS.

Aspects of the lessons that offer relevant evidence related to the lesson-planning model are included, but a full description of each lesson would be too lengthy, particularly as observation represents only one aspect of my mixed methods research design intended, as part of triangulation, to complement my findings from questionnaires and interviews. Overall, I observed a total of ten science lessons with y8 pupils (2005-6 cohort), each of an hour's duration, and all with sets 1 or 2 (out of two parallel bands of four), focusing my observations, primarily, but not exclusively, on the reactions of the twelve pupils, identified in table 4.The lessons are described in summary form in table 5, which relates each lesson to the stages of the lesson-planning model

Lesson Number	Mind State	Prior Experience	Big picture	Outcomes	Delivery	Review	Six-part Model
A1	Calm	Recap	No	At start. Not revisited	Questions; Practical Poster	No	Displayed Not referred to
A2	Calm	Not evident	Wider aspects of the topic	At start Revisited via presentations	Group tasks. Presentations	Via presentations	Displayed Not referred to
B1	Calm	Tested	Yes	At start Revisited	Questions Written tasks	Yes	Not evident
B2	Unsettled at the start	Through questions	No	At start Revisited	Questions Written tasks	Yes	Not evident
C1	Calm. Use of prompt starter	Related to starter	No	At start Revisited	Questions Written tasks	Yes	Displayed Evident in lesson plan
C2	Unsettled. Linked to six-part model and to behaviour	Use of starter	No	At start Not revisited.	Questions Written tasks Demonstration	Yes	Displayed Evident in lesson plan Mind state referred to.
D1	Unsettled at the start	Not evident	No	Not evident	Group tasks Production of cubes	Yes	Displayed Not referred to
D2	Unsettled at the start	Not evident	No	Not evident	Group tasks Written tasks	No	Displayed Not referred to
D3	Calm Use of prompt starter	Not evident	No	At start Revisited	Group task Worksheet Experiment	Yes	Displayed Not referred to
D4	Calm	Through starter and later activity	Linked to y7 work	Not evident	Group task Teacher-led discussions and demonstrations	No	Displayed Not referred to

Table 5: Summary of lesson observations at CSS

The start of lessons.

Although many of the observed lessons, appeared, in my opinion, to start calmly, 40% of the lessons did not, supporting pupil comments from initial interviews and questionnaire 1a.This may possibly be linked to the experience of the teachers as all lessons involving the more experienced teachers (A and B) started calmly (lesson B2 was taken by a supply teacher), but too few lessons were observed to make such a generalisation. There is some evidence to suggest that the use of a starter activity at the beginning of a lesson helps to settle the pupils by engaging them, but this was not always successful. In lesson A1, for example, a series of whole-class questions was used to recap previous work, taking approximately ten minutes: during this time, the pupils were well behaved and generally responsive. Pupil 06 appeared very eager and tried to respond to all of the questions; pupil 12 tried to respond to three of the five questions and remained attentive throughout and, although pupil 09 did not attempt to respond to any questions, she did however appear to be attentive during this session. In lesson D3 a starter activity was already written on the board and the pupils were told to work on this in groups and were given five minutes. They did this quickly and showed interest. All three pupils (01, 02 and 07) responded well, with 02 showing a particularly positive response. Similarly, in lesson D4, the pupils were given a group task as a starter activity on a new topic, evidently examining prior learning. The teacher indicated the length of time they had for the task and then used a computer countdown to try and keep pace: this seemed to work well as the pupils settled quickly and efficiently to their activity. The discussion of the tasks was, at first, interesting to the pupils, with both pupils 01 and 07 volunteering to answer teacher questions. However, when this activity lost pace and had an over-emphasis on teacher-talk and teacher-led activities, pupil 02 became easily distracted, pupil 01 was evidently in a 'daydream' and pupil 07 was quiet.

A written starter activity was used in lesson C2, which revisited the work from the previous lesson and the learning objectives/outcomes were made clear to the class. In general, the pupils responded quite well to this quick, pacey, starter, although this was variable. Pupil 11, as in lesson C1, produced little written response to the task. Pupil 10 worked well on the starter; pupil 08 spent most of his time drawing in his book, rather than attempting the task.

At the start of lesson B1 the pupils were asked to write three sentences, working in pairs, to explain 'where light comes from' and were given five minutes for this task. Initially, there was a very calm and relaxed atmosphere, but a variable pupil response was noticed. Pupil 03 managed to produce one statement and then became apparently disinterested and started talking to his partner; pupil 04 needed two reminders from his teacher but did produce two statements; he found it difficult to settle to the task, preferring to try and 'mess' with his friend; pupil 05 worked well with her partner and produced three statements.

As lesson C1 started, resources were passed out on entry and the class was given a task immediately, attempting to find out something about their prior knowledge. Pupil 11 had difficulty in writing, but did, imaginatively, produce diagrams, which showed a good grasp of light travelling in straight lines and reflection. Pupil 10 quickly (and easily) completed the task and then became rather 'fidgety', indicating perhaps that she was ready for a further task. Pupil 08 did not participate in the task, instead he chose to 'doodle' on his whiteboard and/or talk to his friend. The teacher did circulate and did attempt to question individual pupils about their responses. Pupil 11 was asked to write something (even though his drawn response was good); he didn't do so.

This session took rather longer than the planned ten minutes and many of the pupils became restless.

The use of lesson objectives.

The teachers tended to use the term 'objective' rather than 'outcome', although the expected lesson outcomes and key words for the lesson were evident in lesson C1. The use of lesson objectives was apparent at the beginning of seven of the ten lessons observed, normally written on the board as 'what we will learn', although it was not always evident that they were actually shared with the pupils; they were revisited later in five of the lessons. In lesson B2, when lesson objectives were revisited at the end of the lesson, pupils were involved in 'ticking them off' once the teacher agreed that they had been covered and was happy that the class had showed a good level of understanding. The pupils appeared to be motivated by this approach.

Lesson Delivery. (i.e. teaching)

This is discussed in chapter five

Review.

A review of the lesson (usually, but not always, linked to revisiting the lesson objectives) was evident in seven (70%) of the observed lessons. Lesson B1, for example, concluded with some whole-class discussion of the written task and the objectives were revisited; teacher assessment through questioning did show that the pupils selected appeared to have learned something during the lesson. Commonly, however, insufficient time was available at the end of a lesson for an adequate review of learning (even when obviously planned), for example in lesson D2. In lesson C2, the teacher had planned a review and, to her credit, she did achieve this, albeit with much interruption to discipline the pupils, who had become restless and noisy.

5. The use of a pupil perceptions questionnaire (questionnaire 4).

The questionnaire was used to offer more data with regard to the pupil voice at CSS (e.g. Crane, 2001; Groundwater-Smith, 2004; Noyes, 2005; Lundy, 2007), to triangulate, complement and reinforce my earlier work and to provide a wider pupil perspective with regard to their learning by comparing it to the work of, for example, Postlethwaite and Haggarty (2002) and Black *et al* (2006). Questionnaire 4 was adapted from a questionnaire by Greenhalgh, (undated) and completed, with the schools' permission, during a PSE form period by y8 pupils (2005-6). There were 74 replies from a possible 197, representing a somewhat disappointing 38% return, although my period of illness coincided with the collection of these and I was therefore not able to remind the school. Two of the replies were considered to have spoilt their returns: these were considered invalid. Hence the figures were based effectively on 72 responses.

The questionnaire consists of three parts:

a) Eighteen statements, using a five-point Likert scale to elicit the degree of agreement;

b) The opportunity for free, written, response;

c) A further six statements, again with a five-point response scale, adapted from material provided by the *Campaign for Learning* (e.g. Rodd, 2002).

<u>Section b)</u>

This invited the pupils to comment on: 'anything else you would like to say about the ways in which you learn in lessons'. Of the 72 respondents, the majority (46; 64%) chose to do so, sometimes fairly lengthily. Some common features to the comments were identified during analysis:

Seven pupils referred to the need for interesting lessons, with one girl commenting: "I remember things better if this lesson is interesting and sticks out in my mind"; eight to the desire to use computers more and a further eight to the wish to work in friendship groups, although three pupils were clear about their preference to work alone and a strongly held view of one boy clearly illustrates that the desire for group work is not universal: "I hate working in groups and prefer working independently". The reasons for pupils preferring group work could be related to the comfort factor of friendship links, as five of them refer to 'working with my mates'. This was pursued further through interview questions, and, later, by CSS through questionnaire 5.

Sections a) and c)

As in analyses of earlier questionnaires, I weighted the responses as follows: Strongly agree +2; Agree +1; Neutral 0; Disagree –1; Strongly disagree –2. From the 72 responses the maximum level of agreement for each of the 24 statements is therefore +144 and the minimum level of agreement is -144. For the eight boys, the figures are +/- 16; for the eleven girls, +/- 22. Again, in order to gain a more meaningful comparison, the total weighted scores were compared to these maxima and minima and converted to percentages to produce a comparative figure (the weighted percentage agreement). They are summarised, in order of agreement, in table 6.

Overall, the findings across all pupils were not too surprising and tended to corroborate views formed during lesson observations, interviews and questionnaires. The very strong level of agreement (+79) with statement 24 (Learning will help me to get a good job) must be reassuring to the school as it places a good degree of emphasis on this during its PSE programme; this is reinforced by the strong level of agreement with statement 19 (+61, Learning is something you do every day of your life). Both of these can, perhaps, be considered to represent a very utilitarian approach to education, where it is seen primarily as preparation for work, but I feel that this would not fairly reflect the ethos of the school.

The responses to statements 6 and 4, which indicate that there may be a preference for group work add some support to the written pupil comments described above. However, the very strong agreement with the statement 'I like to work at my own speed' (number 5, +81) appears to be somewhat contradictory and may have potential implications for classroom management strategies, particularly as my observations of science lessons within CSS placed an emphasis on whole class teaching or paired /group activities rather than on individual tasks. This was pursued later through interviews with pupils and through questionnaire 5. Some aspects of questionnaire 4 are more relevant to theme two and are briefly presented in chapter five.

Statement	Weighted percentage agreement (All pupils, n = 72)
5: I like to work at my own speed	+81
7: I like to be able to do physical or practical activity in my lessons	+81
24: Learning will help me to get a good job	+79
18: I like to have some time to move around in my lessons	+77
11: I like to be able to choose how I present my work	+63
6: I like working in groups	+62
19: Learning is something you do every day of your life	+61
1: I like to know what I'm supposed to be learning before I start my work	+53
21: My school cares about more than just my exam results	+42
23: No-one can make you learn, you have to want to	+38
22: My teachers help me understand how I learn best	+36
17: I like it when we mark each others' work	+30
10: I like it when the teacher helps me with my work	+28
8: I like to talk about my work with other people in the class	+24
20: I find school too stressful to do my best	+18
2: I like to know how my work is going to be marked	+15
16: I like to look over my work before I hand it to the teacher	+13
3: I like it when the teacher helps us to go over what we have learnt at the end of the lesson	+11
14: I like using worksheets	+3
9: I enjoy finding out information for myself	-1
4: I like working on my own	-3
13: I like copying from text books or the board	-25
12: I like listening to the teacher	-28
15: I like working from the text book	-31

Table 6: summary of responses to sections a) and c) of questionnaire 4.

It was intended that the questionnaires should have been completed anonymously, although a number of pupils (eight boys and eleven girls) did add their names to their replies, which allowed a small sub-analysis by gender. Table 7 summarises this sub-analysis and places it alongside the findings for all pupils. It would, with hindsight, have been useful to include gender in the questionnaires, as this would then have allowed for a much larger sample size. This omission was discussed with CSS, and, in their later use of questionnaire 5 (which re-examined some of the emerging issues from my research), they did identify gender.

Statement/Weighted percentage agreement	All pupils n =72	Boys n = 8	Girls n = 11
1: I like to know what I'm supposed to be learning before I start my work	+53	+43	+23
2: I like to know how my work is going to be marked	+15	+38	+5
3: I like it when the teacher helps us to go over what we have learnt at the end of the lesson	+11	+44	0
4: I like working on my own	-3	+50	-23
5: I like to work at my own speed	+81	+75	+64
6: I like working in groups	+62	+56	+64
7: I like to be able to do physical or practical activity in my lessons	+81	+75	+77
8: I like to talk about my work with other people in the class	+24	+13	+41
9: I enjoy finding out information for myself	-1	+31	-18
10: I like it when the teacher helps me with my work	+28	+56	-23
11: I like to be able to choose how I present my work	+63	+56	+50
12: I like listening to the teacher	-28	+6	-36
13: I like copying from text books or the board	-25	-25	-14
14: I like using worksheets	+3	+13	+5
15: I like working from the text book	-31	-13	-23
16: I like to look over my work before I hand it to the teacher	+13	+13	-23
17: I like it when we mark each others' work	+30	+31	+50
18: I like to have some time to move around in my lessons	+77	+75	+55
19: Learning is something you do every day of your life	+61	+56	+50
20: I find school too stressful to do my best	+18	+19	+32
21: My school cares about more than just my exam results	+42	+63	+59
22: My teachers help me understand how I learn best	+36	+31	+18
23: No-one can make you learn, you have to want to	+38	+25	+18
24: Learning will help me to get a good job	+79	+63	+73

Table 7: sub-analysis of questionnaire 4 by gender. ***(As weighted percentage agreement)***

An initial conclusion from the sub-analysis of the responses to questionnaire 4 shows, potentially, a difference in the preferred method of working between boys and girls, with boys appearing to prefer independent work. The responses to statement 4 (I like working on my own) produced very different weighted percentage agreement values: the boys showed fairly strong agreement (+50), the girls showed some disagreement (-23). Girls apparently preferred group work, showing strong agreement (+64) with statement 6, although the boys showed a similar response, somewhat contradicting their response to statement 4. This was later pursued through pupil interviews. The possibility for the school to investigate opportunities to further develop independent pupil learning, possibly with regard to gender differences, was discussed with CSS, particularly as this is reinforced by statement 11 (I like to be able to choose how I present my work). Questionnaire 5 was partly designed (by CSS) with the aim of pursuing this; the findings from this are presented later in this chapter. The analysis of the responses to questionnaire 4 also indicated that a higher proportion of the girls, relative to the boys were finding school too stressful to do their best (statement 20: girls +32; boys +19): this was also pursued through interview. These findings are discussed in chapter six.

6. End of research pupil interview questions

These were conducted when the pupils were in y9, and were designed to act, as part of triangulation, in order seek deeper responses to those the pupils made in earlier questionnaires and interviews in relation to both the six-part lesson-planning model, and to activities and learning styles (covered in chapter five). The pupils interviewed (6 boys, 6 girls) were selected simply because they were amongst the pupils who had put their names on questionnaire 4, and hence it was possible to look at their individual responses and probe their responses more deeply. Section A revisits their responses from questionnaire 4 and is presented in chapter 5.

Section B

B1. The six-part lesson-planning model

B1.1 How familiar are you with the six-part lesson-planning model?

The pupils were given a picture of the lesson-planning model to act as visual reinforcement: it was helpful in ensuring that the pupils knew what I was asking them about. All pupils quite clearly indicated that the model was displayed prominently in the vast majority of their classrooms, confirming that the schools' overall strategy was being followed. Six of the pupils also commented that they had met it in their 'Enrichment' lessons in years 7 and 8.

B1.2 How often would you say teachers follow it?

This produced a much more variable response, ranging from "most lessons" (three pupils, 2 girls, 1 boy) to "only ever followed in one lesson" (one boy). The more common response was "sometimes"; there was also an indication that it was followed more in some subjects than others and that it also depended on individual teachers. Evidently there is not the uniformity of approach that the school had been seeking, although this interview could not realistically hope to confirm that teachers were using it as a planning tool. (There was a high level of teacher support for this in my interviews with science teachers and some evidence from my observations of science lessons). Where teachers were referring to the planning model the pupils essentially commented that it was used as a reminder of the need to have the right 'mind state', perceiving it to be more of a behaviour management tool: "they follow it when you're naughty or need calming" (girl). This was further commented on in the responses to B1.3 and B1.4 and was also noted in my lesson observations.

B1.3 Do you think it helps your lessons go more smoothly?

Ten pupils answered 'yes' to this, one boy replied 'no' and one girl was uncertain. Of the ten positive answers, eight related their response to elements of behaviour, i.e. to the first part, mind state: "It helps behaviour" (girl); "people calm down" (boy); "(pupils are) not messing as a result" (girl). Two of the participants also commented on the overall use in terms of lesson structure: "helps because it tells you what you need to do" (boy); "it helps me and the teachers' structure" (girl).

B1.4 Do you think it has helped you to learn better? Why do you think this?

This effectively merged with B1.3 as the responses were similar, although there was more evidence that the pupils had some understanding of the importance of lesson-planning by the teacher as well as a link to behaviour: "There's fewer shouting out"(boy); "you know what you've got to do" (boy); "the teacher plans the lesson" (girl); "you know what you're doing and don't get confused" (girl). There were no negative responses. Earlier interviews with teachers had indicated that, in their view, pupils did not have a clear view about what the lesson-planning model was trying to achieve. It is not possible from the results of my questionnaire to either support or contradict this view and more intensive questioning would be need to pursue this more fully. However, there are some indications that some pupils do see its importance and, as shown in B2, below, there is evidence that pupils value the contribution of 'starters', lesson objectives', 'lesson outcomes' 'recap' and the review of prior learning.

B2. Revisiting initial pupil interview questions

B2.1 Describe how a typical lesson starts

In pupil questionnaire 1a, and within the initial pupil interviews, there was concern that the start of the lesson was characteristically not calm. This was not fully shared from the teacher perspective and was an issue for the school. There was evidence, from the responses to the interview questions, that this remains. The responses had two main themes: the use of starter activities and behaviour issues. Eight pupils mentioned that starter activities were used, in some lessons more than others and were often quite lucid about the purpose of them: "to get your brain working" (girl), confirming earlier findings from initial pupil interviews questionnaire 1a and lesson observations. Seven pupils commented on the noise level at the start of a lesson, one girl graphically describing a typical start as "everyone talks and the teacher flips". This does not, however, occur across all classes: another girl described the start as "usually calm" and I witnessed some lessons that had a very smooth and organised start (and also some that did not).

B2.2 How do you know what the lesson is going to be about?

Findings from questionnaires 1 and 1a indicated that the pupil perspective showed less emphasis on the use of recap, the sharing of objectives and the use of reviews than was evident to their teachers. The school had been actively encouraging the use of shared lesson objectives and shared lesson outcomes and there was evidence from the interview replies that this was happening. All pupils interviewed reported that lesson objectives and lesson outcomes were commonly used across the school. Further, many could easily, often articulately, describe the difference between them and could see the importance of them to their effective learning: "helps pace" (girl); helps you know what you're going to do and whether you've done them"(girl). It appears therefore that the school has some made progress in terms of step four of the lesson-planning model (agree outcomes), although I found no evidence, neither from the interviews nor from the lesson observations, that the outcomes were actually *agreed* with the pupils.

B2.6 How often are you asked questions and when does this happen?

Responses to the initial pupil interviews indicated that the emphasis was on whole-class questioning, particularly at the end of a lesson. The responses to this interview indicate that a greater use of questioning is now evident. All pupils responded in a similar manner: questions are asked throughout a lesson, with both whole- class and individual questioning being common. Five of the pupils said that the teachers would deliberately target pupils who did not appear to be concentrating, as a way of focusing them. One boy, who admitted to being quiet but well behaved in a lesson, reported that he was hardly ever asked a question. This was also evident in most of the lessons that I observed and it is possible that this is therefore not unusual across the school.

B2.7 Describe how a typical lesson ends

The results from questionnaires 1 and 1a indicated that plenaries (or reviews) were used fairly extensively with y7 pupils at the end of a lesson, but were much less common with older (y11) pupils. Teacher interview responses indicated that they frequently revisit the objectives at the end of the lesson and usually include a review, often via a recap rather than as a new activity, which could assess the pupils' learning. The pupils participating in this interview presented a very varied picture. Eight pupils mentioned that there was some type of recap at the end of a lesson, often in the form of whole-class or individual questions. One girl said that it was common for teachers to go over the work at the end of a lesson and another that teachers often revisited the lesson objectives. However, one boy estimated that only one or two of his lessons per week actually included a recap and one girl said that it never occurred. No pupil indicated that lesson outcomes were revisited, even when specifically asked. No pupil actually mentioned the use of a plenary (review), although I did not specifically ask about this. (I had not asked about the use of starters in B2.1 either, but pupils commonly mentioned them: this could imply that the use of starters is still much more prevalent than the use of plenary activities). Many pupils described the end of a lesson in terms of the length of time spent packing away or in waiting for the class to be quiet. It was, the pupils reported, common for them to be kept in until they stopped talking; again I saw evidence of this in my observations.

<u>B2.8 What do you think could be done to help you to learn better?</u>

There were similar responses in this interview to those received in the initial pupil interviews, although four of the pupils did not offer any suggestions. Of the eight that did, four (3 boys, 1 girl) asked for more practicals, as they were seen as "fun" and "enjoyable" and helped them to learn; two similarly referred to 'doing' ('Kinaesthetic' activities) rather than talking (1 boy, 1 girl) and two requested more computer activities (both boys).

7. The use of questionnaire 5: science teachers, CSS, y7, 2007/8.

Questionnaire 5 was designed, and used, by science teachers at CSS with year 7 classes in November 2007; the results of their initial analysis were shared with me in January 2008. Although not all of the questions selected by the science teachers in this questionnaire relate directly to my study, a number do and hence can be considered to complement my own data collection. It does, I feel, offer powerful evidence that the science teachers were engaging in emancipatory research, building on emerging findings from my study. In particular, responses to statements referring to the use of objectives, the use of plenaries, the use of worksheets, copying from the board or texts, and a preference for individual or group work were sought. In addition, a statement also referred to the use of praise, which had been identified as potentially useful in motivating pupils and a statement on behaviour, which may, at least tentatively, relate to the responses from questionnaire 1a. The science teachers at CSS also considered other factors that they considered to be important, for example the pupil view on the importance of homework and the involvement of parents. It was also evident, through informal discussions with them later, (March 2008) that they were using it 'in order to improve professional practice so that the benefits of the research could be seen in the classroom' (quote from chapter one of this thesis). The questionnaire sought levels of agreement to a number of statements, using a four-point scale. In order to offer some degree of comparison with the findings from earlier questionnaires, I undertook further analysis by allocating a weighting scale, summing the totals for each statement and, by comparing the totals with the maximum and minimum scores possible, converting them into a weighted percentage agreement. The results are shown in table 8.

It is interesting to compare the responses from questionnaire 5 to the findings from questionnaires 1a (lesson planning model, pupil version): 1.3.4 (how often are the lesson objectives shared with you?) and 1.4.2 (the use of a Review (or Plenary) at the end of the lesson) and to statements 4, 6, 12, 13 and 14, from questionnaire 4 (pupil perceptions). Because raw data reflecting gender responses was not, unfortunately, available from CSS for questionnaire 5, it was decided to aggregate the gender responses from questionnaires 1a and 4. The responses to y7 (2007-8) were compared to those from y7 (2004-5) rather than from y11 (2004-5) because both year 7 cohorts had involvement in the 'Enrichment' programme; year 11 had not. The responses in questionnaire 4 were from the same cohort as y7 (2004-5), but taken when they were in year 8.

No	Statement/ No. (%) of responses	Never -2	Hardly ever -1	Usually +1	Always +2	Cumulative total Max +/-274	Weighted Percentage Agreement
1	I like science lessons	8 (6%)	25 (18%)	90 (66%)	14(10%)	+77	+28
2	I like answering questions	11(8%)	47(34%)	66(48%)	14(10%)	+25	+10
3	Objectives/outcomes are explained	3(2%)	5(4%)	38(28%)	90(66%)	+209	+84
4	A plenary is used at the end of a lesson	3(2%)	27(20%)	60(44%)	47(34%)	+121	+44
5	I like listening to the teacher	5(4%)	38(28%)	82(60%)	11(8%)	+56	+20
6	I like copying from textbooks/board	63(46%)	36(26%)	30(22%)	8(6%)	-116	-42
7	I like using worksheets	14(10%)	38(28%)	63(46%)	22(16%)	+41	+15
8	I feel homework helps me to learn	3(2%)	33(24%)	76(56%)	25(18%)	+87	+32
9	Homework is checked by my teacher	11(8%)	11(8%)	47(34%)	68(50%)	+150	+55
10	My teachers give me praise	14(10%)	36(26%)	55(40%)	32(24%)	+55	+20
11	I behave myself in lessons	0(0%)	5(4%)	71(52%)	61(44%)	+188	+69
12	I have to think hard in lessons	3(2%)	27(20%)	85(62%)	22(16%)	+69	+25
13	I am made to work hard in my lessons	3(2%)	19(14%)	47(34%)	68(50%)	+158	+58
14	My parents ask about my lessons	14(10%)	16(12%)	49(36%)	58(42%)	+121	+44
15	My parents ask about homework	14(10%)	19(14%)	68(50%)	36(26%)	+93	+34
16	I like working alone	36(26%)	41(30%)	38(28%)	22(16%)	-21	-8
17	I like working with others	3(2%)	14(10%)	58(42%)	62(46%)	+164	+60

Table 8: Responses to Questionnaire 5,Year 7 Science, CSS (2007-8), n = 137.

The comparative figures for questionnaire 5 alongside the figures from questionnaires 1a and 4 are shown in table 9 and I feel that the differences indicated in it are worth commenting on. The smaller the numeric value for the difference, the closer the responses from the different cohorts match, thus, it appears that, in both cohorts, there is a noticeable, and remarkably similar, preference for working in groups, rather than individually. Both groups of pupils show some overall disagreement with 'I like working alone' yet strong agreement with 'I like working with others'. It appears to be the case that, in science lessons delivered to pupils in y7 (2006-7), there is a marked increase in the sharing of lesson objectives as compared to the responses for y 7 (2004-5). A similar, but much smaller increase is apparent with regard to the use of reviews or plenaries at the end of lessons. These results do seem to provide further illustration that aspects of the six-part lesson-planning model have been increasingly implemented, at least within the science faculty. It is not possible to pass comment on whether this has occurred as a result of the introduction of the lesson-planning model, or as a result of an increasing awareness of AfL strategies, but I suspect that they have both played a part.

