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THE ROLE OF STUDY SUPPORT FOR PUPILS FROM SOCIALLY DISADVANTAGED BACKGROUNDS

by

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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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ABSTRACT

For a number of years it has been recognised that there is an association between social disadvantage and academic achievement, with young people from socially disadvantaged backgrounds achieving less than their peers. A range of initiatives and strategies has been adopted to address this. The belief that it would raise the academic achievement of young people was an important catalyst in the development of study support. This research explores the extent to which participation in study support benefits pupils from disadvantaged backgrounds and whether it could be adopted as a strategy for tackling the effects of disadvantage.

The study used the dataset gathered for the National Evaluation of Study Support – a three-year longitudinal evaluation of the impact of study support on the attainment, attitudes and school attendance of 8,390 secondary school pupils. The study extended the National Evaluation by focusing on pupils from socially disadvantaged backgrounds, with entitlement to free school meals being used as the indicator of social disadvantage. In relation to these pupils it:

1. explored additional outcomes (the National Evaluation was limited to attainment and one of the five factors from the attitude questionnaire)
2. investigated school effects (the National Evalution explored school effects for the entire sample, but not for FSM pupils specifically).

The study confirmed the finding from the National Evaluation that study support has a greater affect for FSM than non-FSM pupils in relation to attainment (when using the Best 5 score). No such difference was found with regard to the additional outcomes (school attendance and attitudes). No school effects were found for FSM pupils in relation to any outcomes although, as with the National Evaluation, school effects were identified in relation to all pupils.

While the National Evaluation relied on regression analysis, the present study used multilevel modelling which is statistically more powerful.

Chapter One:
WHAT IS STUDY SUPPORT?

THE NATURE AND SCOPE OF THIS THESIS

For a number of years it has been recognised that there is an association between social disadvantage and academic achievement (see, for example, Douglas 1967, Davie *et el* 1972 and Mortimore & Mortimore 1986), with young people from socially disadvantaged backgrounds achieving less than their peers. Indeed Mortimore and Whitty (1997) argue that "those who have had most to gain from education have often been the least able to do so" (p.1).

A range of initiatives and strategies has been adopted to tackle disadvantage. These strategies have been categorized by Mortimore and Whitty (1997) as:

1. meritocracy (the assumption that those with talents will rise to the top through public competition)
2. compensatory mechanisms for individuals (e.g. free meals and clothing grants) and the allocation of additional resources to schools (e.g. the Educational Priority Area programmes)
3. intervention programmes (including *High Scope* and *Success for All* in the United States, the *Reading Recovery Programme* in New Zealand and the *Early Years Nursery Study* in the United Kingdom).

An important catalyst in the development of study support was the belief that it would raise the academic achievement of young people. It was promoted in some schools with particularly high proportions of young people from disadvantaged backgrounds in the hope that it would benefit these pupils (MacBeath *et al* 2001). Within these schools study support could be considered, in terms of Mortimore and Whitty's categorization, as both the allocation of additional resources (number 2) and an intervention programme (number 3).

The study reported in this thesis explored whether participation in study support does indeed benefit pupils from disadvantaged backgrounds and whether it could therefore be adopted as a strategy for tackling the effects of disadvantage.

The study made use of the relatively recently developed technique of multilevel modelling. The thesis therefore explores the use of multilevel modelling as an approach to analysing a large dataset.

The indicator of social disadvantage used within the study was entitlement to free school meals. The thesis includes some discussion on the appropriateness of the use of this variable within the present and other research studies. Throughout the thesis, the free school meal variable is often shortened to the commonly used abbreviation 'FSM'. Some other authors use the abbreviation 'FME' (i.e. free meal entitlement), which has the same meaning as FSM. In the interests of uniformity, only FSM is used in this thesis.