There is a noticeable difference in the response to 'I like listening to the teacher': y7 (2007-8) showed some agreement (+20), whereas y8 pupils (2005-6) showed some disagreement (-28); it may perhaps be the case that this is explained because younger pupils have simply retained more enthusiasm, but this would need further investigation. Both cohorts of pupils show a dislike to copying, with y7 (2006-7) showing this even more pronouncedly than y7 (2004-5); they also appear to have a slightly more positive view of the use of worksheets.

Statement/Response (Weighted percentage agreement)	**Questionnaire 5 (y7, 2007-8) n = 137**	**Questionnaire 1a (y7, 2004-5) n = 145**	**Difference**
The use of lesson objectives	+84	+ 45	39
The use of a Review (or plenary)	+44	+33	11
Statement/Response (Weighted percentage agreemant)	**Questionnaire 5 (y7, 2007-8) n = 137**	**Questionnaire 4 (y8, 2005-6) n = 72**	**Difference**
I like listening to the teacher	+20	-28	48
I like copying from textbooks/board	-42	-25	17
I like using worksheets	+15	+3	12
I like working alone	-8	-3	5
I like working with others	+59	+62	3

Table 9: A comparison of responses to common statements from questionnaire 5 and questionnaires 1a and 4.

Interestingly, the analysis performed by the science faculty at CSS revealed some gender differences, which they described as 'significant'. Unfortunately it was not possible for me to access this raw data, but the overall findings, as reported by the science teachers at CSS, were:

1. The majority of girls never, or hardly ever, like working alone, but appeared to prefer working together; the boys showed no clear preference for either.

2. Boys showed a greater tendency to think that homework hardly ever helps them.

3. Nearly half of the boys felt that they were never, or hardly ever, praised or rewarded; the majority of girls reported that they were usually, or often, praised.

4. Two-thirds of the girls think that they are made to work, and think, hard, whereas only one-third of the boys felt that this was the case.

The apparent preference for group work indicated by girls with this cohort shows some similarity with the findings of the much smaller sub-analysis performed using data obtained from the responses to questionnaire 4. Implications of the findings from table 9 are discussed further in chapter six, in particular in relation to collaborative, group, working and to gender issues.

CHAPTER FIVE.

Research findings 2.

Theme two: Learning styles, active learning and a wider perspective.

Introduction.

This chapter offers evidence relating to theme two (learning styles, active learning and a wider perspective), with particular regard to what CSS calls the 'Delivery' section of the lesson-planning model, focusing on active learning and VAK learning styles. It again draws upon relevant features from the data collection methods discussed in chapter three and briefly revisited in the introduction to chapter four. It further integrates with the previous chapter as both themes are related to the use of a range of strategies to actively engage the pupils in their learning at CSS. It presents and analyses data from both CSS and also from a wider perspective, gained from schools working in partnership with the PGCE secondary science course at Liverpool Hope University.

From early discussions at CSS, with teacher X, it was clear that the school was attempting to raise awareness of pupil preferred learning styles in terms of VAK and Multiple Intelligences and to encourage the use of multisensory activities. The extent to which this was occurring was explored as part of the sequence of initial interviews with y7 pupils (2004-5) and science teachers at CSS and further pursued through questionnaires 1 and 1a. As in theme one, responses to these questionnaires were sought from the science teachers, the whole of year 7 and year 11 (2004-5) and eleven science mentors from other schools. A further comparison between the views of the science teachers at CSS and these mentors was gained through the use of questionnaire 2 (at CSS) and 2a (mentors), which sought responses to a number of statements relevant to theme two, focusing on accelerated learning and learning styles. Responses to these questionnaires indicated a broad level of support for the analysis and use of learning styles and I felt it to be pertinent to survey this across a larger number of schools through the use of questionnaire 3. Concurrently, theme two was investigated through the same ten lesson observations, described in chapter four; through analysis of the pupil perceptions questionnaire (4); and through final pupil interviews.

Findings from theme two: CSS

1. Initial interviews

Teachers and pupils were asked to describe some of the activities in their lessons. Responses included: worksheets, teacher explanations, paired work, practicals, team games with y7, card sort, mind maps and exercises from books. The time taken to produce the resources for educational games was seen, by the teachers, as prohibitive and some were not convinced about using more activities: some activities (e.g. loop card games) were considered as "a waste of time" by one teacher. A comment was made by one teacher that "pupils are not happy working in groups" (male) and another teacher claimed to be "doing activities catering for Kinaesthetic learning" (female).

The teachers were also asked how often they consciously planned lessons to cater for specific learning styles and whether they targeted individual pupils. A common response was that, while they tried to include a range of activities that would cater for VAK learning styles, they were not aware of the preferred learning styles of their pupils, unless they taught on the 'Enrichment' programme, or if they discussed it with their pupils. Consequently, they felt unable to target individuals in this respect although they did report targeting pupils in other ways, e.g. questioning. One teacher commented that: "pupils are very positive about VAK" (female). Six of the staff felt it would be useful to have VAK details and five commented that they were aware that pupils knew their own preferred learning style. A common view, apparent during the initial teacher interviews was that the majority of pupils in CSS are 'Kinaesthetic' learners, with figures of typically 60% and as high as 90% being cited - this was not, however really supported by a later analysis of the VAK summary, which showed a wide variety. At the initial interview stage I did not offer any comment. Later, I shared the findings of my analysis of the VAK survey at CSS and put this into the context of wider contested views, received with some surprise and no little interest. A comment from one teacher was that pupil knowledge of their preferred learning style could have a negative effect, reporting the comment from one pupil: "I'm a Kinaesthetic learner, I'm not doing this" (female).

2. The use of Questionnaires 1 and 1a

Many aspects of these questionnaires have been presented in chapter 4 as tables 1.1 to 1.4, with a summary, in terms of weighted percentage agreement, in table 2. The questions in questionnaire 2 refer to some examples of teaching and learning activities, suggested in DfES documentation, emphasising some accelerated learning techniques, such as 'Brain Gym' and the use of educational games (e.g. DfES, 2003a, 2003b). Dryden and Voss (2001) also stress the usefulness of learning games such as card sorting activities, quizzes and bingo.

The findings relating to activities and learning styles are summarised in tables 10.1 and 10.2.

Table 10.1: How often are these activities used in your science lessons?

10.1.1 Brainstorming

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	21 (30)	14 (17)	19 (43)	19 (56)
1(hardly ever)	1 (11)	1 (9)	12 (17)	26 (34)	14 (32)	8 (24)
2 (sometimes)	6 (67)	7 (64)	18 (25)	25 (32)	8 (18)	7 (21)
3 (most lessons)	2 (22)	3 (27)	11 (16)	12 (16)	3 (7)	0 (0)
4 (every lesson)	0 (0)	0 (0)	7 (10)	1 (1)	0 (0)	0 (0)

10.1.2 Card Sort

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	43 (62)	38 (50)	31 (70)	22 (68)
1(hardly ever)	2 (22)	2 (18)	18 (25)	23 (30)	9 (20)	9 (24)
2 (sometimes)	7 (78)	8 (73)	7 (10)	10 (13)	2 (5)	3 (9)
3 (most lessons)	0 (0)	1 (9)	1 (1)	2 (3)	1 (2)	0 (0)
4 (every lesson)	0 (0)	0 (0)	0 (0)	3 (4)	1 (2)	0 (0)

10.1.3 Quizzes

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	27 (39)	23 (30)	26 (61)	22 (68)
1(hardly ever)	3 (33)	1 (9)	24 (35)	18 (22)	8 (18)	7 (21)
2 (sometimes)	5 (56)	8 (73)	15 (22)	23 (30)	10 (21)	4 (15)
3 (most lessons)	1 (11)	2 (18)	3 (4)	9 (12)	0 (0)	1 (3)
4 (every lesson)	0 (0)	0 (0)	0 (0)	3 (4)	0 (0)	0 (0)

10.1.4 Group Discussions

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	12 (17)	4 (5)	8 (18)	5 (15)
1(hardly ever)	2 (22)	2 (18)	3 (4)	9 (12)	12 (27)	2 (6)
2 (sometimes)	3 (33)	5 (45)	21 (30)	32 (39)	14 (30)	19 (56)
3 (most lessons)	5 (55)	3 (27)	26 (36)	21 (26)	9 (20)	4 (15)
4 (every lesson	0 (0)	1 (9)	7 (10)	10 (13)	1 (2)	2 (6)

10.1.5 Brain Gym

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	5 (56)	3 (27)	53 (77)	55 (72)	35 (77)	32 (94)
1(hardly ever)	4 (44)	2 (18)	8 (12)	15 (20)	7 (16)	1 (3)
2 (sometimes)	0 (0)	5 (45)	7 (10)	4 (5)	1 (2)	1 (3)
3 (most lessons)	0 (0)	1 (9)	0 (0)	2 (3)	0 (0)	0 (0)
4 (every lesson	0 (0)	0 (0)	1 (1)	0 90)	1 (2)	0 (0)

10.1.6 Bingo

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	6 (67)	2 (18)	57 (83)	61 (80)	41 (93)	32 (94)
1(hardly ever)	2 (22)	5 (45)	12 (17)	10 (13)	3 (7)	1 (3)
2 (sometimes)	1 (11)	4 (36)	0 (0)	4 (5)	0 (0)	1 (3)
3 (most lessons)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)
4 (every lesson	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

10.1.7 Games, e.g. loop cards, dominoes

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	4 (44)	0 (0)	60 (87)	67 (88)	40 (9)	33 (97)
1(hardly ever)	3 (33)	3 (27)	9 (13)	6 (8)	3 (7)	1 (3)
2 (sometimes)	2 (22)	8 (73)	0 (0)	3 (4)	0 (0)	0 (0)
3 (most lessons)	0 (0)	0	0 (0)	0 (0)	0 (0)	0 (0)
4 (every lesson	0 (0)	0	0 (0)	0 (0)	1 (2)	0 (0)

Table 10.2: How often do you cater for the preferred learning style of your pupils (how often do the lessons cater for your preferred learning style)

Response/ No.(%)	Teachers n = 9	Mentors n = 11	Year 7 boys n = 69	Year 7 girls n = 76	Year 11 boys n = 44	Year 11 girls n = 34
0(never)	0 (0)	0 (0)	25 (36)	18 (24)	18 (42)	13 (38)
1(hardly ever)	0 (0)	1 (9)	6 (9)	7 (9)	12 (28)	7 (22)
2 (sometimes)	5 (56)	4 (3)	15 (22)	11 (16)	10 (23)	11 (32)
3 (most lessons)	4 (44)	5 (45)	17 (24)	35 (43)	3 (6)	3 (8)
4 (every lesson	0 (0)	1 (9)	6 (9)	5 (7)	1 (2)	0 (0)

Table 11 and chart 2 offer a comparative view, using weighted percentage agreement, in the manner used to produce table 2 and chart 1from tables 1.1 to 1.4. The table and the chart reveal that, whilst the responses to the questions about activities and learning styles are predominantly negative, there are some differences. As an illustration, for y11 pupils (2004-5), all of the values for weighted percentage agreement are negative, whereas y7 pupils (2004-5) do indicate some, albeit small, positive agreement with 10.1.4 (discussions) and with 10.2 (learning styles), and in every case are less negative than the y11 figures. This may, perhaps, indicate that, during 2004-5, the use of a range of activities at CSS was more prevalent with y7 pupils than with those in y11. It is possible to speculate that this is due to the introduction of LIP, but it could, equally, be related to the pressures of examinations and syllabus demands in y11, as commented on by the teachers during the initial interviews. There appears to be some differences in the perception of the use of activities between pupils and teachers, with teachers claiming to use more activities than is evident to the pupils. There are also some indications that science teachers in CSS use fewer educational games than the science teachers in the other schools.

Question code/ respondent type	Teachers n = 9	Mentors n =11	Year 7 boys n = 69	Year 7 girls n =76	Year 11 boys n =44	Year 11 girls n =34
10.1.1	+1 (+6)	+2 (+9)	-31 (-22)	-40(-27)	-49 (-56)	-46 (-67)
10.1.2	-2 (-11)	-1 (-5)	-103(-75)	-91 (-60)	-65 (-74)	-53(-78)
10.1.3	-2 (-11)	+1 (+5)	-75(-54)	-49(-32)	-60 (-69)	-52 (-76)
10.1.4	+2(+11)	+3 (+14)	+6 (+4)	+26 (+17)	-17 (-19)	-4 (-6)
10.1.5	-14 (-78)	-7(-32)	-112 (-81)	-123(-81)	-75(-85)	-65(-96)
10.1.6	-14 (-78)	-9 (-41)	-126(-91)	-130 (-86)	-85 (-97)	-65 (-96)
10.1.7	-11 (-61)	-3 (-14)	-129 (-93)	-140 (-92)	-81 (-92)	-67 (-99)
10.2	+4 (+22)	+6 (+28)	+27(+20)	+2 (+1)	-43 (-49)	-23(-34)

Table 11: Responses to questionnaires 1 and 1a, activities and learning styles, showing summed weighted scores and weighted percentage agreement.

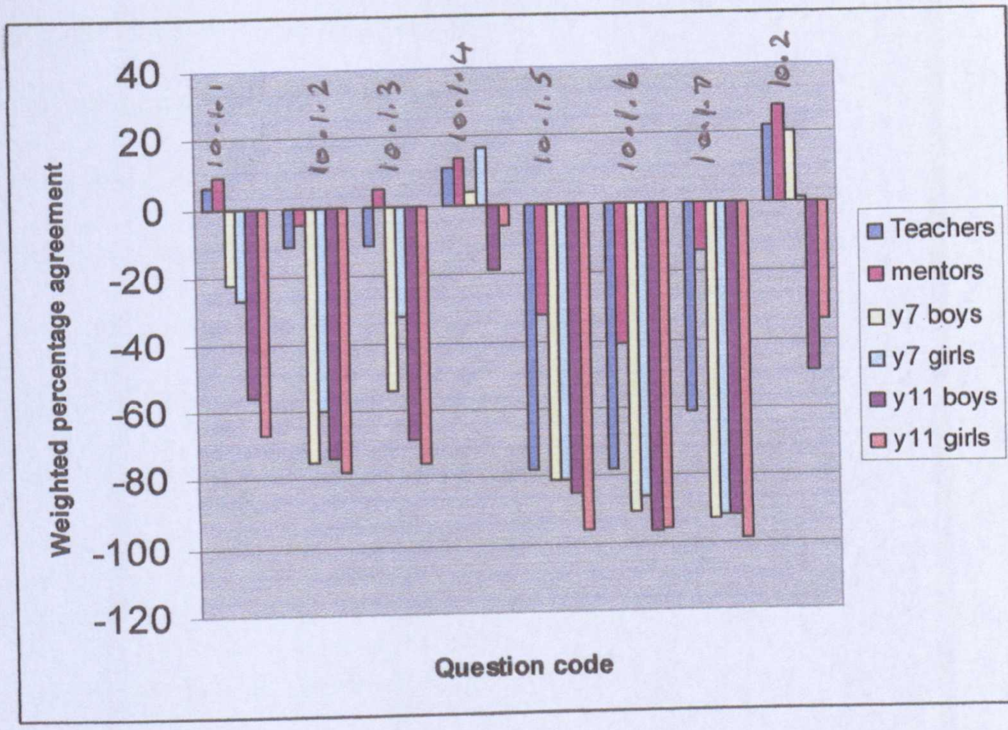

Chart 2: responses to questionnaires 1 and 1a, activities and learning styles, showing weighted percentage agreement

3. Lesson Observations

These are generally discussed in chapter four, but aspects relevant to lesson delivery are presented here.

It was very noticeable that, in general, pupils appeared more engaged and more motivated when they were presented with activities that directly involved them, especially when a task was of short time duration. Even pupils who were apparently usually co-operative and behaved well, showed 'off-task' behaviour during protracted periods, especially relatively lengthy 'teacher talk'. For example, in lesson A1, the class were given a 'hands-on task' in pairs. This was quite fast, taking about ten minutes during which time the pupils exhibited good behaviour and showed interest. Pupil 06, for instance was evidently interested in the activity, was quite vocal and spent a considerable time handling the material. However, the remainder of this lesson was taken up by one task: he was reluctant to settle to this and indeed became somewhat disruptive here as he kept moving to other pupils; he did very little work on this unless challenged. It may be, of course, that he was simply not motivated by the task. A similar pattern was noticed in a later lesson when the same pupil was 'off-task' for long periods during a protracted activity. In lesson C1 a ten-minute activity was planned, but when it was allowed to go on for longer than this, the pupils became noticeably more restless. Lesson C2 was dominated by a lengthy (twenty-minute) teacher talk, supported by computer-generated demonstrations. Initially the pupils were well behaved and apparently attentive, but pupil 11 soon became distracted and pupil 10 later appeared disinterested. Pupil 08 was not apparently attentive, preferring to draw in his book, however, when the pupils were invited to participate in the demonstrations some did, including pupil 08 who apparently enjoyed it.

4. The use of a pupil perceptions questionnaire, (questionnaire 4)

This was presented in chapter 4, (tables 6 and 7), but some of the findings are relevant to theme 2 and so are included here. The very strong level of agreement with the complementary statements 7, 'I like to be able to do physical or practical activity in my lessons' and 18 'I like to have some time to move around in my lessons' (+81 and +77 respectively) may be considered to reinforce findings from my earlier work that pupils like to be engaged in a range of activities and that teachers aim to try and deliver such a range, perhaps with a view to setting 'Kinaesthetic tasks'.

5. End of research pupil interview questions

The pupils interviewed were selected because they were amongst the pupils who had put their names on questionnaire 4, and hence it was possible to look at their individual responses and probe their responses more deeply

Pupil responses A: Revisiting Questionnaire 4

A1. Do you remember filling in the questionnaire? Did you take it seriously at the time?

Not surprisingly, most pupils had forgotten that they had completed this, although all of them did recollect it when they examined it more closely. All pupils claimed to have considered their responses to the questionnaire seriously: this helps to support the validity of my findings from questionnaire 4.

A2. Do you want to change any of your answers – if so, why?

Two pupils chose to change the answers that they gave. One, because she had found the question 'I like to know how my work is going to be marked' confusing (this arose out of her answer to A6 on the interview questions); the second because he now felt far more positive about school and hence now strongly agreed that he "likes to know what I'm supposed to be learning before I start my work" (previously he had strongly disagreed). The other ten pupils did not wish to change any of their earlier responses.

A3. Do you learn better through group work or individually? Why do you think this is?

Although there was strong agreement from pupils' replies to indicate that they liked working in groups, my earlier work had indicated a noticeable difference between boys' and girls' preferences for individual or group work. This was not really confirmed here: all but one replying on interview indicated a preference for group work, primarily because they could 'share ideas' and 'help you learn'. All of the girls, and three out of the five boys indicated a strong preference, with one girl saying "I dislike working on my own" (although she didn't elaborate further on this), with only one pupil (a boy) indicating a very strong preference for individual work. Commonly, although there was a preference for working in friendship groups: "you can discuss and help each other" (boy), there was a general recognition that friendship groups didn't matter. Several pupils admitted that they were more likely to 'mess' with their friends, but still seemed to think that if they were working then this didn't matter. Although there was an overall preference for group work, most pupils also indicated that they could enjoy working individually at times, with no apparent gender difference.

A4. Do you think that doing practical or physical activities helps you learn better? Why do you think this is?

All pupils indicated that they enjoy practical or physical activity, hence giving further support to the findings from questionnaire 4; the majority (eight) replying that it helps them to learn more effectively, with one boy saying it didn't. Some responses to why they think they learn better include: "it makes it more fun, so you want to learn more" (boy); "you learn by doing" (girl); "it helps you remember if you see it happen" (girl); the most common response, however centred around "you get to do more *stuff*; you're not just writing" (girl) – this was commented on again later in the interviews.

A5. What do you think about copying from the board or from books?

Copying notes was clearly disliked by the pupils, who indicated that a lot of this still occurs in their lessons, although they did indicate that this was variable across teachers and subjects. "It's boring" (girl); "you haven't got time to think about what you are writing" (girl); "you're not learning anything" (boy); "you won't remember it much" (girl); "you can't think for yourself" (boy). All of these comments, which are typical of the responses, strongly confirm the findings from questionnaires and from my lesson observations. The more articulate pupils were able to offer suggestions about how they would prefer to make notes, e.g. putting it on a poster, using a mind or spider map and through the use of longer questions.

<u>A6. Do you think that it's important that your work is marked? Does it matter who marks it? Does it help you to learn when your work is marked?</u>

Girls in particular had indicated in their responses to questionnaire 4 that there was little support for 'I like to know how my work is going to be marked'. The comment made in A2 above suggested that the statement in the questionnaire stresses how the work is going to be marked, rather than whether or not they value it being marked. This question (A6) was designed to pursue the second point, as the original replies had been rather worrying to the school. All pupils were positive here, as all agreed that it is important that work is marked and that it helps them to learn: "You can fix it – you know where you've gone wrong and where you can improve on it" (boy); "I want to know how well I've done" (girl). There was quite a depth of feeling that it was important that the teacher marked the work, rather than the pupils as they felt that the teachers would be more reliable and more honest; three of the pupils said that they often 'cheated' when self marking and that their mates would often be too lenient or would simply 'mess' when they marked. This contradicts, to some extent, the findings from questionnaire 4, which showed that pupils *like it when we mark each others' work* – clearly there are some implications here for the schools' developing AfL programme in terms of involving pupils in peer and self assessment. Two pupils (one boy, one girl) commented that some teachers gave constructive comments and that they much preferred this to a mark out of ten for example. Many of the pupils did, however, remark that their work was not marked very often (once a month was reported by one girl) and/or that it was marked without being read: "they just tick it and write 'well done' when it obviously isn't very good" (girl).

A7. Do you find school stressful – if so what makes you get stressed?

Pupils, particularly apparently girls, had indicated that they found school too stressful to do their best. When this was pursued more deeply in interview, the girls were again admitting to more stress than boys, although three of the boys said they felt stressful sometimes. The girls tended to relate their apparent stress to social factors, e.g. if they've just fallen out with their friends; three of the girls (but no boys) commented on teachers 'moaning' at them: "sometimes teachers "do my head in- they just shout – it happens a lot". Nine of the pupils reported that they felt under stress if they found the work too challenging or if they didn't understand the task.

B1. The six-part lesson-planning model

B2.3 Describe some of the activities that you do in your lessons

A range of activities were described in the initial pupil interviews and these were largely repeated here, although many pupils indicated that they spent a lot of their time in their lessons just writing or just listening to the teacher. The use of starters was again evident. When asked more closely what range of starters were used, the common reply was 'questions' or 'quizzes', one girl mentioned the use of 'brainstorming'.

B2.4 How long do the activities take?

Starter activities were always described as quick (five or ten minutes being typical), reinforcing my earlier findings. Although the lessons appeared to be often taken up with one main activity, it was evident that sub-activities were used in some lessons, typically of fifteen to twenty minutes duration, reinforcing comments from the initial pupil interviews and my lesson observations. Other than in practical lessons, pupils did not report any activities that involved them moving about within the classroom (what could be described as 'Kinaesthetic' activities).

B2.5 What do you spend most of your time doing in a typical lesson?

The results of questionnaire 1(1a) indicated that a range of multi-sensory activities was not widely used within the school. The results from this interview tend to reinforce that view: all but one of the pupils answered "writing", with other common answers including "listening to the teacher" (4 pupils); "copying" (6 pupils) and "reading" (6 pupils). One pupil commented that she spends a lot of time copying/listening and that "I don't learn much – it goes in one ear and out the other". A similar pattern was evident in my lesson observations.

B2.8 What do you think could be done to help you to learn better?

There were similar responses in this interview to those received in the initial pupil interviews, although four of the pupils did not offer any suggestions. Of the eight that did, four asked for more practicals, as they were seen as "fun" and "enjoyable" and helped them to learn; two similarly referred to 'doing' ('Kinaesthetic' activities) rather than talking and two requested more computer activities.

C. Learning Styles

C1. What do you know about Learning Styles?

Pupils appeared to be puzzled by this question, with only three pupils making any response to it. One girl talked about Visual and Kinaesthetic learning styles, but could not remember Auditory; and another girl recalled that "Kinaesthetic etc" was covered in 'Enrichment'. When the other pupils were prompted about VAK, all could make some reply, but not in any depth.

C2. Do you have a preferred learning style – if so what is it? How do you know?

Four pupils had forgotten, but did recall being involved in this during 'Enrichment' lessons and could briefly describe the analysis that resulted in their classification; five were quite certain that they were 'Kinaesthetic'; one thought she was 'Kinaesthetic'; one was 'Visual' and one 'Visual/Kinaesthetic'. This emphasis on 'Kinaesthetic' learners reflects the teacher perception (from interviews) but was not supported by my analysis of the schools' simple VAK questionnaire.

C3. Does knowing about your learning style help you in any way? If so, how?

Five pupils thought that this did help, the other seven did not. Of the five that were supportive their reasons tended to be vague, although one girl did suggest that, as the majority of her class were 'Kinaesthetic' learners (in her view), then the lessons should be geared towards that style of learning.

C4. Do teachers cater for your learning style? If so, please give some examples.

This split the respondents equally in their responses as six thought that that teachers did cater for their learning style and six did not. The examples that were offered in support of this were again somewhat vague and tended to relate to practical activities and experiments. One boy thought that teachers tended to use a range of different approaches to cater for the different styles, which, in essence, is what the teachers were suggesting that they tried to do.

C5. Do you ever use what you've learned in your 'Enrichment' lessons in any other lessons? If so, what has been useful? If not, why do you think this is?

There were some examples given, which tended to be subject- and/or teacher-specific, for example, mind maps were used in science, history and English lessons; brainstorming was used in history and an awareness of left brain/right brain characteristics was discussed in English lessons. This perhaps indicates that CSS could investigate further how to effectively develop the 'Enrichment' programme more widely across the curriculum, possibly considering, for example the implications of Feuerstein's IE programme, discussed in chapter 2 (Feuerstein *et al,* 1980). Pupils did report that they found mind maps a useful way of summarising and picturing knowledge.

6. Analysis of pupil VAK learning styles

All pupils in the school had completed a school-based questionnaire, consisting of ten very simplistic statements to which the pupils had to respond. For example, for the statement 'I like to spell', the possible responses were: 'by seeing the spelling in my mind' (V); 'by sounding it out' (A) and 'by writing it out' (K). By summing the number of responses under each heading (V, A, K) an overall impression of preferred learning style was allocated. The overall results are summarised in table 12 and chart 3. It can be seen that, while the figures for 'Kinaesthetic' learners are higher than the others (an average over the sample gives 40%), they are not apparently as high as cited by the science staff (as high as 90% was quoted) and tend to be similar to results from the literature, discussed in chapter 6. However, there appears to be a significant variation across year groups, which, perhaps not surprisingly, casts doubt on the validity of this survey. Over 3000 VAK questionnaires were found to be available online (05/07/07) and it must be at least possible that the preferred learning style would be dependent upon the questionnaire selected. A large number had indicated that they had a preferred style across more than one modality and these results are also shown.

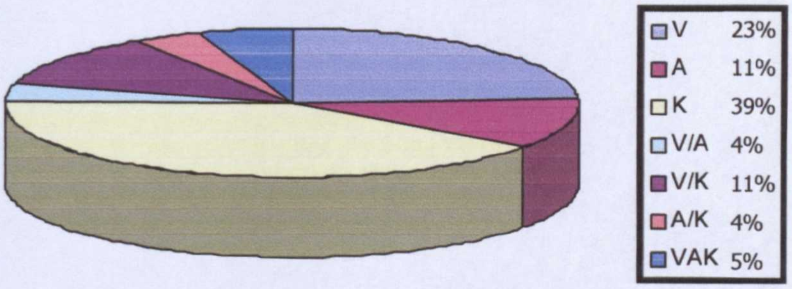

Chart 3: VAK learning style preferences across CSS

Year\Style No. (%)	V	A	K	V/A	V/K	A/K	VAK	TOTAL
Y7 (n = 91)	31 (34)	10 (11)	23 (25)	3 (3)	13 (14)	7 (8)	4 (4)	91
Y8 (n = 91)	14 (15)	12 (13)	52 (57)	2 (2)	9 (10)	1 (1)	1 (1)	91
Y9 (n = 44)	15 (34)	4 (9)	15 (34)	0 (0)	5 (11)	4 (9)	1 (2)	44
Y10 (n = 57)	10 (18)	11 (19)	26 (46)	4 (7)	4 (7)	1 (2)	1 (2)	57
Y 11 (n = 61)	10 (16)	9 (15)	19 (31)	5 (8)	7 (11)	2 (3)	9 (15)	61
TOTAL (n = 344)	80 (23)	38 (11)	135 (39)	14 (4)	38 (11)	13 (4)	16 (5)	344

Table 12: Analysis of pupil preferred learning style modalities by year groups at CSS
(numbers and percentages)

Findings from theme two: wider perspective

1. Questionnaire 2 (2a).

The findings from questionnaire 2 have been presented, with some discussion, as table 3 and chart 2 in chapter 4. Questionnaire 2a contained only the statements from questionnaire 2 that were considered to be relevant to accelerated learning or learning styles, i.e. with no specific reference to LIP, and was completed by 11 science mentors in schools in partnership with Liverpool Hope University, hence providing a comparative view with CSS. The results of this comparison are shown in table 13, using the same format as table 3, i.e. in terms of weighted percentage agreement. The results from questionnaire 1 had indicated that a range of activities was not being widely used in lessons at CSS, but there is evident acknowledgment of its importance shown through the questionnaire 2(2a) (statements 11 and 42).

There appeared to be a widely held perception across the schools that knowledge of, and response to, a pupils preferred learning style is important (statements 36, 37, 41and 51) and there were many similarities between the mentor and teacher responses to the common questions:

- Both agree that DfES guidelines aim to improve pupil attainment and that schools should respond to them.
- The use of a range of activities was seen to help pupil motivation.
- Both stress the importance of prior knowledge, sharing with pupils what they need to do and reviewing the work at the end of the lesson.
- The perception that knowledge of the learning style of pupils is important and that accelerated learning is not limited to primary schools.

The main areas of difference were in the perception that music can be a calming influence (statements 7 and 44) - mentors appeared to have a very much more positive view of this than did the teachers at CSS, and in the use of starters, as the mentors were somewhat more convinced of the importance of a starter activity (statements 5, 24, 32).

Statement/Weighted percentage agreement	***Teachers (CSS, n =9)***	***Mentors (Wider, n =11)***
5 A Starter activity should be used in every lesson	+83	+36
7 Playing music to pupils unsettles them	+6	-50
9 The school should respond positively to external guidelines (eg via DfES)	+50	+64
11 Using a range of activities in my lessons helps to motivate my pupils	+72	+91
12 It is important that I know the prior knowledge of my pupils	+89	+73
14 The pupils in my lessons spend most of their time listening to me	-56	-27
18 It is important that my pupils know what they have to do in the lesson	+94	+82
20 It is vital that I spend time reviewing the work with the pupils at the end of each lesson	+67	+64
23 External guidelines (eg by DfES) aim to improve pupil attainment levels	+61	+55
24 Starter activities motivate the pupils	+28	+50
25 The more activities I use, the more likely the pupils are to misbehave	-22	-50
26 Pupils who are "Kinaesthetic" learners do not learn by reading	-38	-36
27 Pupils who follow an Accelerated Learning programme will make better progress than those that do not	+17	+27
28 Pupils learn best by 'doing'	+56	+45
30 It is important that pupils are calm during my lessons	+56	+64
31 My pupils behave better when they are writing	-6	-14
32 Starter activities do not calm the pupils down	-38	-41
33 I only need to review the work with the pupils occasionally	-61	-59
34 Playing educational games in my lessons makes the pupils more likely to misbehave	-27	-50
36 It is important that I know the preferred learning styles of all of my pupils	+50	+55
37 It is important that my pupils know their preferred learning styles	+38	+36
38 Pupils only learn when they are quiet	-44	-64
39 Accelerated Learning will only work in Primary schools	-61	-55
41 It is important that my teaching is adjusted to account for the learning styles of pupils	+72	+50
42 Pupils respond well to educational games	+50	+55
43 Pupils who are "Kinaesthetic learners" are more likely to misbehave	-11	-14
44 Playing music to my pupils helps to calm them down	-11	+59
46 If I match my teaching to the pupils' preferred learning styles then I will raise achievement	+67	+64
51 It is important that the school analyses pupil learning styles in terms of VAK	+44	+55

Table 13: Summary of questionnaire 2(2a): teachers at CSS v. mentors across other schools. ***(Weighted percentage agreement)***

There were aspects of learning styles responses within questionnaires 2 and 2a and this allowed a comparative view between CSS and other schools; the responses to statements specifically relating to learning styles are summarised in table 14 and in chart 3.

Statement. (Weighted percentage agreement)	**Teachers (n = 9)**	**Mentors (n=11)**
1 Pupils who are "Kinaesthetic" learners do not learn by reading	-38	-36
2 Pupils learn best by "doing"	+56	+45
3It is important that I know the preferred learning styles of all of my pupils	+50	+55
4 It is important that my pupils know their preferred learning styles	+38	+36
5 It is important that my teaching is adjusted to account for the learning styles of pupils	+72	+50
6 Pupils who are "Kinaesthetic learners" are more likely to misbehave	-11	-14
7 If I match my teaching to the pupils' preferred learning styles then I will raise achievement	+67	+64
8 It is important that the school analyses pupil learning styles in terms of VAK	+44	+55

Table 14: summary of teacher and mentor responses to learning style questions from questionnaire 2(2a).

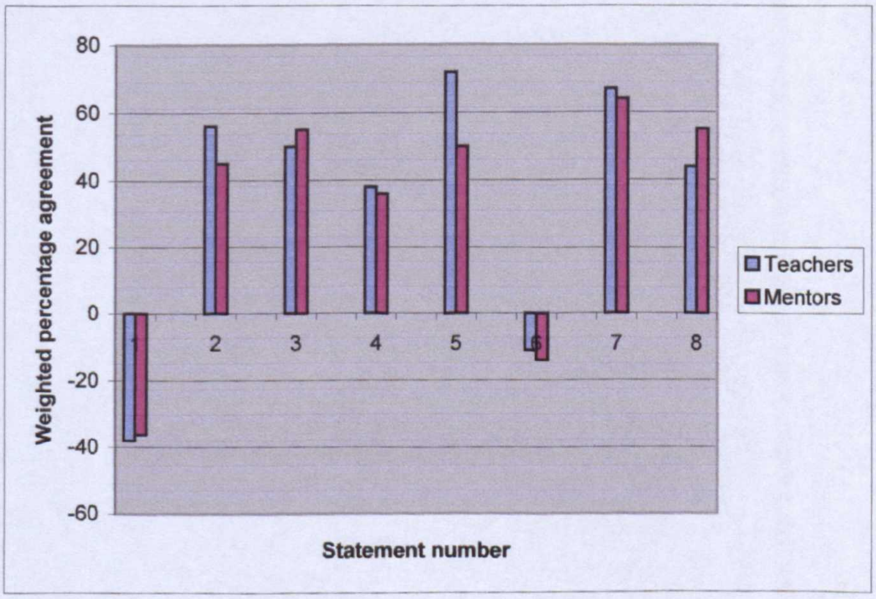

Chart 4: Teacher and mentor responses to learning styles statements in questionnaires 2 and 2a.

The responses from both the teachers and the mentors are very similar, although the teachers at CSS appeared to be even more positive about the need to adjust their teaching to account for pupil learning styles. Broadly speaking, there appears to be support for the analysis and use of VAK learning styles evident from the analysis of questionnaires 2 and 2a amongst both teachers at CSS and the mentors from other schools, particularly to the responses to statements 3, 5 and 7. I felt, therefore, that it was pertinent to explore this more widely through a survey of other schools in order to view the extent to which a wider range of schools analyse and use VAK (questionnaire 3).

2. Analysis of a learning styles questionnaire (questionnaire 3)

Questionnaire 3 was developed in reaction to the apparently emerging view, revealed in table 13 and chart 4 above, that teachers at CSS and mentors in eleven other schools, appeared to be supportive of the analysis and use of VAK learning styles. The questionnaire was designed in order to gain an overview of the analysis and use of learning styles (especially VAK) across a larger sample of schools, partly to compare this with CSS, partly to examine practice more widely, and partly to examine the extent to which schools appear to be following DfES guidelines. Fifteen teachers from CSS responded to the survey; there were 87 individual questionnaires returned from 36 other secondary schools, the majority in the Merseyside area, and all but two within the North West of England. There were multiple returns from sixteen of the thirty-six schools (44%) and two schools returned relatively large numbers of questionnaires.

Section A:

A straightforward collection of information about the analysis and use of learning styles with a Yes/No response required.

A1. Does your school analyse the preferred learning styles of your pupils in terms of Visual, Auditory and Kinaesthetic (VAK) learners?

CSS: all respondents replied 'yes' (100%). Wider: teachers from 28 of the 36 schools (78%) indicated that their schools did analyse learning styles in terms of VAK.

A2. Does your school analyse a pupils' preference as a Tactile (T) learner?

CSS: none of the respondents answered 'yes' to this question (0%), although one did add a written comment to indicate that this did occur to some extent. Wider: the results were an exact reverse of the VAK responses, with teachers from 8 schools indicating that their schools did analyse for Tactile learners (22%).

A3. Does your school analyse the preferred learning styles of pupils in any other way? If so, please specify:

CSS: only two respondents (13%) answered yes to this, both mentioning the use of Multiple Intelligences, (Gardner, 1983, 1991, 1997). Wider: only one of the schools surveyed (3%) indicated that they have attempted to analyse for Multiple Intelligences (it also analyses for Tactile). Teachers from four other schools (11%) indicated that their school did analyse preferred learning styles in some other way, but either did not specify what they were, or were not supported by other responses from the same school. The maximum 'yes' response is therefore 14%.

A4. Is the information on learning styles shared with you?

CSS: 33% answered 'yes' to this. Wider: the percentage of schools in the survey that analyse learning styles *and* appear to share this information with their staff is 69%, but there appears to be considerable variation across schools in terms of how extensively they appear to show information on learning styles analysis with their teachers.

A5. Are the pupils aware of their preferred learning styles?

CSS: all respondents answered 'yes' to this question (100%). Wider: 24 schools apparently share learning style information with their pupils, representing 86% of the 28 schools carrying out an analysis and 67% of the total number of schools surveyed (36).

A6. Does your school use learning style information to group pupils?

CSS: all respondents replied 'no' (0%). Wider: there was an indication that only five of the schools surveyed use VAK analysis to group pupils, representing 18% of the schools that do analyse VAK and 14% of the total surveyed sample.

It appears to be the case that a high percentage of schools within the wider survey share the practice at CSS and analyse for VAK, although it would seem that the information on a pupils' preferred learning style is more widely shared with teachers in the survey schools than in CSS. It is not, unfortunately, possible to pass any comment with regard to what these schools do with that information, although, interestingly, a small percentage of schools reported that they use the information to group pupils. This would make, I suggest, a very interesting, and important study, as, in my opinion (and supported by wider findings discussed in chapter six), the use of VAK analysis to group pupils may represent practice founded on very simplistic analysis and warrants further research. Unfortunately, this is outside the scope of this thesis. Table 15 and chart 5 show the comparison between CSS and the wider survey for section A.

Statement/ Percentage agreement	CSS n = 15	Wider survey n = 87
A1. Does your school analyse the preferred learning styles of your pupils in terms of Visual, Auditory and Kinaesthetic (VAK) learners?	100	78
A2. Does your school analyse pupil preferences as Tactile (T) learners?	0	22
A3. Does your school analyse the preferred learning styles of pupils in any other way? If so, please specify:	13	14
A4. Is the information on learning styles shared with you?	33	69
A5. Are the pupils aware of their preferred learning styles?	100	67
A6. Does your school use learning style information to group pupils?	0	14

Table 15: A comparison of the responses to Section A, Questionnaire 3 –CSS against wider survey. (*Percentage agreements*)

Chart 5: A comparison of the responses to Section A, Questionnaire 3 – CSS against wider survey.

Section B:

Respondents were asked to indicate their level of agreement with a number of statements about learning styles, using a five-point Likert scale, which was again weighted (+2, +1, 0, -1, -2), summed and then compared to the maximum and minimum totals possible for each statement so as to produce figures for weighted percentage agreement. The results are shown in summary form in chart 6 and in table 16. To allow for a consistency of interpretation of findings, the judgements about the level of agreement follow the arbitrary scale shown on page 109.

Statement/ Weighted percentage agreement	CSS n = 15	Agreement CSS	Wider survey n = 87	Agreement Wider survey
B1. It is important that the school identifies a pupils' preferred learning style	+67	Strong agreement	+46	Fairly strong agreement
B2. The analysis and use of preferred learning styles will raise pupil attainment levels	+60	Strong agreement	+41	Fairly strong agreement
B3. I need to be aware that there will be a range of learning styles in my classroom	+60	Strong agreement	+72	Very strong agreement
B4. Knowledge of a pupils' learning style helps me to plan my lessons more effectively	+33	Some agreement	+42	Fairly strong agreement
B5. When planning my lessons I try to incorporate a range of activities to cater for different learning styles	+57	Fairly strong agreement	+65	Strong agreement
B6. It is not possible to cater for all pupils' preferred learning styles in a lesson	+10	Little agreement	+7	Little agreement
B7.It is important that a pupil knows his/her preferred learning style	+40	Fairly strong agreement	+26	Fairly strong agreement
B8. Pupils learn best through one learning style	-40	Fairly strong disagreement	-48	Fairly strong disagreement
B9. Pupils learn more effectively if I cater for their preferred learning style	+20	Some agreement	+39	Some agreement
B10. Pupils should be encouraged to learn using a range of learning styles	+63	Strong agreement	+72	Very strong agreement
B11. Pupils with lower academic ability are more likely to be Kinaesthetic learners	+37	Some agreement	+10	Little agreement
B12. Older pupils are more likely to use a range of learning styles	+17	Little agreement	+13	Little agreement

Table 16: A comparison of the weighted responses to Section B of questionnaire 3 -CSS against wider survey

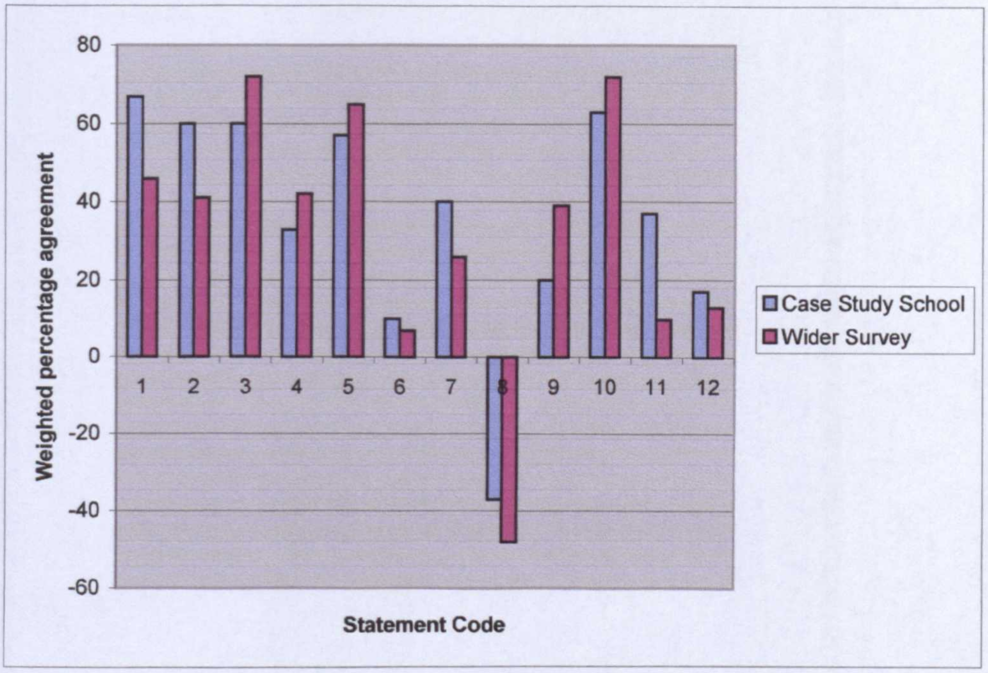

Chart 6: A comparison of the responses to section B of the VAK survey- CSS against wider survey

There are, as shown in chart 6 and table 16, indications that there is a good measure of support for the analysis and use of VAK learning styles across both CSS and the surveyed schools and that the level of support shown by CSS is broadly similar to that shown in the wider survey. There does, though, appear to be stronger support from CSS for B1 (the importance of identifying learning styles) and B2 (the analysis and use of learning styles will raise pupil attainment levels). Responses to all statements were positive, except for B8; responses to B1, B2, B3, B4, B5, B9 and B10 all showed a percentage of at least +40%, i.e. fairly strong support; responses to B3 (the need for an awareness of a range of learning styles within a classroom) and B10 (pupils should be encouraged to learn using a range of learning styles) indicated very strong levels of support (+ 72% in both cases). There appears to be strong agreement with these statements:

- It is important that the school identifies the preferred learning styles of pupils
- The analysis and use of preferred learning styles will raise pupil attainment levels
- Knowledge of a pupils' learning style helps me to plan my lessons more effectively
- When planning my lessons I try to incorporate a range of activities to cater for different learning styles
- Pupils learn more effectively if I cater for their preferred learning style

And particularly strong agreement with:

- ◊ I need to be aware that there will be a range of learning styles in my classroom
- ◊ Pupils should be encouraged to learn using a range of learning styles

There was disagreement (-48%) with the statement that "pupils learn best through one learning style", which, when taken in the context of other responses may indicate that teachers feel that it is important to encourage their pupils to learn using a range of learning styles.

A deeper analysis was undertaken to consider the extent to which the level of agreement to the statements in table 16 were dependent upon gender, age, years of teaching experience and whether or not a particular school analysed for VAK. The analysis of the wider survey had also considered three separate headings, with the aim of examining whether or not there was any difference in perception between teacher perceptions in schools that do analyse VAK and those that do not, namely:

1. All respondents, irrespective of whether or nor their school analysed VAK scores (n = 87)
2. Respondents from schools that do analyse VAK scores (n = 77)

3. Respondents from schools that do not analyse VAK scores (n = 10)

Analyses in terms of gender, age range and years of teaching experience were also performed to discover whether or not there were any apparent differences in teacher perceptions across these headings. The results from the analyses are summarised in table 17; the coded heading above each column refers to the statement from table 16.

Statement/ Respondent type	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
All respondents (n =87)	46	41	72	42	65	7	26	-48	39	72	10	13
Respondents, schools that analyse VAK (n = 77)	47	41	77	41	63	6	29	-46	38	71	5	15
Respondents, schools not analysing VAK (n =10)	40	35	55	50	80	15	10	-65	40	85	45	-5
Female (n = 53)	42	38	78	41	73	9	25	-55	37	78	10	5
Male (n = 34)	42	37	50	35	42	4	22	-30	33	50	7	20
Age range 21-25 (n = 15)	30	23	67	20	47	0	13	-63	30	73	40	43
Age range 26-29 (n = 19)	21	29	66	21	58	29	13	-39	24	76	0	20
Age range 30-34 (n = 24)	58	54	77	60	73	0	44	-50	50	71	4	10
Age range 35-39 (n = 10)	50	40	70	45	70	0	10	-30	55	50	0	25
Age range 40 or more (n = 19)	66	53	79	55	74	5	37	-53	37	82	8	-18
Yrs. experience 2 or less (n = 26)	48	42	77	48	73	58	27	-58	35	81	2	8
Yrs, experience 3 to 5 (n = 18)	58	53	72	52	69	-3	28	-25	53	47	-14	3
Yrs. experience 6 to 9 (n = 17)	62	50	76	53	74	6	35	-56	38	85	15	-12
Yrs. experience 10 to 14 (n = 14)	32	25	75	25	50	-7	11	-61	32	53	29	29
Yrs. experience 15 or more (n = 12)	17	29	54	17	46	42	29	-38	33	75	21	42

Table 17: further analysis of section B, questionnaire 3, by respondent type.
(Expressed as weighted percentage agreement; positive agreement unless indicated).

The results shown in table 17, as further illustrated by chart 7, seem to indicate that, overall, there is a good measure of support for the analysis and use of VAK learning styles even in those schools that do not perform a VAK analysis. For example, there appeared to be very strong support for statement B10 (pupils should be encouraged to learn using a range of learning styles), and strong support for B5 (planning lessons to cater for different learning styles), irrespective of whether or not the school analysed for VAK.

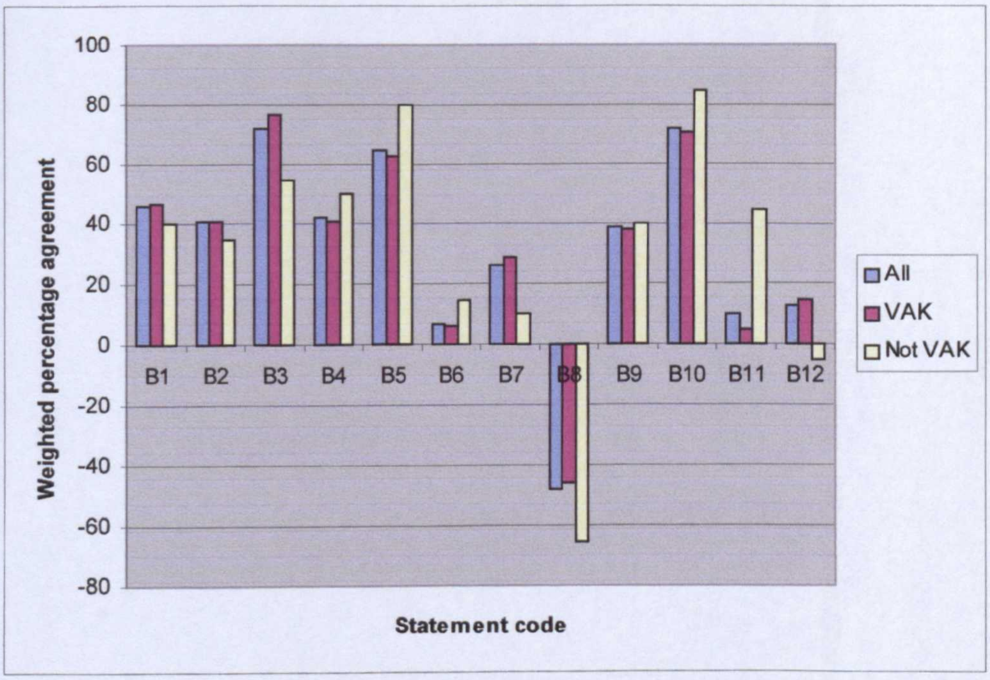

Chart 7: overview of wider VAK survey response to section B, questionnaire 3.

Interestingly, the analysis by gender within the wider survey (table 17), illustrated in chart 8, appeared to show a higher tendency to favour learning styles amongst female teachers. For example, in the responses to B3, B5 and B10, there is very strong agreement from female respondents (+78, + 73 and +78), compared to fairly strong agreement from males (+50, +42 and +50).

A similar analysis at CSS did not, however, reveal the same pattern, with very similar results for male and female respondents, as chart 9 illustrates. It is not easy to suggest any explanation for these results, which were not pursued further.

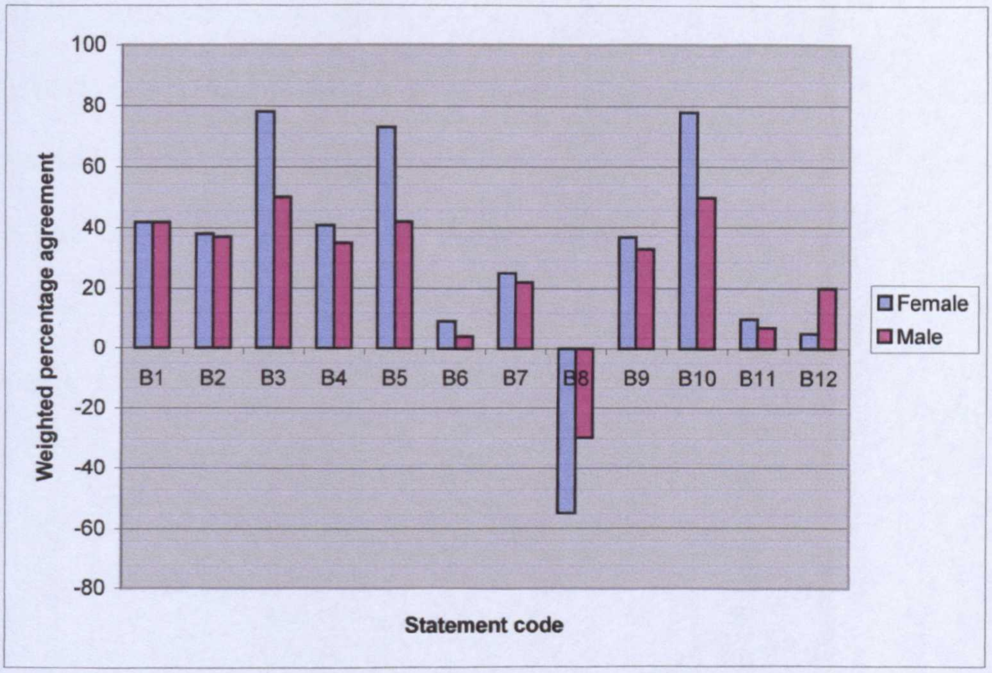

Chart 8: responses to section B of questionnaire 3 by gender – wider survey

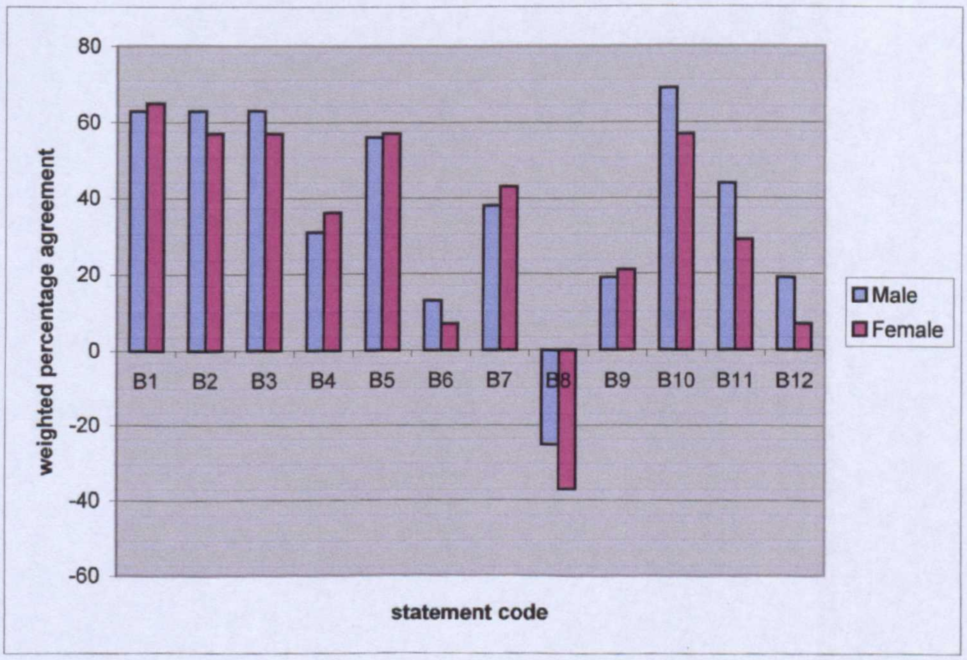

Chart 9: responses to section B of questionnaire 3 by gender – CSS.

There did not appear to be any obvious correlation evident from a scrutiny of the wider survey responses (questionnaire 3) between the teacher responses and their age, or between the teacher responses and their experience as charts 10 and 11 further illustrate. However, there do appear to be some relatively pronounced differences: some responses (particularly to B1, B2, B4 and B9) appear to be favoured more by older teachers. This was a little unexpected. I thought it likely that there might have been a higher degree of enthusiasm for VAK amongst teachers fresh from teacher training courses, a view partially formed through my experiences with trainees and their mentors and also through the responses from the teachers at CSS within the initial interviews, as noted earlier in this thesis. Some other responses (B11 and B12) were, though, favoured more by younger staff, particularly those in the 21-25 age range.

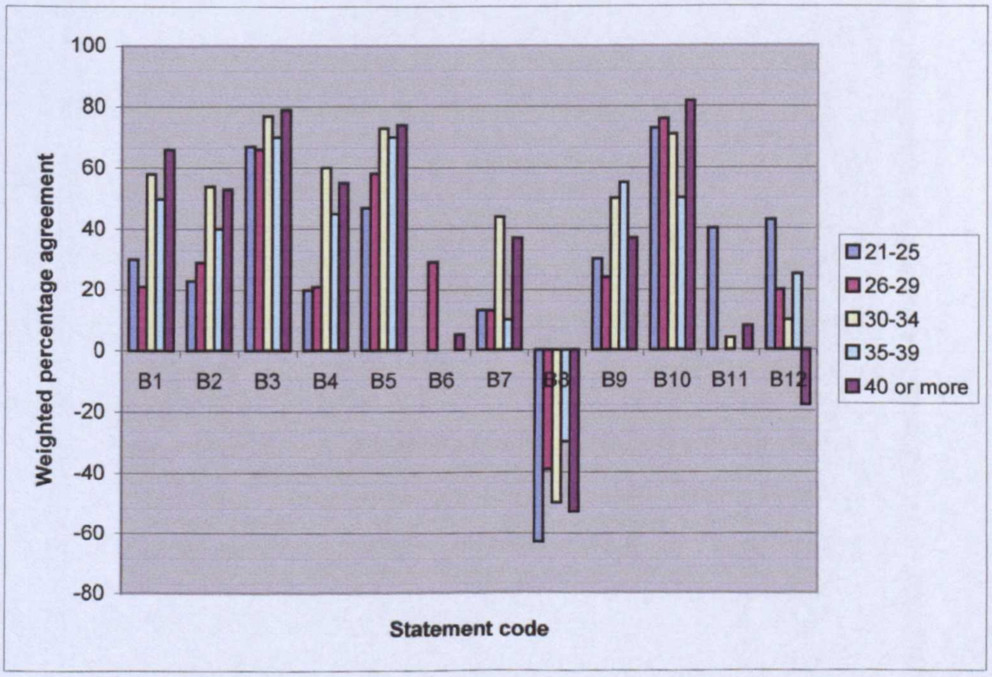

Chart 10: responses to section B of questionnaire 3 by age range – wider survey

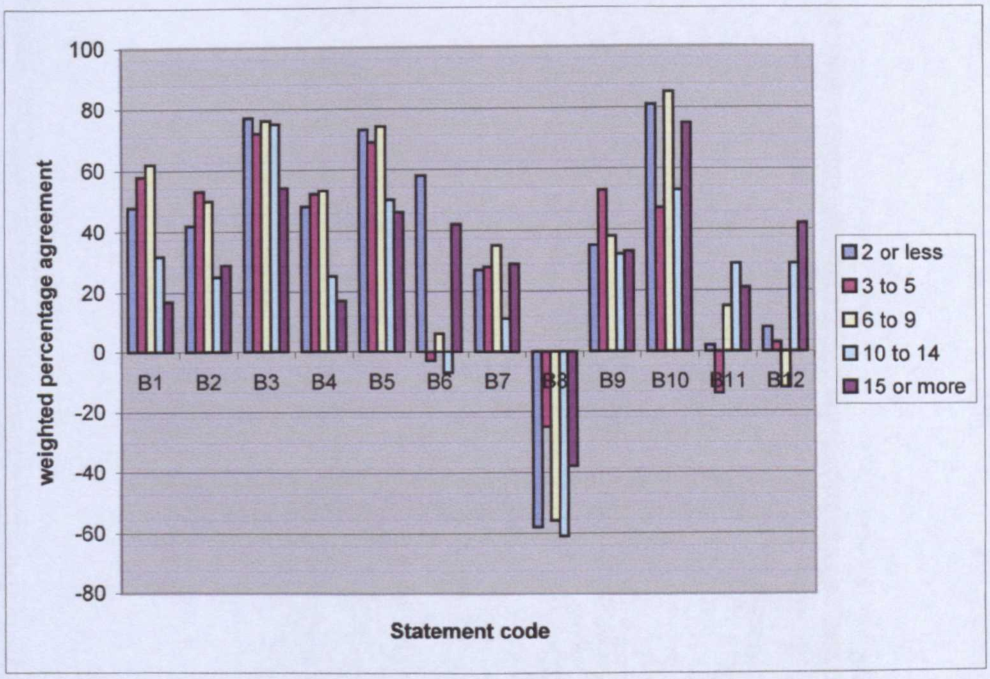

Chart 11: responses to section B of questionnaire 3 in terms of experience – wider survey

The small number of respondents within the age or experience categories in CSS makes any meaningful comparison with findings from the wider survey virtually impossible. However, I decided to merge the age and experience ranges into two broader categories (age 21-29 and age 30 or over and up to 9 years and 10 or more years respectively) to explore any potential pattern.

Analysis by broader age range showed some relatively pronounced differences within the wider survey, again with some responses, (particularly to B1, B2, B4 and B9), being favoured more by older teachers, although there were again some responses (B11 and B12 in particular) that were favoured more by younger staff (chart 12). The analysis for CSS (chart 13) tended to show similar results across the two age ranges; where there was any pronounced difference, it tended to be opposite to that found in the wider survey. It is difficult to suggest a reason for this difference and this was not pursued.

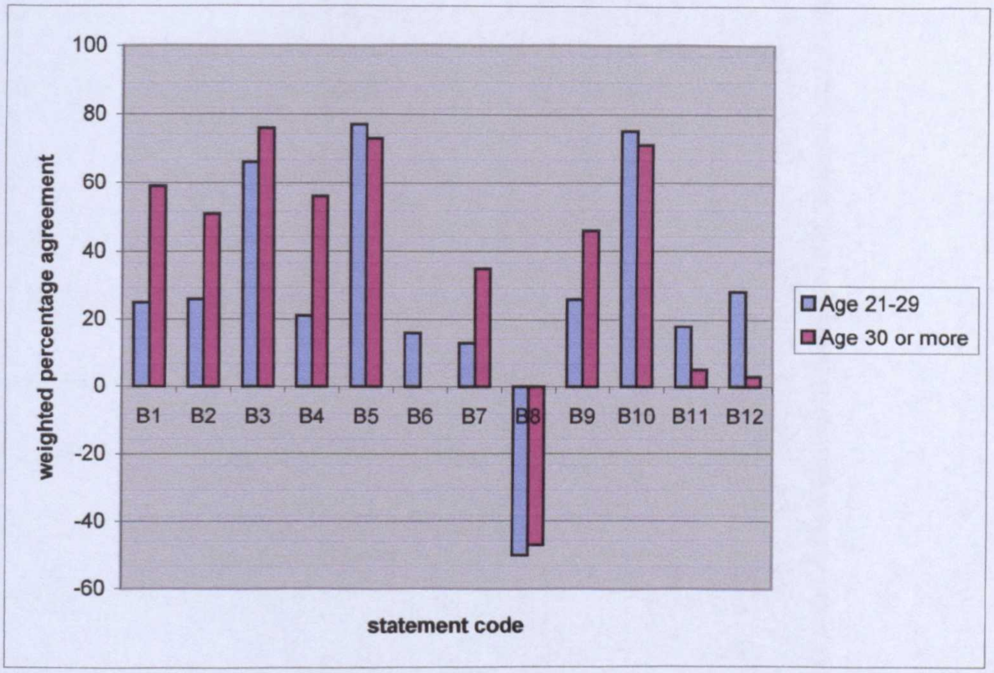

Chart 12: responses to section B of questionnaire 3 by broad age range. Wider survey

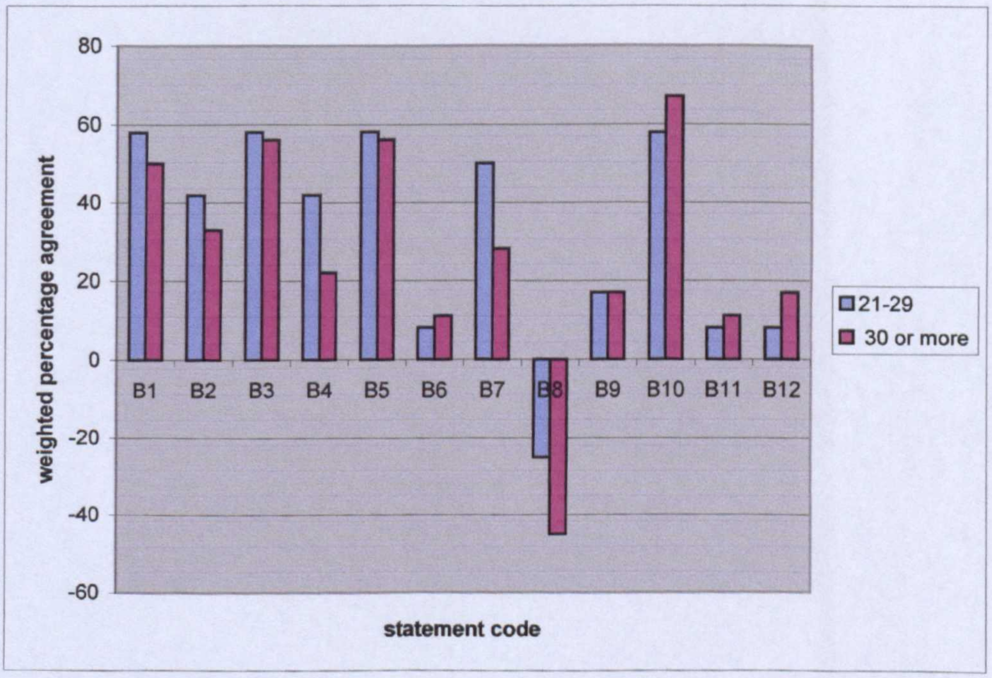

Chart 13: responses to section B of questionnaire 3 by broad age range. CSS.

Analysis by wider experience was undertaken because there appear to be a significant number of teachers that enter the profession at a relatively late age, as demonstrated by the age profile on the trainees entering the PGCE Science Course at Liverpool Hope University. For example, over the period 2005- 2008, 110 trainees have joined this course and, of these, nearly half (47, 43%) had at least four years experience in a non-teaching capacity and almost a fifth (20, 18%) had ten years or more.

Again, the results from the wider survey were compared to the results from CSS. There was some indication (e.g. from the responses to B1, B2, B3, B4 and B5) that the less experienced teachers were slightly more positive about learning styles than their more experienced colleagues, but this was certainly not true for all statements and, apart from similar results for B1, B8 and B10, it was not really mirrored at CSS. The analysis is illustrated in charts 14 and 15.

Overall, the results in terms of age and experience may be described as interesting, but do not reveal any patterns that are worth investigating further, particularly as any attempt to explain them would necessitate interviewing the teachers within the schools: this is outside the scope of my thesis, and in any case, would not be practical as the surveys were completed anonymously. No further attempt to analyse the results by age, experience or gender were made, although this may be a suitable area for future research.

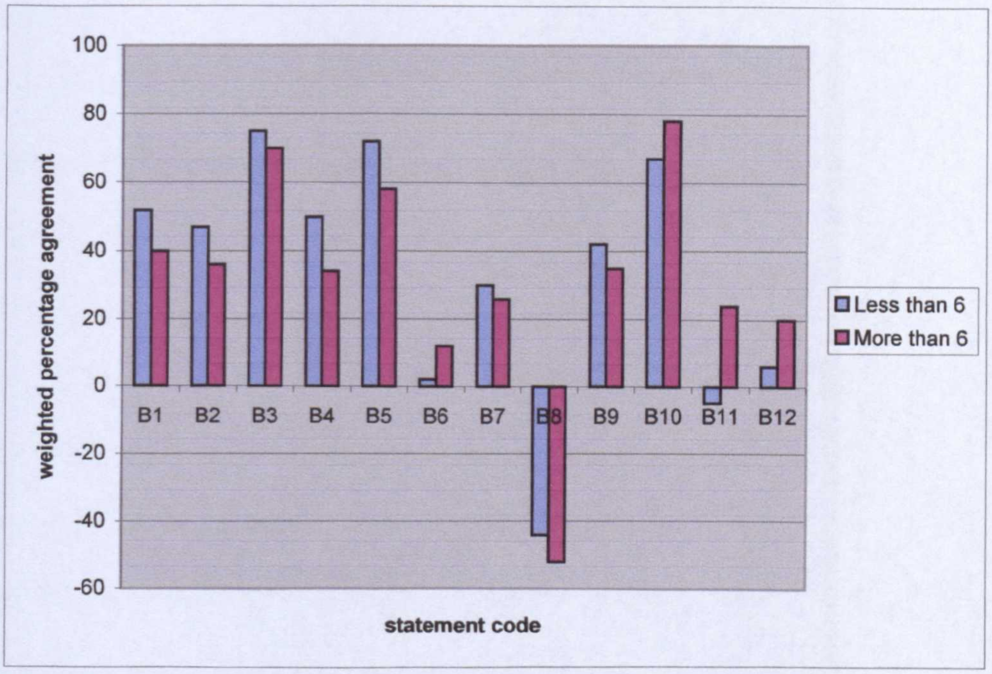

Chart 14: responses to section B of questionnaire 3 by broad experience. Wider survey.

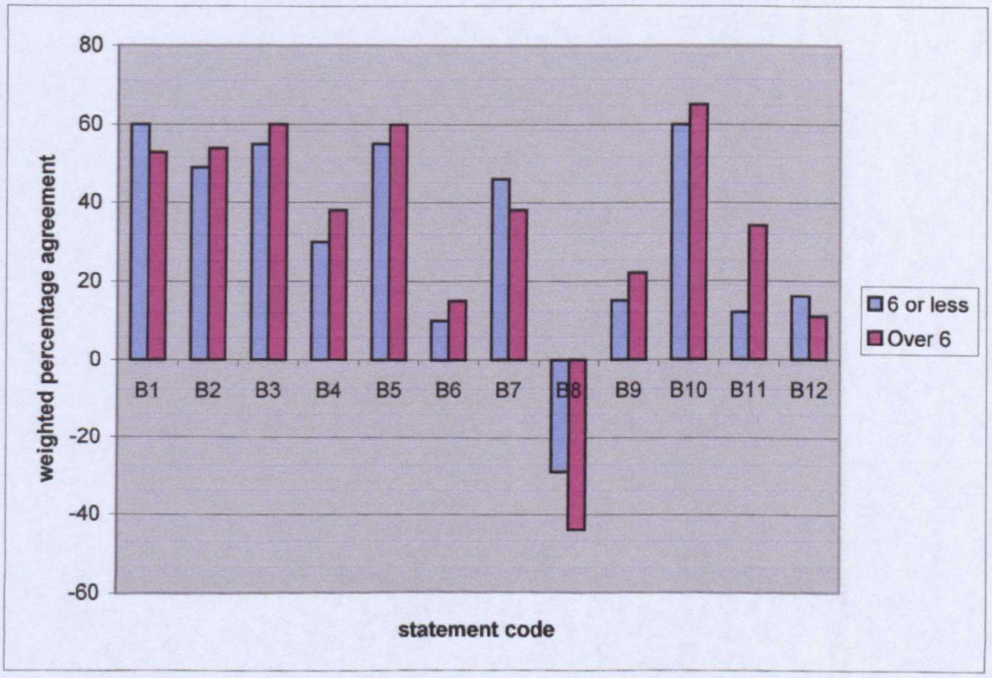

Chart 15: responses to section B of questionnaire 3 by broad experience. CSS.

Section C:

The responses in this section of the questionnaire were optional and designed to give teachers the opportunity to expand on their replies if they so wished; 6 of the respondents from CSS (40%) and 32 (37%) of the respondents in the wider survey chose to do so. The comments from CSS and from the wider survey tended to be similar. Six (two from CSS, four from the wider survey) commented on the benefits of planning; eight (three from CSS, five from the wider survey) regarded it as important to comment on the need to offer pupils a range of learning styles; and six felt that 'Kinaesthetic' learners were more likely to misbehave (two from CSS, four from the wider survey). The responses tend to confirm the main findings from sections A and B of questionnaire 3, i.e. an overall support for the use of preferred learning styles and a recognition of the need to cater for a range of learning style. Some quotes include:

> I think it is important to cover a range of learning styles over a group of lessons
>
> (Female respondent, wider survey, age 40 or more, 10 –14 years experience)

> I believe that pupils should aim for balance of the three learning styles... schools should aim for more Kinaesthetic activities for lower achieving pupils.
>
> (Female, wider survey, 30 –34, 6-9 years experience)

> All classrooms have displayed colour coded learning styles. Each KS3 pupil should have their preferred learning style on the front of their planner.
>
> (Male, 40 or over, CSS, over 15 years experience)

> It is important to know preferred learning styles. However, a preferred learning style is not the only way they can learn and so they should always be encouraged to try other ways of learning.
>
> (Female, CSS, 21-25, up to 2 years experience)

> I always plan to put more than one learning style into a lesson
>
> (Female, wider survey, 35-39, 10-14 years experience)

CHAPTER SIX.

Discussion of research findings.

Introduction

This chapter discusses the findings presented in chapters four and five relating to the introduction of LIP at CSS, as part of its overall strategy to raise standards, focusing on the two main themes: the introduction and use of a six-part lesson-planning model, based on experiential learning cycle models; and learning styles, active learning and a wider perspective.

There appears to be some evidence to indicate that the teachers in the science faculty at CSS are committed to the introduction of LIP, have a good level of understanding of what it is attempting to achieve and that it has led to more effective pupil learning. To some extent it also supports aspects of the very broad claim that: "many schools ... reported the effectiveness of ...preferred learning styles (VAK) and accelerated learning techniques, such as giving pupils the big picture, sharing objectives and focusing on learning intentions and outcomes", (Lucas *et al* 2002:62). For example, there is some evidence that the use of a range of activities, some directly related to accelerated learning (Smith, 1996, 1998; Smith *et al*, 2003) and the use of shared lesson objectives (e.g. Black and Wiliam, 1998; Assessment Reform Group, 1999; Black *et al,* 2002; DfES, 2004), appear to have motivated the pupils at CSS.

The large majority of teachers surveyed within this research appeared to be very supportive of the analysis and use of VAK learning styles (e.g. DfES, 2003b, 2004a; 2004b, 2005; Cleland, 2005; McLaughlin *et al*, 2006). It is, however, questionable whether the use of preferred learning styles has directly led to more effective pupil learning. Instead, I would argue that the use of a range of active learning strategies, relating to a more constructivist approach, i.e. the need for pupils to construct their own knowledge and understanding, (e.g. Dewey, 1933; Bruner, 1966, 1983) has been more beneficial. This fits in with one aspect of effective learning defined by the DfES and adopted by CSS: "appreciate the purpose of what they are doing and make connections with other work" (DfES, 2003a). However, it was very apparent to me that Doyle's suggestion that many other factors such as situational variables, emotions and consequences have a very important role in learning (Doyle, 1997). There are a number of outcomes that can be used to determine effective learning, for example: deepened knowledge; higher order skills, strategies and approaches; enthusiasm; enhanced sense of self; and greater affiliation to learning (Watkins *et al*, 1996), with possibly the latter two being of greatest significance to CSS. Carnell and Lodge (2002) argue that, to promote such outcomes, schools should develop pupil capacities in four main areas:

- Active learning
- Collaborative learning
- Responsibility for their learning
- Meta-learning (learning about learning)

CSS would argue that it is trying to achieve at least some of these outcomes, for example its attempt to use a range of multi-sensory activities through the 'Delivery' section of its lesson-planning model and through its 'Enrichment programme', which involves the pupils in thinking about their own learning and 'learning how to learn' (e.g. Rodd, 2002, 2003; Higgins *et al*, 2007), suggesting that the school values the importance of meta-learning (e.g. Flavell, 1979; Smith, 1998; NRC, 2005). Findings from questionnaires 4 and 5, supported by the feedback to the research findings, (appendix 3), suggest that the pupils have a preference for collaborative work and this may well be an area that CSS needs to carefully consider. Some comment on this may be found later in this chapter.

Theme one: the introduction and use of a six-part lesson-planning model, based on experiential learning cycle models

The introduction of a six-part lesson-planning model by CSS was part of its overall strategy to raise pupil achievement, recognising that: "the key to effective learning by pupils is good lesson-planning" (Versey, 2006: 126). The model, which was based on the experiential learning cycles discussed in chapter 2 (Greenhalgh, 2002; Smith, 1996, 1998; Rose and Goll, 1992; Kolb and Fry, 1975; Kolb, 1976, 1984, 1985), seemed to offer a practical solution to the difficulty of trying to differentiate pupil learning and to encourage the development of independent learning, a point echoed by Hamer *et al* who thought that such a model:

> Embedded the distinction between perception and processing within a model of learning that we felt able to share with our pupils; and to allow us to actively integrate motivation strategies, revision and formative assessment. It also included mechanisms for getting learners to think about their own learning and to remember the model.
>
> (Hamer, Chapman and Allmark, 2006: 142)

The last point, 'remember the model' was aided at CSS by the practice of displaying it in the classrooms: it was evident in 80% of my lesson observations. In the final pupil interviews, all pupils quite clearly indicated that the model was displayed prominently in the vast majority of their classrooms, implying that the intended overall strategy of CSS was being followed, although perhaps not in all lessons as there was an indication that it was followed more in some subjects than others and that it also depended on individual teachers. This was also noticed within my lesson observations as the model was only referred to once, to reinforce the need for good behaviour and linking to the first part of the model, 'the mind state'. In some ways, this is not surprising as the model is primarily a tool to help teachers to plan their lesson structure. However, it was also expected by the school that the model should also help the pupils to see the structure in their lessons. Although this was not evident in the lessons I observed, it was discussed in the final interviews, which offered some support for '*Do you think it helps your lessons go more smoothly?*' because ten pupils answered 'yes' to this, eight of whom related their response to elements of behaviour, i.e. to the first part, 'mind state'.

The 'mind state' can represent the entry point of the lesson-planning model and is seen, by the school, as important in establishing the right conditions for learning to take place, reflecting Goleman's work on 'emotional intelligence' (Goleman, 1995). This is seen by Smith, (1998: 43) as providing a powerful argument for the key presuppositions of the accelerated learning cycle, in particular, creating a positive, supportive learning environment, building and maintaining a positive self-esteem and developing reflective and meta-cognitive thinking as part of regular review activity. The pupil feedback to the research findings (appendix 3) indicated that pupils recognised the importance of lessons starting in a calm manner. However, the responses to pupil questionnaire 1a, and the initial pupil interviews, indicated that there was concern that the start of the lesson was characteristically not calm. This was not fully shared from the teacher perspective and was an issue for the school. The pupils had reported a higher frequency of lessons not starting calmly than their teachers, perhaps reinforcing Frasers' view that teachers sometimes have a more positive view of their classroom climate than do their pupils (Fraser, 1999). However, the findings from questionnaire 5, (table 8, chapter four) indicated strong pupil agreement with the statement 'I behave myself in lessons'. There was, though, no question within this questionnaire on the general atmosphere in the lessons, and nothing that sought the degree to which pupils were distracted by poor behaviour from other pupils.

On a similar theme, questionnaires 1 and 1a revealed an interesting difference in perception between teachers and pupils, and indeed ages of pupils, when considering the use of greeting at the start of a lesson. Teachers and mentors closely coincided, most claiming that they regularly greeted pupils by name; a lower figure was evident from y7 pupils whereas in y11 the figures were noticeably higher, perhaps indicating a greater degree of familiarity between teacher and pupil. Overall, the indications are that teachers think that they greet pupils by name more frequently than they actually do.

Findings by Rodd (2002) support the idea that pupils become more motivated to learn when teachers spend time creating a safe, comfortable and stimulating environment. Although this work does not appear to be particularly 'robust', being mainly conducted by practising school teachers, it does reinforce a point made by Wang *et al* (1997), who, in their meta-analysis of learning influences, identified classroom climate as one of the most important features impacting upon pupil achievement. The Hay McBer report (DfEE, 2000) also linked the climate of the classroom to the expertise of the learning environment. It was noticeable that, in the lessons I observed, the pupils appeared to respond more quickly, and tended to exhibit, and maintain, higher levels of attention and good behaviour with the more experienced teachers rather than with the less experienced teachers. This may suggest that there could be a link between teacher experience and the receptiveness of pupils to learning. Studies of the effects of teacher experience on student learning have found a relationship between teacher effectiveness and their years of experience (Murnane & Phillips, 1981; Klitgaard & Hall, 1974). Rosenholtz (1986) commented that inexperienced teachers (those with less than three years of experience) are typically less effective than more senior teachers, but that the benefits of experience appear to level off after about five years. More recently, however, the consensus from a wide array of studies, according to Hanushek and Rivkin (2006), is that many of the standard teacher characteristics, such as training and experience, do not influence pupil achievement, although the results of a survey by Darling-Hammond (2000) indicated that the degree of teacher preparation showed by far the strongest correlation with student achievement. Perhaps the comment by Darling-Hammond could well be shared with the teaching staff at CSS if the school wishes to further pursue the use of the lesson-planning model.

Pupils at CSS, particularly, apparently, girls, had indicated in questionnaire 4 that they found school too stressful to do their best: obviously their 'mind state' would not be conducive to effective learning if they were too stressed. According to Smith (1998:41): 'the brain responds best in conditions of high challenge with low stress', what Lozanov had termed 'relaxed alertness' (Lozanov, 1978). When this was pursued more deeply during the final interviews, the girls were again admitting to more stress than boys, although three of the boys said they felt stressful sometimes. The girls, though, tended to relate their apparent stress to social factors, e.g. if they've just fallen out with their friends; three of the girls (but no boys) commented on teachers 'moaning' at them: "sometimes teachers 'do my head in'- they just shout – it happens a lot". Many of the pupils claimed that they felt under stress if they found the work too challenging or they didn't understand the task, somewhat contradicting the views of Smith and Lozanov above and perhaps, instead, supporting the views of Caine *et al* (1994) and Hart (1983) who argued that the presence of stress had a negative impact on learning. Blakemore and Frith (2005: 159) also opine that optimal learning occurs under a certain level of stress but caution that too much stress can inhibit learning. They further comment that stress levels can be modulated by emotional imagery, hence linking to Goleman's ideas on emotional intelligence. In a similar vein, the use of music as an aid to learning and 'influencing behaviour and managing behaviour' (Smith, Lovatt and Wise, 2003: 71) was briefly considered in questionnaires 1 and 1a. Dryden and Voss (2001: 301) claim (but do not offer any supportive evidence to substantiate it) that: "more and more teachers have music playing to establish the mood as students enter the room". I have, however, observed a number of trainee teachers use music to change the mood of pupils in their classes, for example 'fast' music to maintain pace and 'calming' music at the beginning of the lesson, and have noted that this seems to have been well received by the pupils. The use of music as an aid to helping to set the 'mind state' at the beginning of the lesson does not appear to be at all widespread at CSS but is apparently used, to a small extent, by teachers in other schools, although the benefits of this were not explored. It is an area that may well benefit from future research.

Stage two of the lesson-planning model is 'connect with prior experience' and this may be related to Ausubel's theory of learning, (Ausubel, 1963) in which, through what Ausubel termed 'subsumption', new material is related to relevant ideas in the existing cognitive structure, and also to Bruner's spiral learning model (e.g.Bruner, 1960, 1990): learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. All of the teachers at CSS indicated that they asked pupils about earlier learning in a topic in every lesson. This is much higher than the figure for the teachers from other schools, where half of them responded "sometimes". The majority response from all groups of pupils is also "sometimes", which is closer to the mentors' response than to the teachers at CSS. This was investigated later through lesson observations. In six of the ten lessons there was a clear reference to prior learning, sometimes just referring to the previous lesson, but I also observed reference to topics covered much earlier. The instructional materials were 'evidently attempting to integrate new material with previously presented information through comparisons and cross-referencing of new and old ideas' (Ausubel, 1978; Ausubel, Novak and Hanesian, 1978) and many of the pupils responded well to this, for example in lesson A1, where pupils appeared to respond well to a series of questions which were used to recap previous work. The response from teachers and mentors to the question in questionnaire 1 on recap was almost identical, with a strong indication that they recap the work from the previous lesson on a regular basis, hence allowing the pupils to build knowledge and skills (e.g. Bruner, 1990). However, this was not as obvious to all pupils in their response to questionnaire 1a. For each group of pupils, there was a significant number who indicated that recap never, or hardly ever, happened. This was particularly the case with girls in y11, as about a third of them indicated that recap hardly ever, or never, occurred. As indicated in appendix 3, which summarises the pupil feedback to my research findings, there was some pupil agreement (+38, using the arbitrary scale on p.109) with the need for teachers to find out what the pupils already know about a lesson.

Some type of starter activity was used in half of the lessons that I observed, usually related to a recap of prior learning and hence to 'connect with prior knowledge' from the lesson-planning model. The use of starter activities is seen as part of effective lesson structure in guidelines issued to schools (DfES, 2003a, 2003b) and, according to the DfES, they must: engage pupils, state purpose, be quick and clarify objectives, (DfES, 2003a: 26). There is some evidence that the use of starters was quite widely used within CSS, although there was evidence from the teacher interviews that they were less prevalent with y10 and 11 classes and most common, and, reportedly, more successful, in y7. The reason for this related to a perceived lack of time: there was an awareness of the need to cover the syllabus in limited time and this was seen as much more of an issue in KS4.

In the final interviews, eight pupils mentioned that starter activities were used, although in some lessons more than others, and were often quite lucid about the purpose of them: "to get your brain working"(clearly linked to the need for the right 'mind state'), confirming earlier findings from initial pupil and teacher interviews questionnaires 1 and 1a and lesson observations. When asked more closely what range of starters were used, the common reply was 'questions' or 'quizzes', one pupil mentioned the use of 'brainstorming'. There was a recognition, evident amongst the pupils, (appendix 3), that starter activities do have an influence at the start of a lesson as there was fairly strong agreement (+47 overall) with the statement ' starter activities help me settle'.

The third stage of the lesson-planning cycle is 'the big picture', which, in practice, effectively merges into the fourth stage, 'outcomes'. I found quite a large difference in perception between pupils and teachers (including mentors) about how frequently pupils are told where a lesson fits into the rest of the science scheme (the 'big picture' of the cycle). Nearly half of the boys responding to questionnaire 1a and approximately a third of the girls consider that they are hardly ever, or never, told about this (45% y7 boys, 47% y11 boys, 39% y7 girls, 29% y11 girls); this is in marked contrast with the teacher/mentor view where the corresponding figure is 0%. The teacher perception of sharing the 'big picture' was not supported by my lesson observations as it was rarely referred to. The sharing of the objectives for a lesson, was however, more common, occurring in 70% of the observed lessons. The findings from questionnaire 5 suggested that, with y7 pupils (2007-8) the use of lesson objectives was even more widespread in science lessons as there was very strong agreement with the statement within the questionnaire relating to this (statement 3, table 8). Allen *et al* (2005) suggest that the use of higher order questions, for example through the use of Bloom's taxonomy (Bloom, 1956), can help pupils to explore ideas and to make connections and aid them in seeing the bigger picture. O'Sullivan (2003) comments that such a usage will also help to improve pupils' motivation and engagement in lessons. This is perhaps an area that CSS could well aim to develop further.

The school is seeking to adopt AfL strategies into its lessons (e.g. Black and Wiliam, 1998; Assessment Reform Group, 1999; Black *et al*, 2002, DfES, 2004a) and aspects of these, in particular, the sharing of lesson objectives and reviewing them later, overlaps with LIP. There are some elements of pupil support for such AfL practice, particularly in their responses to questionnaire 4. There was strong agreement with 'I like to know what I'm supposed to be learning before I start work (although, interestingly, less so with girls), and overall agreement with statements involving pupils in peer and self assessment. Again, there was a noticeable gender difference in these responses, indeed, in general, it appeared that the boys had a more positive view of the statements from questionnaire 4 than the girls, although girls appeared to value the social aspect of their work more, but this was not confirmed by later interview. The wish to work in friendship groups was a common theme in written pupil responses, although three pupils were clear about their preference to work alone and a strongly held view of one pupil clearly illustrates that the desire for group work was not universal: "I hate working in groups and prefer working independently". The reasons for pupils preferring group work could be related to the comfort factor of friendship links as a number refer to "working with my mates".

Equally, it could be an unconscious acknowledgement of the importance of learning from peers, particularly as, in the final interviews, there appeared to be a recognition that friendship groups didn't matter as the main points of working together were " to share ideas and "help you learn", possibly reflecting Vygotsky's view on social interaction (Vygotsky, 1978). A fuller discussion of collaborative working and gender issues may be found later in this chapter.

There is some evidence that explicitly sharing objectives with pupils is of benefit, for example, Kallinson (1986) found that the more aware learners are of the objectives and reasons for the structure of a lesson, the higher their retention rate of material being studied, resonating with the work of Ausubel (1963). Recent research in the USA also indicates the importance of revisiting objectives at the end of each lesson (Department of State Bureau of Educational and Cultural Affairs, 2006).

CSS has been actively encouraging the use of shared lesson objectives and shared lesson outcomes and there was evidence from the final interview replies that this was happening. It sees a lesson objective as 'a statement about what skills and knowledge the teacher wants the pupils to learn by the end of the lesson' and a lesson outcome as 'what pupils actually do or demonstrate as a result of teaching, which they may not have been able to before'. These definitions are similar to the ones recommended by Versey (2006) and Arreola (1998) who saw a learning objective as referring to what skills and knowledge the teacher wants the pupils to learn by the end of the lesson and an outcome as what the pupils can demonstrate as a result of that teaching. All pupils interviewed reported that lesson objectives and lesson outcomes were commonly used across the school. Further, many, indeed most, could easily, often articulately, describe the difference between them and could see the importance of them to their effective learning: "helps pace"; helps you know what you're going to do and whether you've done them". It appears therefore that the school has made progress in terms of step four of the lesson-planning model (agree outcomes), although I found no evidence, either from the interviews or from lesson observations that the outcomes were actually *agreed* with the pupils. The findings from questionnaire 5 and from appendix 3 tend to support the progress made by CSS in terms of sharing objectives/outcomes, at least in terms of science lessons involving y7 pupils (2006-7). The weighted percentage agreement shown in table 9 (chapter three) indicates a very noticeable increase in pupil agreement with reference to the use of objectives, increasing from 'some agreement' (+45) to 'very strong agreement' (+84).

In questionnaire 1(1a), covering 'what the lesson is going to be about', there was a fairly close similarity between the teachers' and mentors' answers, with both indicating that pupils are told in most/every lesson. This similarity was also shown in the pupil responses across all pupil groups. The response to the question on sharing lesson objectives again showed close agreement between teachers and mentors but the variety of pupil response suggests that pupils may have a lower perception of the objectives of a lesson. It is possible that some teachers share objectives with y7 classes on a more regular basis than they do with pupils in y11. A possible reason for the discrepancy between the question on 'what the lesson is going to be about' and 'sharing objectives' could simply be that the term lesson objective is not consistently used: in a number of observed lessons, the general points of learning were shared with classes, but the use of stated lesson objectives wasn't always apparent.

Stage five of the lesson-planning model ('Delivery, including a multi sensory output') is discussed under theme two.

Stage six of the lesson-planning model is 'Review and Reflect, hence ready for the next lesson', thus emphasising the cyclical nature of the lesson-planning model and therefore the link to Bruner's spiral learning model. The model uses the term review, rather than plenary and stresses the need to check what the lesson was about. According to the DfES, plenary activities are part of effective lesson structure and are used to take stock of learning and to direct the pupils to the next phase of learning (DfES, 2003a: 43). It is also stressed that a plenary should be part of the process of formative assessment, again linked to AfL.

All teachers, and all mentors, reported that they use a starter and a plenary for the majority of their lessons: this was broadly supported by pupils in y7, although a significant proportion of the responses did indicate that they were never, or hardly ever, used. In year 11 it was evident that the use of starters and plenaries was less widespread. Interestingly, the figure reporting that a starter was always used was almost identical to that claiming it was never used, indicating, perhaps, that, in some classes, teachers use them consistently and in others they are not used at all. The use of a plenary with y11 pupils was not, in contrast to starters, apparently much used and was significantly lower than that apparent in y7, suggesting that it is more widely used by staff with younger pupils.

Teacher interview responses indicated that they frequently revisit the objectives at the end of the lesson and usually include a review, often via a recap rather than as a new activity, which could assess the pupils' learning. The pupils participating in the final interview presented a very varied picture, however. Eight pupils mentioned that there was some type of recap at the end of a lesson, often in the form of whole-class or individual questions. One girl said that it was common for teachers to go over the work at the end of a lesson and another that teachers often revisited the lesson objectives. However, one pupil estimated that only one or two of his lessons per week actually included a recap and another said that it never occurred. No pupil indicated that lesson outcomes were revisited, even when specifically asked. No pupil actually mentioned the use of a plenary (review), although I did not specifically ask about this.

Lesson objectives, or expected outcomes, were evidently shared with pupils in 70% of the lessons that I observed, but were only revisited in five of these seven lessons, usually within the time set aside for 'review'. Often this aspect of the lessons was, however, rushed: possibly with greater time allocation and a greater emphasis on pupil assessment, more could have been made of it. It appears that the school might consider placing more emphasis on the use of reviews, particularly because of its link with AfL. The results from questionnaire 5 indicate that there has been some progress in the use of a review or plenary from y7 (2004-5) to y7 (2007-8) as the weighted percentage agreement figures (table 9 chapter four) have increased from +33 (some agreement) to +44 (fairly strong agreement), although nothing like the level of progress apparently made in the use of sharing objectives noted above. Appendix 3 indicates some agreement (+38) by y10 pupils (2007-8) to the need for a review at the end of a lesson.

In more than one observed lesson, pupils appeared to be motivated when objectives were meaningfully revisited, particularly when praise was attached to this (Postlethwaite and Heggarty, 2002). A comment cited by Smith (1998: 88) from a y8 pupil: "it's praise that really makes you work", illustrates the importance of praise. Interestingly, the science teachers at CSS, in questionnaire 5 had sought pupil views on the use of praise within their science lessons and there was some pupil agreement (+20) with the statement 'my teachers give me praise'. The results might indicate that, although praise is apparently used, at least to some extent, it could be an area that the teachers would wish to develop further.

It can be argued that the use of a review of learning within a lesson, allied with the use of a recap of prior knowledge, is essential to reduce the apparent dramatic decline in memory known as the 'Ebbinghaus curve of forgetting' (Ebbinghaus, 1855,cited in McLaughlin *et al*, 2006: 116; a discussion of the contribution of the work of Ebbinghaus to psychology may be found in, for example, Fuchs, 1997). McLaughlin *et al* further comment that this decline in memory can be overcome by strategically timed reviews of work and stress that: "it is always possible to conduct the initial review in a .... plenary session at the end of a lesson and to review again in the subsequent lesson", hence reflecting the lesson-planning cycle at CSS and to Kolb's 'Reflective Observation' phase of his experiential cycle in which feedback is seen as the basis for new action (Kolb, 1984).

It is possible to relate the need for frequent review and effective learning to the notion of working memory, particularly as the model proposed by Baddeley and Hitch, (1974) placed an emphasis on active, rather than passive memory. Equally, it is possible to suggest a relationship between effective learning memory and the use of activities that involve and engage pupils. Macintosh (1999) has discussed the strong relationship between working memory, performance and comprehension; and other research had suggested the importance of working memory to pupil attainment (Gathercole and Pickering, 2000; Riding *et al*, 2003; Gathercole *et al* 2004).

As noted in chapter two, Smith (1996:50) argued that learners ignoring one or more stages of a learning cycle could not learn effectively. Although it was not possible in my study to pursue this claim, there was some evidence from lesson observations to support the view that a review of work did appear to enhance learning and that the pupils, through their interview responses, appreciated this. Carnell and Lodge (2002) commented that the use of a review was particularly useful if it was related to what they termed meta-learning, where the content of learning was integrated with the processes of learning. In many ways, this idea of integrating content with process was evident in some of the lessons that I observed, particularly where there was a clear attempt to involve the pupils in their learning through a more active, constructivist, approach (e.g. Dewey, 1933; Bruner 1960; 1983). This is discussed under theme 2, below.

Hamer *et al* (2006) suggest that the use of a six-stage model offers a practical solution to learning strategies for two main reasons: it parallels a number of more formal models of learning (Chapman, 1998); and it embeds the distinction between perception and processing within a model of learning that they felt happy to share with pupils. In this sense, CSS can consider themselves 'ahead of the game' and should take credit for their innovative approach.

Theme 2: active learning, learning styles and a wider perspective.

Step five of the lesson-planning model is the 'Delivery' i.e. "the actual teaching part where V, A or K techniques can be used to help us to learn." (CSS). Questionnaire 1(1a) refers to some examples of teaching and learning activities, suggested in some of the KS3 National Strategy documentation, emphasising some accelerated learning techniques, such as 'Brain Gym' and the use of educational games (e.g. DfES, 2003a, 2003b). Dryden and Voss (2001) also stress the usefulness of learning games such as card sorting activities, quizzes and bingo. Guidance to staff at CSS highlights the need for a multi sensory input into the lesson, by which it means the use of VAK. There appears to be a clear difference in the perception of the use of such activities between pupils and teachers across all of the types of activities included in the survey, suggesting that the activities are used to a smaller extent in lessons than is apparent to the teachers. It also appears that science mentors in other schools are using a wider range of educational activities, and more frequently, than their counterparts in CSS. The use of educational games is, as I have frequently observed during visits to schools in partnership with Liverpool Hope University, widely used by trainee teachers (with encouragement from their mentors); pupils in lessons that I have observed, both on these visits and at CSS, appeared to be motivated by their use.

All teachers/mentors claimed that they use 'brainstorming' at least sometimes in their lessons, but this view was not supported by the pupils' responses, as very significant numbers in y7 and large numbers in y11 indicate that it is never used. There does, however, appear to be a greater use of this activity with y7 pupils, as compared to y11. Card sort activities appear to be used, by both teachers and mentors, in some of their lessons: the figures for both being in close agreement. There was, however, a very substantial pupil perception across y7, and to a slightly higher extent across y11, that card sort activities are never used. This pattern is also evident for the use of 'quizzes', although there is a much higher fraction of the pupils in y11 (compared to y7) indicating that it is never used. The use of quizzes in plenary activities was commented on by one of the science teachers in the structured interviews, suggesting it was a preferred method, but this was qualified by a reference to behaviour issues. The use of 'brain gym' ('a physical activity, which connects left and right brain and is useful for managing the "state' of learners; Smith, 1998: 242) has, as noted in chapter 2, been heavily criticised (Geake, 2005; Blakemore and Frith, 2005) and there appeared to be little use of it within CSS, although it did, according to the responses from questionnaire 1, appear to be used in some of the lessons taken by the mentors.

The science teachers at CSS claimed to include a range of activities that catered for V, A and K styles, with nearly half indicating that they do so in most lessons, a very similar figure for the teachers in other schools, indicating both a general awareness of the preferred learning styles of pupils and an attempt to cater for this, among the respondents. It is, however, very difficult to support this, primarily because it is far from clear what is meant by a 'Visual' or 'Auditory' or 'Kinaesthetic' activity and advice from, for example, the DfES (2003b) is not over-helpful being, at best, extremely simplistic. It must surely be true that all lessons contain a Visual and an Auditory element (although the pupils at CSS were reporting an over-emphasis on this) and most lessons would surely have pupils 'doing things', which is what is commonly regarded by the teachers as 'Kinaesthetic'. However, there were indications that pupils preferred to be able to 'do physical or practical activity' (if only for the reason given by one pupil: " (if) you are not allowed to move round (then) you get a numb bottom!") Within the lessons that I observed, it was evident, on many occasions, that, when pupils were sat still for any significant length of time, they became noticeably restless. These observations all occurred within science laboratories, where both the layout of the room and the pupil expectancy of practical work might mean that this is a subject-specific issue. It might be possible to track the same pupils across the curriculum in order to investigate this further, but this is outside the scope of this study. Interestingly one girl did comment that "I would like it if we could do more activities...that match our learning styles" and possibly there is a connection to 'Kinaesthetic' learning activities here (e.g. Reinert, 1976; Dunn and Dunn, 1978; O'Connor, 2001: DfES, 2003b; DfES, 2005). It also appeared that 'active' tasks tended to motivate and engage the pupils. Whether these could be called 'Kinaesthetic' activities is though very questionable, even though they involved active participation. Certainly there appears to be a good level of support revealed by y10 pupils (2007-8) for pupils to be actively involved in lessons. Appendix 3 indicates that, overall, there is fairly strong agreement (+56, using the arbitrary scale on p. 107)) with the statement 'I learn better if I am actively involve in the lesson'; boys seemed particularly positive, with a weighted percentage agreement of +73 (very strong agreement). There was also fairly strong agreement (+41 overall) with the need to break lessons down into several short activities.

Although I have not found any evidence to link these to VAK learning styles, I would argue that both the lesson-planning cycle and school references to VAK have encouraged teachers to have a greater awareness of the need to involve pupils in activities that engage them, in other words, to use 'active' rather than 'passive' approaches to learning and follow a more constructivist approach. In the reception model of learning, (Carnell and Lodge, 2002: 11) where the learner is a passive recipient, basic skills are emphasised while emotional and social issues are not addressed.

A central aim of LIP is to promote active learning and therefore to involve pupils during the learning process. Bruner (1961) suggested that students who actively engage with the material are more likely to recall information, and self-determination theory (Ryan and Deci, 2000) suggested that there is a direct link between student engagement on learning tasks and the degree to which they are motivated to pursue academic goals. A similar view, that active learning can result in the 'deep learning' referred to by Marton and Saljo (1976) where concepts are deeply understood and are of lasting benefit to the individual has been widely proposed (e.g. Stephenson, 1992; Gibbs *et al*, 1994; Hodkinson, 1994) There is evidence from my study to support the view that pupils respond more favourably to the use of short activities, delivered with pace, that actively engage and challenge them and, equally that there is evidence to suggest that they are less responsive to more passive approaches. This supports the findings of Adey and Biddulph (2004) that pupils enjoyed group work, active involvement and investigative approaches; they disliked passive approaches and the findings of a small-scale study and of Hooper (2001), who found that, 'practical and expressive' activities were most likely to motivate pupils, although there appeared to be no indication in Hooper's study to clarify to what extent 'practical' work was considered to be equivalent to 'expressive'. A survey by the Teaching and Learning Research Programme (TLRP, 2003) found that, although experimental work appeared to be enjoyed by the majority of children surveyed, only 38% of them thought that it was useful. The findings at CSS offer a slightly different view as the majority of pupils had replied, in their responses to questionnaire 4, that practical or physical activity helps them to learn better.

Within my observations, activities of relatively short duration (up to ten minutes) appeared to be more likely to be successful in motivating pupils and maintaining their interest than longer ones, although this was not always the case, for example in lesson B1. I have also found this to be largely true in the observations of lessons with trainee teachers, offering some support to the self-determination theory of Ryan and Deci (2000). In lesson A1, for example, the pupils I focused on were all apparently interested and engaged during short activities; however, when the remainder of the lesson was taken up by one task there was quite a variety of response to this. Pupil 06 was reluctant to settle to and indeed became somewhat disruptive here as he kept moving to other pupils; he did very little work on this unless challenged – he was clearly not motivated by the task. Pupil 09 settled to her work, although she spent the time effectively doing just a very neat title; pupil 12 produced much more and was able to summarise some of the key points: she was questioned by the teacher and responded well and had evidently learned something new during the lesson, but it was not possible to tell whether the other two had.

Possibly the challenge presented to the pupils by the use of pace, is more related to Alexander's notion of 'interactive pace': "the speed of a sequence of classroom exchanges" (Alexander, 2000: 420) than to 'cognitive pace', which involves the demands of the tasks as well as the speed of completion, although some pupils were clearly challenged in terms of their thinking. There may well be some implications for CSS in terms of cognitive challenge, particularly for boys. The pupils had, overall, indicated some agreement (+ 25) to the statement from questionnaire 5 (table 8) 'I have to think hard in lessons', although the teachers at CSS reported that, while two-thirds of the girls felt that they were made to work, and think, hard, only a third of the boys did. A study by Wilson, Andrew and Below (2006) highlighted the tension between teacher-pupil interaction and cognitive pace and the Office for Standards in Education (Ofsted) has been critical of practice in which "briskness is maintained when it would be more effective to slow down and concentrate … on a step by step analysis" (Ofsted, 2001: 13). In practice, this advice is difficult to follow at CSS, as it was very apparent that many of the pupils in the lessons observed had quite low levels of concentration, finding it difficult to stay focused. They are probably not unusual in this respect: Jensen (1995) has reported that the maximum 'on-task' time, in minutes, for school-aged children is chronological age plus two.

In questionnaire 4, seven pupils referred to the need for interesting lessons: "I remember things better if the lesson is interesting and sticks out in my mind". Some responses to why they think they learn better include: "it makes it more fun, so you want to learn more"; "you learn by doing"; "it helps you remember if you see it happen"; the most common response, however centred around "you get to do more *stuff*; you're not just writing" – this was commented on again later in the interviews. In my lesson observations it was apparent that the pupils were more motivated by practical activities and they were more engaged by them, although many of the lessons were dominated by written tasks. A study by Postlethwaite and Haggarty (2002) reported that pupils were more highly motivated when their lessons were 'fun', when they were able to work at their own pace and when they were not just copying from books. The results from questionnaire 4 in my study strongly support this: there was very strong agreement with 'I like to work at my own speed' and 'I like to be able to do physical or practical activity in my lessons' and disagreement with 'I like copying from text books or the board'. The pupil preference for working at their own speed has potential implications for classroom management strategies at CSS within the school, particularly as my observations placed an emphasis on whole class teaching or paired /group activities rather than on individual tasks. There is possibly a need for the school to investigate opportunities to further develop independent pupil learning, particularly as this is reinforced by statement 11 from questionnaire 4 (I like to be able to choose how I present my work). However, statement 4 (I like working on my own), which effectively produced a neutral response, counters this need: this is reinforced by the support for group work, which appears to be viewed favourably by pupils (statement 6). Questionnaire 5 also included some statements to seek further views on the apparent preference for group work.

There appears to be, from the analysis of questionnaires 4 and 5, together with the findings from the end of research interviews and from the feedback summary (appendix 3), a possibility that the pupils at CSS have a tendency to prefer to work in groups, rather than alone, with this preference appearing to be more prevalent with girls than boys. There are a number of research findings that relate to collaborative, group work, for example, Knight (2002) offers support to the Piagetian view that cognitive engagement with others is a very powerful stimulus for learning and other research (e.g. Webb and Palinscar, 1996; O'Donnell and King, 1999; Slavin *et al*, 2003) indicates that peer interaction through cooperative and group work has positive effects on both pupil academic and social outcomes. However, other research has reported that, in UK schools, very little quality group work was occurring (Galton *et al*, 1999; Baines *et al*, 2003). Baines *et al* (2007) have argued that there are educational advantages in peer-based interactions, but that these have largely been neglected in terms of both classroom practice and current UK educational policy. However, Blatchford *et al* (2004) caution that group work is just as likely to inhibit learning as to improve it and comment on the strong belief, prevalent, they argue, amongst teachers, in the value of addressing pupils' individual needs. This is now particularly relevant as a result of 'personalised learning', (e.g. Pollard and James, 2004).

CSS are considering their response to the views of pupils on group work and it may be pertinent that they note the suggestion from Baines *et al* (2007: 677) to make greater use of a pedagogy which incorporates group work in order to facilitate pupil involvement, hence providing learning opportunities not provided by either teacher-led situations or individual work. However, any readjustment of teaching practices should, perhaps be approached with caution, particularly as it appears to be the (unrecorded) view, gained through my informal discussions with a number of teachers at CSS, that pupils need to be separated from each other to avoid 'off-task chatter' and to reduce potential misbehaviour. However, this is far from universally true, with many other teachers at CSS positively promoting group work in their classes and commenting on its success, particularly in Performing Arts, History and English. It could be the case that some subjects lend themselves more readily to collaborative group working than others and this would make a fascinating research project, but is outside the scope of this thesis.

Some gender-related issues emerged from the findings of my research and its continuation by CSS. The interpretation of these results need to placed in the context of wider research, particularly as CSS are considering the introduction of single-sex teaching. Younger and Warrington (2002) have argued that single-sex teaching has the potential to raise achievement level in some contexts, but opine that this potential will only be maximised when teaching approaches are systematically planned and that an explicit programme of implementation, monitoring and evaluation needs to be built in.

There are indications that boys and girls respond, and interact, differently in the classroom. For example, Swann and Graddol (1988) found that, in primary classrooms, boys talked more than girls; they also argued that girls appeared to expect a lower participation rate than boys. This did not appear to be evident during my lesson observations and Myhill (2002:347) saw any differential participation rates as only partially attributable to gender.

A comprehensive study by Howe (1997) revealed that boys contribute more prominently, both verbally and physically, during classroom interactions than do girls. However, as Myhill (2002: 341) points out, such a sweeping statement needs to be tempered by the recognition that, even in a classroom dominated by noisy, articulate boys, there will be boys who are less confident in contributing to whole-class interactions and will be much more reserved, echoing some earlier criticism by Hammersley (1990).

The link between achievement and gender is, according to Jones and Myhill (2004) frequently used to account for boys' underachievement, citing for example, Millard (1997), Platten (1999) and Ofsted (2003a, 2003b), although other research (Bousted, 1989; Swann and Graddol, 1988) was used to show the underachievement of girls, particularly with regard to science and mathematics (Leder 1980; Walkerdine 1989: Murphy and Whitelegg, 2006; Ivinson and Murphy, 2007; Ponchaud, 2008). A number of schools have responded to these apparent underachievement issues and have implemented single-sex teaching. A survey by Warrington and Younger (2003) noted that, although some positive aspects were found in some schools in terms of raised achievement levels and increased confidence and participation in class, in others, single-sex teaching appeared to have little impact on achievement levels. Further, they commented that it led to increased problems of behaviour management in boys' classes. However, the effectiveness of single-sex teaching can be difficult to evaluate because it is often undertaken on a short-term basis, for just one year or one cohort of students. It has also been argued (Collins, *et al,* 2000; Gillborn and Mirza, 2000) that there is a far greater link between achievement and socio-economic status. This has particular relevance to CSS as the Ofsted report for the school (summarised in chapter one of this thesis) includes the comment that: "The overall level of deprivation is high by national standards and, alongside economic deprivation, the school's community experiences social and cultural deprivation". (Osted, 2006; not included in the references to maintain anonymity).

There has been a considerable, and planned, emphasis within my research on the use of 'pupil voice'. I found this to be very valuable, not just because it offered the pupil perspective on aspects of LIP as a comparator to the teacher view, but also because it helped to focus the progress of the research, and also, I suggest, because it added to the strength of the conclusions I reach in the final chapter.

The concept of 'pupil voice' has, as highlighted by Lundy (2007), received increasing attention in recent years, mainly attributable, according to Noyes (2005: 533) to the ratification of the United Nations Convention on the Rights of the Child which states (Article 12) that the views of the child should be given due weight in accordance with the age and maturity of the child. Ruddock *et al* (2005) also opine that a key aspect of personalised learning (e.g. Pollard and James, 2004) is the development and support of pupil voice, especially across a school. This view was emphasised by the General Teaching Council for England (2007), as its advice to the government recommended a 'pupil voice' approach involving a dialogue with pupils, which enables them to play an active role in their learning. Ruddock *et al* argue that when pupil perspectives are taken seriously the pupils feel more positive about themselves as learners, can understand and manage their own progress better, and feel more included in the school's purposes. Consulting with pupils was, they continued, also beneficial to teachers as it helped them understand how to support pupil engagement and build more open, collaborative and communicative relationships with their pupils. The school improvement plan for CSS (2007-8) includes the aim of developing pupil voice across all aspects of school life.

There has recently been a considerable amount of literature and research into the voice, role and participation of children and young people in teaching and learning, with comprehensive reviews of it undertaken by Halsey *et al* (2007), Davies *et al* (2006) and Johnson (2004). Flutter and Ruddock (2004) argue that the increased involvement of children in decision making in education has produced educational benefits. However, research by Morrow (1999) and by Kilkelly *et al* (2005) concluded that children's views were commonly neither sought nor listened to and were often afforded only tokenistic opportunities to participate and engage with adults. A typical pupil comment was "pupils don't have a say in school. Teacher's opinions always come first", (Girl, aged 11 years in Kilkelly *et al*, 2005: 186). Lundy argues that compliance with article 12 will foster a positive school ethos and notes that 'young people are quick to grasp the wider benefits of pupils being given greater influence over the things which affect them in schools'. Whilst this view was supported by the findings of Bragg (2007) in terms of children rising quickly to the challenge of pupil voice, she adds a note of caution from a teacher perspective as, in her case study of a primary school, the teachers were reporting that a number of complexities arose as intentions were implemented. A number of teachers voiced apparently genuine anxieties and concerns when being asked to encourage pupil participation, particularly on teaching and learning issues. Bragg points out that this is especially difficult if the teacher does not have a particularly positive relationship with their pupils (Bragg, 2007: 513).

After discussion with teacher X and the Head teacher it was felt to be both appropriate, and important, to present the outcomes of the research to the pupils; this occurred in February 2008 with an A4 summary sheet (appendix 2) and a simple feedback sheet presented to the y10 pupils (2007-8) during PSE lessons. This appeared to be well received by the pupils and there was a good response to the feedback sheet (161 returns, 79%, appendix 3), which added valuable corroborative support to some of my earlier findings, particularly with regard to the use of starters, reviews, prior learning, active learning, learning styles and group work.

An emphasis on the need for pupil activity within classrooms (DfES, 2003b) recommended that teachers provide for different learning styles and intelligences so that they can opt to use their preferred learning style. It appears to be evident from the results of my VAK survey, and from my wider discussions with a number of teachers, that such guidance is generally enthusiastically received, possibly because: "they offer a simple solution to the complex problems relating to improved pupil attainment" (Coffield *et al*, 2004a: 50).

Fazey (1996: 30) has stressed that active learning cannot take place without guidance: "active decision-making has to be accompanied by expert guidance if the learner is to achieve the desired destination". Similarly, it has been reported that an emphasis on a teaching structure, which guides and sequences learning activities whilst simultaneously allowing student creativity has been shown to yield higher student motivation and self-worth when compared to rigid or unstructured formats (Fantuzzo *et al*, 1992; Ryan and Stiller, 1991). This could be seen as further justification for the need to have a structured lesson-planning model, such as that adopted by CSS. It was also evident within my observations, that, without this expert guidance, pupils appeared to adopt the trait noticed by Campbell *et al* (2001) in seeing active learning approaches as fun, but not appreciating their contribution to learning in a serious way. These findings are consistent with those reported by Campbell *et al* (1996), who suggested that children need to be shown how to learn from varied active learning experiences, and Gillies and Ashman (1997) who showed pupil benefits, in terms of learning and achievement, from training in cooperative learning.

There are other problems associated with active learning approaches. Pupils having a surface approach to learning (Marton and Saljo, 1976) were found by Campbell *et al* (2001) to usually lack an understanding of their teacher's attempts to adopt more constructivist teaching and learning strategies and, instead, tended to remain focused on the transmission and reproduction of learning. Comments in pupil interviews suggested that copying from the board or a book is still common practice in lessons at CSS and, according to a survey cited by Lucas *et al* (2002: 30), is prevalent more widely. They found that 63% of the 11-16 year-old pupils surveyed spent most of their time in lessons copying from the board or a book. One pupil at CSS commented that she spends a lot of time copying/listening and that "I don't learn much – it goes in one ear and out the other". The findings from questionnaire 4 and 5, supported through the findings summarised within appendix 3, certainly indicate that pupils dislike copying from textbooks/the board.

There was an emphasis in many observed lessons on teacher-talk and the pupils generally struggled to cope with this. Within the science lessons that I observed (and supported by pupil comments, both written and verbal) it was apparent that pupils were spending long periods of time either listening to the teacher or copying from a text or board and it was noted that many of the pupils appeared disengaged, bored or misbehaved during long sessions of teacher exposition. This is important as Anderson and Keith (1997) for example, found that pupils that are disengaged from their studies were likely to have low academic achievement. A study by Zamorski and Haydn (2002) also reported that pupils were 'put off' by teachers talking too much and by too much written work. It has been suggested that writing is a means of enhancing learning (e.g. Bangert-Drowns, Hurley and Wilkinson, 2004) although they also point out that longer writing assignments can lead to reduced effect, hence possibly supporting the pupil reactions. When teachers use such traditional expository teaching methods, Campbell *et al* (2001) found that students with both deep and surface approaches to learning focused on transmission and reproduction. Some pupils however, reported that they liked copying from books or the board, although it was unclear why they wrote this. A possible development here would be to try and ascertain whether the pupils were acquiring information without understanding, or whether they were seeking to meaningfully integrate new knowledge, i.e. to explore rote versus meaningful learning (Novak, 1998).

CSS is well aware that, for a significant number of its pupils, pupil confidence and self-belief is a concern. Dart *et al* (1999) argued that there is a need to boost pupil confidence and self-belief if they are to make the transition from surface to deep learning. Although pupils at CSS appeared less responsive to long periods of such traditional methods it may well be that they were, in fact, still learning. Kirschner, Sweller, and Clark, (2006) have also suggested that the use of some activites, whilst they may be motivating for learners, if unguided, can leave learners less competent than when they began the activity. My observation of, for example, lesson D3 offers some support to this, as during an activity it was evident that not all pupils understood what they had to do and this did appear to restrict both their participation and their learning.

The large majority of schools (78%) responding to my VAK survey appeared to analyse VAK learning styles and there is apparent strong support for the analysis and use of learning styles, including the adjustment of teaching to take into account a pupils' learning style both within teachers at CSS and across a range of other schools, a view supported by, for example, Sprenger (2005) and Perry and Ball (2004). Interestingly, it appeared that, even in schools that are not apparently pursuing any analysis of VAK learning styles, there was an awareness of, and a degree of support for, the pursuance of some sort of learning styles agenda.

Table 16 (chapter five) showed that there was strong agreement with these statements:

- it is important that the school identifies a pupils' preferred learning style
- the analysis and use of preferred learning styles will raise pupil attainment levels
- knowledge of a pupils' learning style helps me to plan my lessons more effectively
- when planning my lessons I try to incorporate a range of activities to cater for different learning styles
- pupils learn more effectively if I cater for their preferred learning style.

There also appears to be an acknowledgement that pupils should be aware of their learning style, particularly amongst schools that do analyse VAK (although perhaps this is to be expected). There was some, albeit limited, support for the suggestion that older pupils are more likely to use a range of learning, as Briggs (2000) suggests. Interestingly, teachers in schools that do not use VAK analysis showed significant variation in the response to statement B11 from questionnaire 3 (+45% against only +5%), which linked low academic ability with Kinaesthetic learners.

As mentioned earlier, pupils in CSS have timetabled 'Enrichment' lessons during KS3 in which they are 'learning how to learn' (e.g. Rodd, 2002), suggesting that the school values the importance of meta-learning (e.g. Flavell, 1979; Carnell and Lodge, 2002; NRC, 2005). As part of these lessons, the pupils discuss, for example, the significance of the schools' lesson-planning cycle in relation to 'what kind of learner am I?' with an emphasis on VAK learning styles and 'brain-based learning'. During 2004-2005, all pupils in the school had a summary of this within their planner. It ended with the following statement, which the pupils had to complete by adding Visual, Auditory or Kinaesthetic as appropriate:

> I am chiefly a -------------------- learner but I can use all three styles and need to practise using my brain in as many different ways as I can
> (extract from pupil planner, CSS).

The results of questionnaire 2(2a) showed that all but two (out of the twenty respondents) agreed that it was important that schools analyse learning styles in terms of VAK (although they weren't asked why they thought it important). A common response within interviews with the science teachers at CSS was that they were not aware of the preferred learning styles of their pupils, unless they taught on the 'Enrichment' programme, or if they discussed it with their pupils, and so were not able to target individuals in this respect. One teacher commented that: "pupils are very positive about VAK". It may be that the pupils were enthused by VAK when they were in year seven, but this was certainly not shown in the responses to the questions about learning styles with year nine pupils, where at best, they vaguely recollected what VAK was about. Some, but not all, of the teachers felt it would be useful to have VAK details (yet all but one had agreed in questionnaire 2 that it was important for the school to analyse learning styles in terms of VAK) and some, but by no means all, were aware that pupils knew their own preferred learning style. A common view was that the majority of pupils in the school were 'Kinaesthetic' learners, with figures of typically 60% and has high as 90% being cited - this was not, however, supported by the analysis of the VAK summary, which showed a wide variety across years (and indeed across forms within years. Indications from the literature are that, in general, 35% of people are mainly Visual learners; 40% are mainly Kinaesthetic and only 25% are mainly Auditory (DfES, 2003b: 4). Similar, but not identical, statistics can be found elsewhere, for example McLaughlin *et al* (2006) report proportions that match very closely with the DfES data; Smith quotes 29% Visual, 34% Auditory and 37% Kinaesthetic (Smith, 1996:10) and Lisle (2005a) found that, for adults with learning difficulties, the figures were 34% Visual; 34% Auditory; 23% Kinaesthetic and 9% multi-modal. The figure for 'Kinaesthetic' learners at CSS (39%) is broadly in line with these findings but the figures for Visual (23%) and, in particular, Auditory learners (11%) are significantly lower, perhaps in line with Thomson *et al's* (1999) claim that most pupils were Tactile and Kinaesthetic learners with little Auditory strength. I can find no analysis that actually compares VAK results across year groups in a school, and little which attempts to group style preferences together, even though Rautopuro and Vaisanen (2003) had questioned the wisdom of locating students to one learning style, particularly when similar scores are evident for two or more preferences (as occurred at CSS). However, work, reported in McLaughlin *et al*, (2006: 124) also, like CSS, shows a large spread of VAK results across each class, with some notable extremes, which they claim, suggests that 'multisensory lessons are vital if all pupils are able to maximise their personal learning potentials'. Similarly, Lisle (2005a: 16) reported that some of the participants in her study found it difficult to choose one answer over the others and would, at times, have preferred to choose all three modes. It appears that more work is necessary to establish whether or not VAK analyses have any validity, particularly as there does not appear to be any clear or useful definition of what constitutes a Visual, Auditory or Kinaesthetic learner and they are based on 'relatively simple, self-report tests' (NSIN, 2005: 5).

The apparent strong support for the analysis and use of learning styles revealed in questionnaires 1 and 2, including the adjustment of teaching to take into account a pupils' learning style prompted my investigation into VAK learning styles across a wider number of schools. Generally, there appears to be a close correlation between the responses from the teachers at CSS and the responses made within the wider survey indicating that teacher perceptions of VAK learning styles at CSS are shared quite widely across other schools within a broad geographical area. There are some minor differences, for example, teachers at CSS appear to agree more strongly than the teachers in the wider survey that a school should analyse pupil learning styles and that this could lead to raised pupil attainment levels.

The high ratio of schools that do, according to my survey, analyse pupil preferred learning styles in terms of VAK learners (four out of five) confirmed anecdotal comments made by both practising and trainee teachers. If this pattern were to be echoed in other secondary schools across the country, then it would indicate that a huge number of secondary schools are responding to advice given in 'official' guidance documentation, e.g. *Learning Styles* (DfES, 2003b) and material that supports it (e. g. Smith, 1996. 1998). However, I am not aware of any data available to examine whether this pattern is repeated in other geographical areas, although interestingly, the two schools in the survey not in the North West of England both indicated that they did not carry out such an analysis.

Although the analysis of a Tactile learning preference is apparently prevalent in Scandinavia (Bostrom, 2005) and there are several references to it elsewhere in the literature (Reid, 1987; Dunn, Dunn and Price, 1989; Rautopuro and Vaisanen, 2003; Bell, 1998; Gadt-Johnson, 2000; Price and Dunn, 1997; Semple and Pascale, 1984) it was not common within the schools responding to my survey. The results were an exact reverse of the VAK responses, with teachers from 8 schools indicating that their schools did analyse for Tactile learners (22.2%). This figure is possibly too high, however, as there were instances of respondents from schools offering multiple returns presenting different answers. (It could, of course, be the case that analysis in terms of Tactile learners is simply not well known across the school even when it occurs; a similar pattern was not evident from the VAK responses). A possible reason for such a low frequency of Tactile analysis could simply be that it is not indicated within the DfES guidance document on Learning Styles and that teachers in schools do not, generally, access the wider educational literature.

Gardner's work on Multiple Intelligences (Gardner, 1983, 1991, 1997) is, however, covered in a number of apparently influential texts commonly available to school staff (e.g. DfES, 2003b; Smith, 1996, 1998; Dryden and Voss, 2001; Ginnis, 2002). CSS does, during its 'Enrichment' lessons with y7 pupils, analyse Multiple Intelligences through the use of a simple analytical wheel. However, it was apparent that this is not widely known by the teaching staff at CSS as only two respondents mentioned the use of Multiple Intelligences. Unlike VAK, Multiple Intelligences does not appear to be reflected in terms of any analysis that schools perform: only one of the schools surveyed (3%) indicated that they have attempted to analyse individual pupils' types of intelligences (it also analyses for Tactile). Thus, CSS could be regarded as somewhat unusual in that they do attempt to analyse pupils' Multiple Intelligences. However, as teachers at CSS were largely unaware of this it is therefore quite possible that this is equally true in the schools within the wider survey. It is possible that the question I asked was too vague (it did not directly mention Multiple Intelligences for example). It may be the case that VAK is much simpler to administer and much easier to analyse than Multiple Intelligences and hence tends to predominate. Certainly there is a plethora of simple VAK analyses readily available on-line and elsewhere; Multiple Intelligences analyses appear, according to CSS, both harder to use and harder to find.

Of the 28 schools that reportedly analysed for VAK learning styles, 25 apparently shared this information with their teaching staff, representing 69% of the total in the survey. During earlier interviews with teachers from the science faculty it appeared that they were not aware of the preferred learning styles of their pupils, unless they taught on the 'Enrichment' programme, or if they discussed it with their pupils. This was supported by responses to questionnaire 3. It would appear that a higher percentage of schools share VAK information with their teachers than is evident at CSS, although I did not attempt to discover what they do with this information: this would be a pertinent part of any future research, although I am not aware of any references within the literature that indicate the extent to which VAK analysis is shared with teachers. It was commonly reported in my survey that information on VAK learning style preferences is, though, shared with pupils: 86% of the teachers in the wider survey and all of the teachers responding at CSS indicated that pupils are aware of their learning styles. What the pupils and teachers do with this information is another matter. At CSS, pupils when interviewed in y9 (two years after the analysis was performed) were at best vague in their recollections of their preferred learning style and provided few, if any, strong examples to show that their learning style was being catered for. It was, unfortunately, outside the scope of my study to pursue this with some of the schools from my survey: again this represents very relevant potential research.

Generally, there appeared to be a small, but noticeably more positive, level of support for the analysis and use of VAK learning styles amongst females in the wider survey. Apart from one response on section B of questionnaire 3, all responses from females are more positively in favour of VAK than males, with responses to B3 (I need to be aware that there will be a range of learning styles within my classroom), B5 (When planning my lessons I try to incorporate a range of activities to cater for different learning styles) and B10 (Pupils should be encouraged to learn using a range of learning styles) being markedly so. It is difficult, however, to suggest any reason for this.

The analysis for age and experience was more complex, partly because there are more categories and this produces a confusing picture. It was expected that younger, inexperienced, teachers, relatively fresh from College and therefore more likely to have been exposed to recent theories about VAK, would be more supportive of it than older, more experienced (and possibly more cynical?) colleagues. This was not found to be the case as the responses were broadly similar for each of the statements B1 to B11; the only 'oddity' being the response to B12, which shows a stronger degree of support from experienced teachers, than from less experienced ones. Sub-analysis by broader age range showed some relatively pronounced differences within the wider survey, again with some responses (particularly to B1, B2, B4 and B9) being favoured more by older teachers, although there were some responses that were favoured more by younger staff. The results across the two age ranges at CSS were similar; where there was any pronounced difference, it tended to be opposite to that found in the wider survey. Further analysis by wider experience revealed some indication that the less experienced teachers were slightly more positive about 'learning styles' than their more experienced colleagues, but this was certainly not true for all statements and it was not mirrored at CSS.

Within the literature, as reported in chapter 2, there are conflicting claims that the use of preferred VAK learning styles is beneficial. Similarly, a number of tentative messages supporting the use of VAK have been reported within L2L (Rodd, 2002, 2003; Lucas *et al*, 2002; Lucas and Greany, 2000; Greany *et al*, 2002; Greany and Rodd, 2003; Higgins *et al*, 2007). Work in Sweden (Bostrom, 2005; Bostrom and Lassen, 2005) has also suggested that, when using multisensory instruction packages, 'Kinaesthetic' learners performed better, endorsing earlier work by Burke (2003). Bell (1998) had found that Visual learners tended to out-perform Auditory and Tactile learners although Rautouro and Vaisanen (2003) found that different learning styles had no effect on success and other work, discussed earlier, shows scepticism towards the use of VAK (e.g. Burns, Johnson and Gable, 1998; Curry, 1990; Stahl, 1988, Davidman, 1981; Coffield *et al,* 2004a, 2004b; Coffield, 2005, Geake, 2005). The Demos report (Hargreaves, 2005) also commented that the evidence for learning styles was 'highly variable' and that practitioners were 'not by any means frank about the evidence for their work'. Advice to teachers (NSIN, 2005: 7) suggested that teachers should concentrate on formative assessment, with an emphasis on feedback (as part of AfL) rather than on learning styles, because, it was argued, the evidence shows that it can 'produce significant, and often substantial, learning gains' (Black and Wiliam, 1998: 3).

I argued earlier that the awareness of learning styles has, possibly, encouraged teachers at CSS to explore a wider range of teaching and learning strategies and there appears to be a perception, gained from teacher responses from other schools, that this is true elsewhere (and possibly with more conviction). Further, there appears to be an appreciation that there is a need to cater for the range of pupil learning styles. Teachers strongly agreed that they need to be aware that there will be a range of learning styles in their classrooms and that pupils should be encouraged to learn using a range of learning styles; they disagreed with the statement that 'pupils learn best through one learning style'. A number of positive comments reinforced this, for example,

> I think it is important to cover a range of learning styles over a group of lessons

> A preferred learning style is not the only way to learn…they should be encouraged to try other ways of learning.
>
> I believe that pupils should aim for balance of the three learning styles.

Such views were not, however, universal, with some respondents stressing the need to know a pupils' preferred learning style (all teachers thought that, in schools that analyse VAK, all pupils are aware of their learning style preferences, although y9 pupils at CSS showed, through interview, that this was not the case). Other views highlighted the need for pupils 'to have their preferred learning style in their planner'. Five schools appeared to go further than this as they reported that they use VAK information to group pupils, probably within subjects, rather than across a school, although this was not clear. In support of this approach, Lucas *et al* (2002: 18), for example, report a significant preference for 'Kinaesthetic' activities, and claim later (Lucas *et al*, 2002: 57), that when the teaching style matched the Kinaesthetic preference the attainment of pupils increased, but they do not indicate how this was measured. Coffield (2004a) has, however, warned that labelling a pupil in such a way may do them more harm than good. Certainly, one teacher at CSS had, as noted previously, noticed a negative pupil response ('I can't do that: I'm a Kinaesthetic learner') and the implications of work, reported in McLaughlin *et al* 2006: 123, are that 'assumptions should not be made about the learning preferences shown by pupils in particular sets. An overall conclusion continues:

> VAK questionnaires are not a useful diagnostic tool for determining strategies for whole-class teaching…rather… as a general rule pupils' learning is enhanced when information is presented in as multisensory a manner as possible.
>
> (McLaughlin *et al*, 2005: 126)

There are similarities between this conclusion and the intent within the lesson-planning model at CSS that the 'Delivery' section includes a multisensory element. CSS makes it very clear that they use VAK and Multiple Intelligences surveys primarily to make pupils aware that they can access information and learn through a range of senses and that the pupils should strive to use all of these. A similar view is held by Blakely and Smith (2005: 47) who felt that while it was necessary to engage children in learning through their preferred learning styles it was also important to use other learning styles so that they could also learn in a non-preferred way. Advice, given by NSIN, does seem to marry exactly with what CSS is aiming to achieve through LIP:

> Instead of being assigned a particular learning style, it would be more beneficial for students to appreciate the relative advantages and weakness of a range of different styles. The aim for teachers would be not only to study how students learn, but to show them how to enhance their learning by developing a flexible repertoire of approaches to learning rather than settling for just one.
>
> (NSIN, 2005: 5)

CHAPTER SEVEN.

Conclusions.

Introduction to this chapter

This study set out to investigate, though a case study approach, the impact of LIP and the use of perceived preferred learning styles, on the effectiveness of learning at CSS, with a focus on two main themes: the introduction and use of a six-part lesson-planning model; and the use of VAK learning styles and active learning. A wider perspective was gained through a comparison with teachers from other schools, particularly with regard to the use of learning styles and to some aspects of accelerated learning. The findings from this research were placed into the context of the wider educational research literature.

I have argued that the introduction of LIP at CSS has led to more effective pupil learning, with key elements of its six part lesson-planning model seen as important from both a teacher and pupil perspective and that CSS appears to be developing pupil capacity through both active learning and meta-learning. I further argue that my role as a researcher at CSS was integrated with the provision of CPD for the science teachers and with the evaluation of LIP from the perspective of SMT. There was substantial evidence to indicate that the large majority of teachers involved in this research supported the use of VAK learning styles. Although there was little, if any, evidence at CSS to support the hypothesis that the use of preferred learning styles impacted on pupil motivation, it is possible that it has led to the use of a wider range of active learning strategies. The chapter provides further comment on the main findings from the research, makes a number of recommendations for CSS to consider, highlights implications for future research and concludes with some substantive and formal theoretical propositions in the manner espoused by Glaser and Strauss (1967).

General comments

The long-term aims of the school include the whole-school implementation of its six part lesson-planning model, based on an accelerated learning cycle, and to promote active learning so as to see an overall improvement in 'effective learning'. Essentially, the school was trying to 'change the way pupils learn': there is evidence to indicate that LIP has had some positive impact on pupil learning. To some extent it also supports aspects of the claim that: "many schools ... reported the effectiveness of accelerated learning techniques, such as, sharing objectives and focusing on learning intentions and outcomes", (Lucas *et al* 2002:62). For example, the use of a range of activities, some directly related to accelerated learning (Smith, 1996, 1998; Smith *et al*, 2003) and the use of shared lesson objectives (e.g. Black and Wiliam, 1998; Assessment Reform Group, 1999; Black *et al*, 2002; DfES, 2004) appear to have motivated the pupils at CSS.

I recognised that there may well have been a dilemma between accurately representing the findings of my research and being sensitive to the needs of those involved. The statement "developing and nurturing a true partnership between the research team (myself) and the relevant education communities is critically important" (NRC, 2004: 27), represented a strong message for my research. Groundwater-Smith and Mockler (2003: 34) suggest that the best advice is to "approach it with authenticity and concern for both teachers and students, trusting in your own professional judgement to guide you". This I aimed to do: the outcomes of the research have focused on how LIP has impacted on CSS, with the identification of future needs, rather than on definitive proof that it has 'worked'.

My research has focused on teacher and pupil perspectives of gains to learning rather than a reliance on quantitative data, such as test results. Certainly, since the

1980s, education policy has been improvement-driven, but there seems to no clear account of what actually constitutes 'higher standards'. Adey (2006), for example, warns against an over-reliance on relying on test results as these, he argues, often assess low-level rote knowledge rather than real understanding and that 'teaching to the test' may raise test grades, but can undermine good teaching. However, a survey by Thomson and Gunter (2006) found pupils in a secondary school in England to be almost universal in their approval of testing. Adey (2006: 207) usefully distinguishes between instruction and intervention: instruction is the provision of knowledge and understanding through appropriate activities; intervention is more concerned with intervening in the process of cognitive development, essentially from a Piagetian perspective (e.g. Piaget, 1969, Wadsworth, 1978).

Radford (2006) gives support to my methodological approach as he comments that the primary role of educational research is to provide descriptions and explanations that provide a broad perspective on development. Further, citing complexity theory, (e. g. Byrne, 1998) he comments that school improvement is dependent on multiple interacting variables and is therefore likely to be situation specific, local and temporary. Black *et al* (2006) used a questionnaire to explore pupil beliefs about, and attitudes towards 'learning how to learn'. Their results reflect some of the problems that I found in exploring pupil views through questionnaires: "the twin problems of exploring the concepts in simple language, and in limiting the number of questions within their attention span were predictable" (Black *et al*, 2006: 167).

The confusion between L2L, with its emphasis on accelerated learning techniques, and LHTL with an emphasis on AfL is unfortunate, particularly as there are many areas of overlap, which are important to CSS and to other schools. It does, however, illustrate what is, in my experience, a genuine concern amongst teachers that they are overwhelmed with advice, guidelines and directives, much of it contradictory. Earl *et al* (2000) found that to achieve sustainable changes in school practice is dependent upon practitioners' (i.e. teachers') understandings of a theoretical model; Askew *et al* (2001) considered that such understanding can be hindered if the tension of mixed messages is not resolved and teachers are left to "battle to reconcile conflicting advice and challenges to long-established beliefs" (Askew *et al*, 2001: 24). Similarly, James *et al* (2006) found that their planned exploration of the effectiveness of the LHTL project was seriously affected as it quickly became apparent that schools were taking on many new initiatives simultaneously and that the prospect of isolating the effect of the LTHL project from others was therefore very limited. A similar comment was made in the final report for phase 3 of L2L: "It is difficult to maintain a development focus over three years in schools with so many competing demands on time and attention". (Higgins *et al*, 2007: 83). I certainly found this to be the case in my study, not just because the six-part lesson-planning cycle used at CSS had many areas of commonality with AfL, but also because there were so many factors within it. This, I suspect, is why there is so little research, other than a small amount of school-based, action research, apparently available to accurately assess the impact of accelerated learning cycles: this, in my view urgently needs doing because so many guidelines issued to schools appear to promote them. Both LHTL and L2L can be seen as a collection of learning practices and, Black *et al* (2006: 130) believe that "further understanding and insight into LHTL and L2L is to be attained by engaging in development and research into a variety of such learning practices". They add the caveat that effective practice in one organization does not imply that it will apply across all situations. One possible explanation of this, due to Marshall and Drummond

(2006), is that the beliefs teachers hold about learning impact on the way they apply a learning strategy in their classrooms; this may help in understanding why change in classroom practice is so hard to achieve in general.

CSS would regard my study as evaluation research as they wanted an external, independent, view of the impact of LIP on the effectiveness of learning. Cohen *et al* (2000: 38) comment that this can be dangerous in that it enables others to set the research agenda. I would, however, counter this by arguing that the research agenda was set as a result of close discussions with CSS and by citing Norris's view that evaluation applies research methods to shed light on a problem of action (Norris, 1990: 97). The evaluation of the effect of my research on CSS has revealed broad positive support for the process (appendix 1). Of particular note is the very strong agreement that my final report to CSS can be used as part of whole school evaluation and the strong agreement with the need to listen to the 'pupil voice'.

The view of the Head teacher at CSS is that evaluation needs to be linked to development, echoing the earlier view by Stenhouse (1975): "Evaluation should.... lead development and be integrated with it. Then the conceptual distinction between development and evaluation is destroyed and the two merge as research." (Stenhouse, 1975:122). The evaluation element of research is, according to both Stenhouse (1987) and Hopkins (1989), also centrally concerned with gathering evidence so that judgements may be made in reflective or deliberate settings. Comments made by LeCompte and Goetz (1982b) on the common phenomenon of incorporating an ethnographic component into evaluation research (e.g. Koppelman, 1979 and Patton, 1980) seem to be particularly relevant to the research at CSS as it matches with the typical features of such study in that it involves participant observation, the selection of a group for study and my immersion within the research setting (Robson, 2002:

89). Further, it could be argued that it has some similarities to the notion of Bentz and Shapiro (1998) who suggest that ethnographic research typically tries to answer questions about specific groups of people. LeCompte and Goetz (1982b) argue that data provided by ethnographic research strategies are useful in assessing the impact of an intervention programme or curricular innovation. In particular, they mention baseline data (contextual information about the research population and setting); process data (information determining what happened in the course of a programme or innovation); and values data (information about the values of the participants). They further argue that, because ethnography uses multiple data collection strategies, it provides flexibility, provides more complete and complex data than a unimodal research design and possess more credibility because they enhance the reliability and validity of the research results (Denzin, 1978).

The conclusion made by Hopkins (1989) that achieving change is a process, not an event, which needs careful planning and management over a long period of time would appear to be relevant to CSS. Hopkins (1989: 188) used the phrase 'formative evaluation', i.e. "evaluation conducted for the purpose of bringing about improvements in practice"; he goes on to opine that the outcomes from evaluation need to be linked to school development planning, (e.g. Hargreaves, *et al*, 1991; Hopkins, 1996; Davies and Ellison, 1999). This, I argue, has occurred at CSS, as key findings from my research have been included in the School Improvement Plan, the priority of which is:

> To ensure that consistent high quality learning and teaching is established, embedded, and continues to be developed, across the school.
>
> (CSS, School Improvement Plan, 2007-8).

Within this priority, departments in the school are asked to focus on, for example, effective schemes of work, objective-led lessons and the consistent use of learning outcomes and lesson reviews.

Muijs and Lindsay (2008: 195) illustrate that research (e.g. Hargreaves, 1994; Day, 1999; McLaughlin and Talbert, 2001) has consistently shown that " professional development is an essential component of successful school development and of teacher-growth, well being and success". My work at CSS, particularly the prolonged involvement with science teachers has, they report (both verbally and within my end-of-research evaluation, see Appendix 1), produced some benefits to their practice, for example the use of time indicators, the greater emphasis on open questions and the importance of regular review of learning objectives. There were problems, as identified by Rust and Meyers (2006) in working in school linked to time constraints and pressure of work (mine as well as the teachers), but these were solved as the teachers proved to be cooperative and willing to be flexible. As I have previously mentioned, it is possible that, because I had 'credibility' in the classroom setting, then this may have helped to overcome these problems.

It is recognised that the science teachers were encouraged to participate in the study by the Head teacher and by teacher X, partly because the research had 'strategic value to the client organisation' (Raelin and Raelin, 2006: 47), with its main aim being to improve practice (Elliott, 1991). It was also recognised that, as suggested by Raelin and Raelin, (2006), there was the possibility that some of the participants could be either actively or passively resistant to the study. This did not appear to be the case. Although the teachers were primarily interested in feedback on their lessons, they also showed a keen interest in the research itself. It could be argued that the re-shaping of the professional imagery of the teachers did, at least to a certain extent, occur, as it appeared to be the case that teachers within the science department subtly enhanced their professional identity by taking the opportunity to participate in research and become more reflective about practice. Evidence for this is provided through, for example, the teachers' involvement in discussions before and after lesson observations, the end of research evaluation (appendix 1) and their production and use of questionnaire 5. The creation and use of this questionnaire does, I feel, offer powerful evidence that the science teachers were engaging in emancipatory research, building on key findings from my study and also considering other factors that they considered to be important. It was also evident, through informal discussions with them later, (March 2008) that they were using it 'in order to improve professional practice so that the benefits of the research could be seen in the classroom' (quote from chapter one of this thesis). This was an important aim of the research design, and echoes the findings of Savoie –Zajc and Descamps-Bednarz (2007), who concluded that action research and collaborative research contribute to the strengthening of both individual and collective competencies.

It could, therefore, be argued that the professional development of the science teachers at CSS has been enhanced through at least a partial 'school-university partnership in collaborative research and professional development' (Johnson *et al*, 1999: 124). The results of a study by Patrick *et al* (2007) tend to support this statement as it indicated that academic partners can have an important and significant role in assisting teachers to undertake action research or learning in schools as a form of professional development and school improvement. Interestingly, the academic partners in Patrick *et al's* study reported a number of benefits to themselves as individual practitioners; they include: increases in their own reflective practice, academic renewal, an enhancement of their own esteem, and improved academic collaboration and leadership skills. Earlier research by Huling and Resta, (2001) reported similar outcomes and also highlighted overall improved professional competency.

Work by Clayton *et al* (2008) is of particular interest as it reflects on the experience of researchers involved with practitioners in school-based research. They opined that they were broadly in agreement with the views of, for example, Halton (2004) and Burton and Bartlett (2005) who comment on the value of practitioner research for CPD, but that they also had concerns that action research approaches tend to serve narrow, instrumental ends, echoing the comments of Kemmis (2006) and Bridges (2003).

The involvement of pupils has, as I argued in chapter six, played an important part in my research design. It was encouraging to note the effective continuation of my research, both through the use of questionnaire 5 to elicit pupil views by the science teachers at CSS, and through the focus on 'pupil voice' in the School Improvement Plan for CSS (2007-8). The findings from my research were presented to the pupils at CSS (y10, 2007-8) during PSE lessons, both verbally, by myself, and through a summary sheet (appendix 2). The feedback to this is summarised in appendix 3 and seems to confirm some of the earlier findings with regard to the lesson-planning model; it also can, perhaps, be considered to re-affirm the findings of questionnaire 4 and, more widely, of Black *et al* (2006), that pupils had generally positive beliefs about learning.

Hypothesis 1: that LIP will lead to enhanced pupil and teacher perceptions regarding effective learning

I have presented evidence that CSS appears to be developing pupil capacity in two of the areas seen as important by Carnell and Lodge (2002), namely active learning and meta-learning. It is also, perhaps, worth commenting that the 'pupil voice' (questionnaires 4 and 5 and appendix 3) may possibly be helping a drive towards the third area that Carnell and Lodge view as important, i.e. collaborative working. Through its attempt to use a range of multi-sensory activities in the 'Delivery' section of its lesson-planning model and through its 'Enrichment programme', which involves the pupils in thinking about their own learning and 'learning how to learn' (e.g. Rodd, 2002, 2003, Higgins *et al*, 2007), it appears that the school does value the importance of a metacognitive approach to learning (e.g. Flavell, 1979; Smith, 1998; NRC, 2005), but perhaps it should aim to further develop reflective and meta-cognitive thinking as part of a more regular review activity (Smith *et al*, 2003), not only because of its link with AfL, but also because there was an indication, from questionnaire 5, that the majority of boys (67% of those responding) felt that they were not made to think hard. The use of a review of learning within a lesson, allied with the use of a recap of prior knowledge, may reduce the apparent dramatic decline in memory known as the 'Ebbinghaus curve of forgetting' (Ebbinghaus, 1885, cited in McLaughlin *et al*, 2006: 116). It is also possible to relate the need for such frequent review to the notion of working memory, particularly with an emphasis on active, rather than passive memory (e.g. Baddeley and Hitch, 1974; Macintosh, 1999; Gathercole and Pickering, 2000; Riding *et al*, 2003; Gathercole *et al* 2004).

Positive aspects of the introduction of LIP were often linked to lesson structure and planning: all teachers interviewed agreed, most of them strongly, that LIP has made them think about new teaching strategies and most thought that it had helped them to plan lessons better. There are indications that a number of features of the lesson-planning cycle are being widely incorporated, both within the science faculty and more widely across the school. There are also some indications that pupils see its importance and there is evidence that pupils value the contribution of 'starters', lesson objectives', 'lesson outcomes' 'recap' and the review of prior learning. It can, therefore, be said to offer some support to Smith's view that the use of such a cycle raises student motivation (Smith, 1998:23). Hamer *et al* (2006) also supported the use of a six-part lesson-planning cycle of learning (citing Rose and Goll, 1992), partly because it allowed them to actively integrate motivation strategies. However, in only one of the observed lessons were all six parts of the model actually evident. In particular, the sharing of 'the big picture' with the pupils was rarely noticed and there was often inadequate time for a meaningful review of learning. Carnell and Lodge (2002) found the use of a learning cycle to be of value, but stress that there is a danger of focusing on the content of learning. They suggest the use of a second, connected cycle, referring to the processes of learning undertaken, what they refer to as meta-learning. Essentially, the cycle used at CSS does attempt to do this through 'sharing outcomes' and 'review and reflect (hence ready for the next lesson)', essentially mirroring part of Kolb's experiential cycle (Kolb, 1984) and the comment that learners need to go through the cycle several times (Zuber-Skerritt, 1992). It may, therefore, be of benefit for CSS to develop these aspects further, particularly as it seeks to promote meta-learning through its 'Enrichment programme'.

The pupils appeared to show an understanding of important aspects of their learning and elements of accelerated learning through the 'Enrichment' programme and their enthusiasm for this was noted in year 7. However, possibly because this was not shared across the curriculum and possibly because it was not taught beyond year

8, pupils had forgotten some aspects of it, including their 'preferred learning style'; perhaps the school could continue to share elements of such good practice more widely. Teachers who taught on the 'Enrichment' programme were better placed to transfer the overall aims of it to science, but didn't always do so; teachers not teaching on this course were largely unaware of its content. Again, this is something that the school might wish to seek to address. Pupils in year 9 did, though, report the use of mind maps to be useful (e.g. Buzan and Buzan, 1993; Williams, 1999; Caviglioli and Harris, 2000). It might prove beneficial for the school to develop this further by making more demands on the learner, possibly through the adoption of concept mapping, which is claimed to have considerable use in teaching and learning (e.g. White and Gunstone, 1992; Driver *et al,* 1994; Kinchin *et al*, 2000, 2005).

The 'mind state' was seen, by CSS and by Smith *et al* (2003), as important in establishing the right conditions for learning to take place, and hence a vital part of its lesson-planning cycle, reflecting Goleman's work on 'emotional intelligence' (Goleman, 1995). It was evident that the teachers worked hard at this, although the pupils reported a higher frequency of lessons not starting calmly than their teachers, echoing the view that teachers sometimes have a more positive view of their classroom climate than do their pupils (Fraser, 1999). It would appear to be advantageous for the school to continue to develop their work in this area, particularly as findings by Wang *et al* (1997), the Hay McBer report (DfEE, 2000) and Rodd (2002), identified classroom climate as one of the most important features impacting upon pupil achievement. Some pupils at CSS, particularly girls, had indicated that they found school too stressful to do their best, generally related to social factors, which would obviously affect their 'mind state'.

Factors that affect learning from a pupil perspective were studied by Groundwater-Smith (2005). She found that the most often cited condition that assisted in learning was having a quiet and peaceful classroom: the pupils wanted to listen to their teachers and they appreciated it when the teachers listened to what they had to say. My work showed some conflicting views to this, with some pupils commenting that they could 'talk and work' (although they made no reference to their ability to understand their work if they were also talking) and teachers broadly disagreed with the statement in questionnaire 2 that pupils only learn when they are quiet. Groundwater-Smith also noted that 'successful' students were those who could 'ignore bad behaviour' – a trait apparent with some pupils in my observations, but not all. Interestingly, some of the pupils who were apparently 'off-task' within my observed lessons had still shown learning gains when questioned by their teachers. Older pupils in Groundwater-Smith's study reported that their peers were important in learning (Vygotsky, 1978) and there was some evidence that this was also valued at CSS by the pupils, who clearly indicated in interviews that they could, and did, learn from each other.

The use of a starter activity appeared to be widely used at CSS and, reportedly, in other schools, although there was some indication that this was less widespread in KS4 than in KS3. Certainly, at KS4, the science teachers at CSS were acutely conscious of syllabus demands and examination schedules and they clearly indicated that the pressures of time and the accountability of 'passing exams' prevented many aspects of LIP being applied beyond KS3.

The school has been actively encouraging the use of shared lesson objectives and shared lesson outcomes, partly though LIP, but also through considerable overlap with AfL strategies. There was evidence that this was occurring: all pupils interviewed reported that lesson objectives and lesson outcomes were commonly used across the school. Further, many could, often articulately, describe the difference between them and could see the importance of them to their effective learning. It appears therefore that the school has made progress in terms of step four of the lesson-planning cycle (agree outcomes), although I found no evidence, either from the interviews or from lesson observations that the outcomes were actually agreed with the pupils. In more than one observed lesson, pupils were clearly motivated when objectives were meaningfully revisited, particularly when praise was attached to this.

The results from questionnaire 4 broadly support the overall view of Black et al (2006) that pupils' opinions in the general area of learning in schools are positive. The very strong level of agreement with 'Learning will help me to get a good job' and 'Learning is something you do every day of your life' must be reassuring to the school as it places a good degree of emphasis on this during its PSE programme. The statement 'I like to work at my own speed' has potential implications for classroom management strategies, particularly as my observations of science lessons within CSS placed an emphasis on whole class teaching or paired /group activities rather than on individual tasks. An initial conclusion showed, potentially, a key difference in the preferred method of working between boys and girls with boys preferring independent work and girls preferring group work. This was later pursued through pupil interviews. Although I could find no evidence to substantiate this conclusion from the interviews, it was again reflected in the findings from both questionnaire 5 and appendix 3. There is possibly a need for the school to investigate opportunities to further develop independent pupil learning, alongside any development of group work.

Hypothesis 2: That the analysis of pupil preferred learning styles, and subsequent use by teachers in lessons, will result in improved pupil motivation.

There was evidence of widespread support for the view, of, for example, Sprenger (2005) and Perry and Ball (2004) that it was important that schools analyse learning styles in terms of VAK, as 80% of the schools in my survey reportedly analysed pupil preferred learning styles in terms of Visual, Auditory and Kinaesthetic learners. The large majority of teachers within my survey appeared to be very supportive of the use of VAK learning styles and there is some wider research evidence to support its use (e.g. DfES, 2003b, 2004a; 2004b, 2005; Cleland, 2005; Bostrom, 2005; McLaughlin *et al*, 2006, Wicks, 2006). There is also apparent strong support for the adjustment of teaching to take into account a pupils' learning style both within CSS and across a range of other schools and an acknowledgement that pupils should be aware of their learning style. Generally, there was a close correlation apparent between the responses from the teachers at CSS and the responses made within the wider survey. There was an awareness of, and a degree of support for, the pursuance of some sort of learning styles agenda even in schools that are not apparently pursuing any analysis of VAK learning styles,

Interestingly, I found that schools were generally not concerned with Multiple Intelligences (Gardner, 1983, 1991, 1997) (unlike CSS) nor with Tactile learning, yet Bostrom reported (2005) that she found Tactile to be the most usual- she also commented that all students have elements of Visual, Auditory, Kinaesthetic and Tactile learning styles. Her evaluation was that, in Scandinavia, where about 300 schools use the Dunn and Dunn model (e.g. 1988, 1993) the use of learning styles has led to increased teacher and pupil motivation and increased levels of differentiation.

The science teachers at CSS claimed to include a range of activities that catered for V, A and K styles, with nearly half indicating that they did so in most lessons. This is very similar to the figure for the teachers in other schools indicating both a general awareness of the preferred learning styles of pupils and an attempt to cater for this, among the respondents. It is, however, very difficult to support this, primarily because it is far from clear what is meant by a 'Visual' or 'Auditory' or 'Kinaesthetic' activity and advice from, for example, the DfES is not over-helpful and is, at best, extremely simplistic. Further, many teachers at CSS were reportedly unaware of the preferred learning styles of their pupils, unless they taught on the enrichment programme, or if they discussed it with their pupils and so it is not really feasible that they could realistically cater for V, A and K styles. It must surely be true that all lessons contain a Visual and an Auditory element and most lessons would surely have pupils 'doing things', commonly regarded by the teachers in the school as 'Kinaesthetic' activities. As mentioned earlier, the use of multi-sensory activities and educational 'games' in the delivery of lessons is not widespread through the school, even though there is clear reference in the school guidance to teachers that multi-sensory (VAK) activities should be part of the 'delivery' in the lesson-planning model. There is evidence to support the use of short activities, delivered with pace, that actively engage and challenge pupils, but I have not found any evidence to link these to VAK learning styles.

I could find little, if any, evidence to support the premise that the use of VAK learning styles in lessons at CSS did result in improved pupil motivation as I detected little to suggest that pupils really valued knowing what their learning style is, so it could not claim to be an important contributor to their motivation to learn. There was, however, evidence that pupils preferred to be able to 'do physical or practical activities' and that 'active' tasks tended to motivate and engage them. Whether these could be called 'Kinaesthetic' activities is though very questionable, even though they involve active participation. One pupil did comment, however that "I would like it if we could do more activities...that match our learning styles". Although it is questionable whether the use of preferred learning styles has directly led to more effective pupil learning, there is some evidence to support the wider use of a range of short activities that actively engage and challenge the pupils and it seems likely that the teachers at CSS, and possibly in other schools, were encouraged to do this through an awareness of the alleged need to cater for pupils preferred learning styles. I would argue that the use of a range of active learning strategies, relating to a more constructivist approach, i.e. the need for pupils to construct their own knowledge and understanding, (e.g. Dewey, 1933; Bruner, 1966, 1983) has been more beneficial.

It seemed apparent that the majority of pupils in the lessons observed had relatively low levels of concentration and that they found it difficult to stay focused. There was an emphasis in many lessons on teacher-talk and the pupils generally struggled to cope with this. When activities were kept short, the pupils responded better; equally they responded more favourably when they had a clear understanding of the task and when they were actively involved in the activity. This offers some support to the self-determination theory of Ryan and Deci (2000), which suggests that there is a direct link between student engagement on learning tasks and the degree to which they are motivated to pursue academic goals.

In my lesson observations it was apparent that the pupils were more motivated by practical activities and they were more engaged by them, although many of the lessons were dominated by written tasks. The pupils also indicated that they spent a lot of their time in their lessons just writing or just listening to the teacher. There is the danger that by using such expository teaching methods, pupils with both deep and surface approaches to learning could focus on transmission and reproduction, Campbell *et al* (2001). This is possibly something that the school could continue to work on. It was also noted that many of the pupils appeared disengaged, bored or misbehaved during long sessions of teacher exposition. This is important as Anderson and Keith (1997) for example, found that pupils that were disengaged from their studies were likely to have low academic achievement.

A common view at CSS was that the majority of pupils in the school are "Kinaesthetic" learners, with figures as high as 90% being cited. This was not, however, supported by the analysis of the school's VAK summary, which showed a wide variety and which was generally in line with other figures quoted in the literature (e.g. DfES, 2003b; McLaughlin *et al*, 2006) although the figure for Auditory learners is lower. This has implications for the method of delivery of lessons at the school as, has already been noted, there is an emphasis on teacher-led lessons, which place a high emphasis on Auditory reception, to which many of the pupils do not respond. CSS make it very clear, however, that they use VAK and Multiple Intelligences surveys primarily to make pupils aware that they can access information and learn through a range of senses. Further they stress that the pupils should strive to use all of these. Blakely and Smith (2005: 47) similarly concluded that while it was necessary to engage children in learning through their preferred learning styles it was also important to enable children to use other learning styles so that they could also learn in a non-preferred way.

It is very questionable whether it is possible to accurately identify what a preferred learning style actually is. Although the term 'learning style' has been defined (e.g. Rautopuro and Vaisanen, 2003; Riding and Rayner, 1998; Griggs, 1991), and is often confused and overlaps with, 'cognitive style' (e.g. Messick, 1984; Riding and Rayner, 1998), I can find no clear definition of VAK learning styles. It may well make sense that, as suggested by Hamer *et al* (2006), learning may be better modelled in terms of learning strategies, which interact with cognitive style. They argue that learning in terms of a strategy, rather than as a style, helps to avoid what they see as a pitfall of labelling learners with a fixed learning style, which "can result in a monotonous or inappropriate diet and constrain (their) development" (Hamer *et al.* 2006: 141). There is evidence that this is exactly what CSS is already striving to do as they argue that they make it very clear that they use VAK and Multiple Intelligences surveys primarily to make pupils aware that they can access information and learn through a range of senses. An activity becomes strategic when, according to Riding and Rayner (1998: 84), it becomes particularly appropriate for an individual learner. Schmeck (1988) described learning strategies as combinations of cognitive skills, which are implemented when a situation is seen as one which demands learning. Weinstein and Van Mater Stone (1996) have argued that a critical step in the acquisition and improvement of a learning strategies repertoire is the awareness of one's own thinking (meta- cognition). As mentioned earlier, the 'Enrichment' programme at CSS aims to follow such a meta-learning approach by encouraging the pupils to learn how to learn. Perhaps the school could consider how to extend this approach more widely across the curriculum so that it more clearly integrates with its lesson-planning cycle and with its use of active, multisensory, approaches to learning.

Recommendations for CSS.

CSS has clearly worked hard, with both its teachers and its pupils, to successfully implement many aspects of LIP, especially with regard to its six-part lesson-planning cycle. This could be further developed as the teachers might consider placing a greater emphasis on some aspects of it, particularly sharing the 'big picture', (although this probably would not be needed every lesson), the greater use of active learning within the 'delivery' section and a more consistent use of reviews. CSS is committed to a whole school approach to AfL strategies, which have much in common with LIP and it would probably be beneficial to examine ways by which they can be more closely integrated.

The start of the lesson, with the emphasis on 'mind state' is seen as critical to creating the conditions for effective learning to occur. Pupils are, though, conscious that lessons do not always start in a calm manner, and see this as one way by which their learning could be improved. It is, I feel, important to recognise that the pupils are not particularly motivated by long periods of teacher exposition or by copying work from text; both of which appear prevalent. They appear to be more motivated by work that has a practical element and by activities that are short, and that actively engage them. There is strong agreement among the teachers that the use of a range of multisensory activities are thought to motivate pupils and, this, together with wider evidence from the literature, suggests that CSS may well wish to further develop active learning opportunities.

There was some evidence that learning gains of the pupils through 'Enrichment' lessons were not consistently being applied across the curriculum. This is a pity as the pupils had seemed enthused by their learning in 'Enrichment' and had valued some of its messages. This transfer of skills and knowledge from one lesson to another is a common issue in schools in my experience. Some of the science staff do teach on the 'Enrichment' programme and could consider sharing this more widely with their colleagues; equally the school might wish to consider ways of sharing a wider knowledge and understanding of its implications for effective learning across all teachers. CSS have considered extending 'Enrichment' lessons to more senior pupils but feel that the pressures that stem from 'an already overburdened KS4 curriculum prevent this' (comment by the Head teacher of CSS).

There appears to be a general acknowledgement that it is important to have an awareness of, and to respond to, the preferred VAK learning styles of pupils. CSS plans to continue to assess pupils in terms of VAK, and indeed Multiple Intelligences, which is considered useful in terms of making pupils more aware of their potential learning styles. However, the evidence from this study (and wider) makes it questionable whether it is necessary, or desirable, to share the information on a pupils' preferred learning style, in spite of the fact that teachers seemed to indicate that they would value it.

There are, though, some aspects of the lesson-planning cycle, in particular, the use of reviews and the 'big picture' that are less widespread. There are also some indications that aspects of it are being used more with younger pupils, although it is not clear whether this is due to the introduction of LIP, or whether it is because the teachers view some aspects of teaching and learning to be more applicable to younger pupils, or whether it is as a result of perceived examination pressure at KS4. There are indications that all could play a part and this would warrant further investigation at a later date, for example, Ashwin (2005) suggests that the current examination system encourages surface rather than deep learning (e. g. Marton and Saljo, 1976) and rote rather than meaningful learning (Novak, 1978). I noticed some evidence to support this view, as there appeared to be an emphasis on factual recall and the use of many closed-type questions (although there was also some evidence that children were encouraged to think more deeply through more open questions, but this was did not appear to be widely used). This could well be an area that CSS seeks to develop and it may, as suggested by Allen *et al* (2005), be beneficial for the school to promote pupils' higher order thinking skills through, for example, the use of Bloom's taxonomy (Bloom, 1956). The comment made, within appendix 3 by one of the science teachers that he now uses open questions a lot more, may indicate that this has started. Pupils seemed to value the use of mind mapping and the school might consider developing this further through the use of concept mapping as an additional assessment tool.

My research has revealed an inconsistency of approach to LIP across the curriculum and, as such, needs to be further embedded into school policy so that it becomes 'integral to the structure and culture of the organization' (Swaffield and MacBeath, 2006: 202). Whilst this presents challenges for the leadership of CSS, I feel that a critical evaluation from an informed point of view of LIP, based on my research findings, would aid this process. In my opinion, one of the hardest challenges that CSS will face will be to effectively manage the introduction of further externally imposed changes alongside their perceived programme of development. For example, new changes to KS4 commenced in 2007, sweeping changes to KS3 are planned for 2009 and there is a large emphasis on personalised learning (e.g. Pollard and James, 2004). Personalised learning, according to the newly created department for children, schools and families (DfCSF, 2007) has five components, which it presents as a pyramidal structure, with effective teaching and learning and assessment for learning as the top two layers. As mentioned in chapter six, it also has, according to the

General Teaching Council for England, a clear link to 'pupil voice'. The need to listen to the 'pupil voice' and to 'personalise' the curriculum have, as noted by Thomson and Gunter (2006: 839) have been added to the array of government expectations for schools; CSS should, I suggest continue to develop their work in this area.

CSS appears to be committed to school improvement and, according to teacher X will continue to involve pupils in an awareness of learning styles and Multiple Intelligences, will use, and seek to further develop, the six part lesson-planning model and integrate it more with AfL. CSS considers that Accelerated Learning in Training and Education (Alite), which claims to link L2L with AfL through personalised learning, will very much complement past practice and allow for further improvement. Unfortunately, in the view of Wrigley (2004), school effectiveness is considered more important than school improvement: this will represent an additional challenge for CSS. Wrigley further opines that government emphasis on prescribed strategies, specific target setting, accountability and league tables, leaves little room to give due consideration to educational outcomes. Pedder (2006:198) stresses that there are considerable levels of challenges for schools aiming to develop organisational strategies as a means of sustaining change in the classroom through the promotion of a whole school initiative (like LIP and Alite).

There are some implications, mainly from the use of 'pupil voice' that pupils may have a preference for group work and that this may be particularly applicable to girls. CSS are considering their response to the views of pupils on group work and it may be pertinent that they note the suggestion from Baines *et al* (2007: 677) to make greater use of a pedagogy which incorporates group work in order to facilitate pupil involvement, hence providing learning opportunities not provided by either teacher-led situations or individual work. However, any readjustment of teaching practices should, perhaps be approached with care, particularly as other findings (Blatchford *et al,* 2004; Galton *et al*, 1999 and Baines *et a*l, 2003) strike a more cautionary note.

Implications for future research.

Any future research into LIP at CSS, or at any school involved with any programme using accelerated learning techniques, would need to resolve the issue of trying to identify the effectiveness of the programme on pupil learning. Quite simply, because accelerated learning is an 'umbrella term' it is too encompassing for there to be any realistic chance of this: the only way forward would, I suggest be to try to isolate one aspect of it at a time and research this in depth. Dryden and Voss (2001), for example, make claims that appear to link the use of music to the climate within the classroom and imply that it can have a positive influence and the use of 'brain gym' has been criticised by Geake (2005) and by Blakemore and Frith (2005) but they do not appear to offer any justification of this criticism in terms of concrete research findings.

Teachers in CSS implied that it was harder to use LIP with older pupils and with pupils in lower ability sets. I had no opportunity to really pursue this, but clearly it would be important for the school to know whether there was any substance to this and this could form the basis of a future case study. It would, for example, be of interest to pursue Ashwin's (2005) suggestion that the current examination system encourages surface rather than deep learning (e. g. Marton and Saljo (1976)) and rote rather than meaningful learning (Novak, 1978). My findings can perhaps be usefully compared with the work of Postlethwaite and Haggarty (2002) who sampled over- and under- achieving pupils and found that there were significant differences in terms of pupil perceptions of some areas of their experiences of teaching and learning: under-achievers conformed less to the work and social norms of the classroom but communicated more with their teachers than did over-achievers. The second part of this surprised Postlethwaite and Haggarty; it could be well worth pursuing a similar investigation to see if this was replicated within the pupils in my case study, especially as it was not possible to observe lessons with pupils of lower ability at CSS.

The debate about the usefulness of VAK learning styles in particular needs to continue, if for no other reason than, as is clearly shown in my survey results, teachers show an enthusiasm for the analysis and use of preferred learning styles and the vast majority of schools responding indicated that they analyse VAK learning styles. Research led by the Campaign for Learning into 'Learning to Learn' makes a number of supportive statements for the use of VAK learning styles; it will be interesting to see how these develop and how, and if, they are challenged. Baker (2003) found that there were significant interactions between cognitive style and attendance and cognitive style and attainment in secondary pupils but that the nature of the interaction varied between the schools. A similar study would need to be carried out for 'learning style', but I feel if this were to have any value there would need to be a much tighter definition of what is meant by 'Visual' Auditory' and 'Kinaesthetic' (and indeed 'Tactile') and what activities actually cater for their specific needs. This is particularly needed as some schools have reported that they set some pupils according to their learning style, rather than by their ability. The tests used to identify a particular learning style appear to be very simplistic; I am not aware of any study that has examined the reliability and validity of their use and opine that, as many schools are using them, this needs addressing.

CSS introduced a commercial package (Alite) with all pupils in year 7 in September 2007, because, in their view, it complements their current practice with accelerated learning techniques. For example, they plan to continue to use the six-part lesson-planning cycle, to continue to develop a range of multi-sensory pupil activities and plan to continue to introduce pupils to VAK learning styles and Multiple Intelligences (including the identification of their preferred learning styles). An investigation into the effectiveness of the Alite programme would make another fascinating case study, particularly if it were possible to track pupil learning from their entry in year 7 to their leaving in year 11.

The Alite package is, apparently, linked to 'Learning to Learn' and to personalised learning (Pollard and James, 2004), which, in turn, has links to 'pupil voice'. The concept of 'pupil voice' has, as highlighted by Lundy (2007) received increasing attention in recent years, and there is, in my opinion, a need for further research on the impact of this on schools, particularly in the light of the concern noted by Bragg (2007) that a number of teachers voiced apparently genuine anxieties and concerns when being asked to encourage pupil participation, particularly on teaching and learning issues.

Substantive and formal theory propositions.

The evaluation by the teachers at CSS, together with the feedback from pupils (appendices 1 and 3), indicate that the explanation of my findings makes, at least some, sense to the teachers and pupils. It can, I suggest, therefore be argued that, as the outcomes of my work address real practical issues they relate to the principles of grounded theory (discussed in chapter three of this thesis): "people in situations for which a grounded theory has been generated can apply it in the natural course of daily events" (Glaser and Strauss, 1967: 249). Locke (2001) reinforces this, commenting that grounded theory acknowledges its pragmatist philosophical heritage by insisting that a good theory is one that is practically useful and works 'on the ground'. My findings may, perhaps, be profitably extended to include the tentative generation of substantive and formal theory in the manner suggested by Glaser and Strauss (1967). Substantive theory has particular implications for the setting at CSS; formal theory may be applied beyond CSS, particularly by reference to the findings gained through the wider dimension afforded by the involvement of other schools.

Substantive theory propositions, specific to CSS, are as follows:

- The introduction of LIP has led to more effective pupil learning, with key elements of the six-part lesson-planning model valued by teachers and pupils alike, in particular the use of starter activities, the sharing of lesson objectives, the identification of pupil prior knowledge and the use of a review.
- The introduction of LIP has led to the introduction of a wider range of teaching strategies and a more focused approach to lesson planning.
- Pupils respond in a more focused manner through a sequence of short activities, delivered with pace, particularly when they have a clear understanding of the task and when teacher exposition is not too extensive.
- CSS is developing pupil capacity in both active learning and meta-learning, primarily through its 'Enrichment' programme.
- The involvement of teachers at CSS in the research process has led to heightened CPD.
- The research findings have aided the process of effective school evaluation and the process of school improvement planning
- Overall, pupils at CSS have a broadly positive view of education and appear to value opportunities to express 'pupil voice'

Formal theory propositions, which are more conceptual, and which have applications beyond CSS, to other secondary schools, are:

- The use of a lesson planning structure, based on an experiential learning cycle (e.g. Kolb, 1984; Smith, 1996, 1998; Smith *et al*, 2003; Greenhalgh, 2002), which stresses the importance of prior knowledge, which allows for the sharing of the objectives of the lesson with pupils, and which reviews the work at the end of a lesson, aids effective pupil learning, particularly if, through a cyclical approach it enhances meta-learning by referring to the processes of learning. This supports the view of, for example, Smith (1998), Carnell and Lodge (2002) and Hamer *et al (*2006) and has important links to AfL strategies (e.g. Black and Wiliam, 1998; Assessment Reform Group, 1999; Black *et al*, 2002, DfES, 2004a and Deakin-Crick *et al*, 2005).
- The use of a range of activities that engage pupils within a structured lesson helps pupil motivation, a point also stressed in the final report of L2L (Higgins *et al*, 2007: 81). Although I have been unable to ascertain clearly what is meant by VAK learning styles the apparent enthusiasm for it revealed amongst my wider survey may well have led, as noted by Wicks (2006), to a greater use of activities that children find enjoyable and engaging and which can help to increase their readiness to learn.
- Although it is questionable whether it is possible to accurately identify what a learning style is, it may be possible that pupils do have preferred learning styles, but it would appear to be beneficial that they should strive to use a range of other learning styles.

Concluding comments

Overall, there appears to be some evidence to support hypothesis one that the introduction of LIP has had some positive impact on pupil learning, but much less to support the second hypothesis that the use of preferred learning styles has had a positive motivational effect on pupils. However, it has been argued that an awareness of this has quite possibly led to, at least, the acknowledgement and partial introduction of, a wider range of active learning strategies and that the pupils have been motivated by them. There were many similarities between the views of the teachers at CSS and teachers from other schools, implying that the practice and attitudes in CSS are broadly similar to those in other schools:

- Both agree that DfES guidelines aim to improve pupil attainment and that schools should respond to them
- The use of a range of activities was seen to help pupil motivation,
- Both stress the importance of prior knowledge, sharing with pupils what they need to do and reviewing the work at the end of the lesson
- The perception that knowledge of a pupils' learning style is important and that accelerated learning is not limited to primary schools.

What is quite evident from my work and from talking to teachers, both at CSS and elsewhere, is that teachers do regularly refer to learning styles, especially "Kinaesthetic" learners. What they understand by the terms, what they do in response, and whether, and how, it impacts on the pupils needs further investigation. This must include the pupil perspective. It seems to be very easy for schools to measure VAK learning styles and many schools are doing just that, although I had no way of knowing what instruments they were using to do this. I strongly suspect, but cannot confirm, that like CSS, they were using VAK questionnaires that were easy for the pupils to use, easy to administer and easy to analyse. It is not possible within the scale of this research to explore the huge plethora of VAK questionnaires available online (over 3000 worldwide and over 300 in the UK alone). However, I would comment that all of the ones that I have seen (a very small percentage of this figure, admittedly) appear to be very simplistic, and that I struggled to decide for each statement whether I was a Visual, Auditory or Kinaesthetic learner. This appeared to be true for many of the pupils at CSS and reinforces the findings by Lisle (2005b) and McLaughlin *et al* (2006). The advice by NSIN (2005:5), and the approach adopted by CSS, to encourage pupils to appreciate the relative advantages and disadvantages of a range of learning styles would appear to be sensible.

I can conclude that LIP has had a positive impact, primarily because it has acted as a stimulus in enabling teachers to focus on the quality of learning in their lessons and that, to a certain extent, this can be identified through pupil comments and reactions in lessons. I have argued that, where the pupils are actively engaged in their learning, then it appears to have a beneficial effect on their motivation, a point also noted in the final report of L2L (Higgins *et al*, 2007: 81); this report also comments that the key factors for attainment seem to be motivation and self-esteem. I have, earlier in this thesis, noted that CSS is very aware that the self-esteem of many of its pupils is an issue, and this is something that CSS will need to continue to work on in the future.

Pupils at CSS appeared to have largely forgotten about learning styles from year 7 to year 9, a view reinforced by the pupil feedback to the research findings in appendix 3. Perhaps if CSS continues to make its pupils aware of VAK and Multiple Intelligences (as it plans to do) it should place greater emphasis on its applicability across the curriculum and across the age range; this may have the added effect of heightening the pupils' learning experiences through a wider range of active learning approaches.

CSS appears determined to continue to work hard to improve the learning experiences of its pupils. However, it must be recognised that this is part of a long, probably slow process, which will need to react with, and complement, other initiatives, notably AfL, the planned involvement in Alite from September 2007 and the introduction of a new national curriculum at KS3 and 4 the year after (Qualifications and Curriculum Authority, QCA, 2007a). It is envisaged that this new curriculum will both allow CSS to further tailor learning to their pupils' needs through a reduction in the prescribed subject content and lead to a greater degree of cross-curricular planning (QCA, 2007b). Hopefully this will counter some of the problems of curriculum overload that the science staff at CSS had indicated presented a barrier to the full implementation of LIP, in particular active approaches to learning, especially at KS4 and lead to the use of 'more creative and innovative teaching and learning approaches' (QCA, 2007a). There does seem to be a consensus amongst those responding to an online questionnaire (QCA, 2007b) that such a move would be beneficial to schools and there has also been an emerging critique of the formulaic approaches to teaching and learning (e.g. Lambert, 2004; Ofsted, 2004).

I have argued that the teachers at the school have reported some benefits from my study and hopefully this will lead to longer-term effectiveness in pupil learning. I do recognise, however, that it is not possible to infer that my findings are applicable to all pupils at CSS; equally the case study is best considered as an example from a specific school rather than being put forward as a model of practice. Nonetheless, I would argue that my findings do serve to add useful illumination to complement findings from other research in the complex arena of effective pupil learning.

The science teachers have commented that they have welcomed the opportunity to have some involvement in action research and enquiry and that the whole research process has been supportive of their professional development. On a personal level I have gained, through this study, a greatly heightened understanding of areas of educational research and policy documents and how one school in particular has attempted to interpret and work with them. This in turn will, I believe, further strengthen the PGCE science course at Liverpool Hope University.

APPENDICES.

1. **Summary of the evaluation by the Senior Management Team/science teachers at CSS.**

2. **Summary of the research findings presented to y10 pupils (2007-8) at CSS.**

3. **Summary of the pupil feedback on the research findings presented to y10 pupils (2007-8) at CSS.**

APPENDIX 1
Summary of the evaluation by the Senior Management Team/science teachers at CSS *(11 respondents, n=11)*

Please indicate the degree of agreement with each of the statements in the table

Statement	*Strongly agree*	*Agree*	*Neutral*	*Disagree*	*Strongly disagree*
The report can be used as part of whole school evaluation	10	1			
The report enables me to reflect on current practice within the school	7	4			
The report enables me to reflect on my own practice	8	3			
The report has highlighted areas of current strength	5	5	1		
The report has highlighted areas for further development	6	5			
The report will be useful as an aid to future strategic planning	7	3	1		
It is useful to have an indication of the 'pupil voice'.	10		1		
It is useful to have a comparative view from teachers in other schools	5	5		1	
The report generally confirms my own judgements on practice within the school	6	4	1		
The report has highlighted a number of areas that were surprising	2	4	5	2	
Overall, the report is useful	6	4	1		

Using the same weighting scales as in earlier questionnaires and converting to weighted percentage agreement produces:

Statement	**Weighted percentage agreement**	**Level of Agreement**
The report can be used as part of whole school evaluation	+95	Very strong agreement
The report enables me to reflect on current practice within the school	+82	Very strong agreement
The report enables me to reflect on my own practice	+86	Very strong agreement
The report has highlighted areas of current strength	+68	Strong agreement
The report has highlighted areas for further development	+77	Very strong agreement
The report will be useful as an aid to future strategic planning	+77	Very strong agreement
It is useful to have an indication of the 'pupil voice'.	+95	Very strong agreement
It is useful to have a comparative view from teachers in other schools	+64	Strong agreement
The report generally confirms my own judgements on practice within the school	+73	Very strong agreement
The report has highlighted a number of areas that were surprising	+27	Some agreement
Overall, the report is useful	+77	Very strong agreement

(Eleven respondents, n = 11).

ADDITIONAL COMMENTS. *Please feel free to add any other comments on the report, including the progress of the research.*

This work is really useful, not just to (CSS) but to other schools. You have used language so skilfully to describe what's happening- it's really clear without being threatening.

(Female, SMT)

Some of the comments about VAK were surprising: I thought that lots of our kids were Kinaesthetic learners.

(Male, Science teacher)

I have really valued the opportunity for feedback on my teaching… it has helped me to improve. I appreciated your comments on using time indicators more: this really helped.

(Female, science teacher)

I am rather concerned about some of the pupil comments on the start of a lesson and too much teacher talk and not enough activities – these are areas that we need to continue to work on; however it is good to see that much of what we are trying to do is having an impact – thank you.

(Female, SMT)

It has been exciting to feel that I have been involved in research; I have enjoyed the experience.

(Female, science teacher)

It has been good professional development. I now use open questions a lot more and have seen that revisiting learning objectives helps them (the pupils) and me.

(Male, science teacher)

This will really add powerful evidence for Ofsted that we are genuinely involved in evaluating our work – can you do any more!?

(Male, SMT)

APPENDIX 2: Summary of the research findings presented to y10 pupils (2007-8)

Liverpool Hope University

I have been working with your teachers since you were in year seven, looking at what types of things help you to learn more effectively and I feel it is only right to share the main findings with you, as well as your teachers. I found that, lessons seemed to be more effective if:

1. they have a calm, quick, start,
2. a starter activity is used to focus the learning
3. the teachers tell you what the lesson is going to be about (they share the lesson objectives
4. the teachers find out what you already know about what you're going to cover
5. you are actively involved in the lesson
6. you don't get distracted (and you don't distract others)
7. you are praised when you deserve it
8. the lesson is broken down into several short activities
9. there is a range of ways by which you make notes
10. there is a balance between teachers and pupils talking
11. the teachers review how much of the lesson you've understood at the end of the lesson

Other things, that probably need a lot more research, include:

- you identified your preferred learning style in y7 and 8, but it is better if you develop a range of different learning styles
- some pupils (often boys) seem to prefer working on their own; others (often girls) preferred group work.

I, and your teachers, would be very interested in finding out what you think about them- could you please answer the questions that follow.

Many thanks
John Storrar
Liverpool Hope University

APPENDIX 3: Summary of the pupil feedback on the research findings presented to y10 pupils (2007-8) at CSS.

Statement /Weighted percentage agreement	All pupils n = 161	Boys n = 74	Girls n = 87
It is important that lessons start calmly	+55	+49	+ 58
Starter activities help me settle	+47	+44	+50
It is important that I know what the lesson is going to be about	+38	+39	+34
It is important that my teachers find out what I already know about a lesson.	+27	+24	+31
I learn better if I am actively involved in the lesson	+56	+73	+53
Lessons should be broken down into several short activities	+41	+40	+43
It is important that my work is reviewed at the end of a lesson	+38	+33	+42
Knowing my preferred learning style helped me to learn better	+5	-3	+6
I learn best by myself	+9	+10	-13
I learn best through group work	+ 49	+ 37	+63

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