The methodological issues of multilevel modelling and the use of the free school meal indicator will be discussed in a subsequent chapter (Chapter 4). The present chapter will set the scene for the research reported in this thesis by introducing the concept of study support. A definition of study support is offered and a model into which different forms of study support activities can be located is presented. The range of guides to good practice that have been published recently and the organisations that support the development of study support are discussed.

STUDY SUPPORT: A DEFINITION

In 1998 the Department for Education and Employment published *Extending Opportunity: A national framework for study support.* This document defined study support as:

> ...learning activity outside normal lessons which young people take part in voluntarily. Study Support is, accordingly, an inclusive term embracing many activities – with many different names and guises. Its purpose is to improve young people's motivation, build their self-esteem and help them to become effective learners. Above all it aims to raise achievement. (DfEE 1998, p.1)

A wide range of activities is included within this definition. The document lists a variety of examples:

- homework clubs (facilities and support to do homework)
- help with key skills, including literacy, numeracy and ICT
- study clubs (linked to or extending curriculum subjects)
- sports, games, and adventurous outdoor activities
- creative ventures (music, drama, dance, film and the full range of arts)
- residential events – study weeks or weekends
- space and support for coursework and exam revision
- opportunities for volunteering activities in the school or community
- opportunities to pursue particular interests (science, ICT, law, archaeology, languages)
- mentoring by adults or other pupils
- learning about learning (thinking skills, accelerated learning)
- community service (crime prevention initiatives, environmental clubs).

(DfEE 1998, p.7)

The DfEE's definition of study support has been adopted by a plethora of reports. For example, Sharp *et al* (1999a) of the National Foundation for Educational Research used the DfEE definition in their review of opinion and research on the benefits of study support and Keys *et al* (1999) cite the definition in the report of their survey of the provision of out of hours learning activities in primary, secondary and special schools. Although Keys *et al* had undertaken their survey prior to the publication of the DfEE document, the report (which was published after the DfEE document) concluded that their definition fell within that of the DfEE.

The above – and other (e.g. MacBeath 1997) - definitions of study support have a number of common criteria. These include the fact that study support activities:

1. are aimed at children of school age and are linked to schools
2. encompass activities taking place outside of normal school hours (i.e. before and after school, at breaktimes, weekends and in school holidays)
3. are attended on a voluntary basis
4. can be extremely diverse and varied in nature, but all aim to assist pupils' learning, raise achievement, and/or to promote positive personal and social change (e.g. attitudes to learning, motivation, self-esteem and teamwork).

(adapted from Sharp *et al* 1999a, p.2)

A further specific criterion found in some definitions of study support (e.g. MacBeath 1997 and DfEE 1998) is the promotion of self-directed learning and the encouragement of pupils to take responsibility for their own learning.

While the above criteria are present in many definitions of study support, the first four are worthy of comment. Criterion 1 states that study support activities are linked to schools. Although most study support activities are indeed linked to schools, it is important to note some activities are based outwith schools. The Codes of Practice that have been published for study support in public libraries (Botten *et al* 1999) and youth work (National Youth Agency 2001) are evidence of this. Criterion 2 states that activities take place outwith normal school hours and Criterion 3 states that activities are attended on a voluntary basis. However, some schools have shortened the length of the school day in order to create more time for study support activities after school (see, for example, Griggs & Griggs 1993). In these schools there is often an expectation, if not a requirement, that pupils will attend study support activities. Although it is recognised that study support activities are qualitatively different from "normal" school lessons, for pupils in these schools it could be argued that these activities have merely replaced part of the traditional school day - they do not take place outwith conventional school hours and attendance is not voluntary. Further evidence that attendance at study support is not always voluntary can be found in the anecdotal accounts that in some schools (not just those in which the length of the school day has been shortened) certain categories of pupils (e.g. lower attaining pupils) are actively encouraged by teachers to attend study support, while other pupils are either discouraged or simply not permitted to attend. The fourth criterion emphasizes the wide range of activities that can be considered to be study support. Indeed, a sceptic might well ask whether there are any activities that would not fall within this criterion.

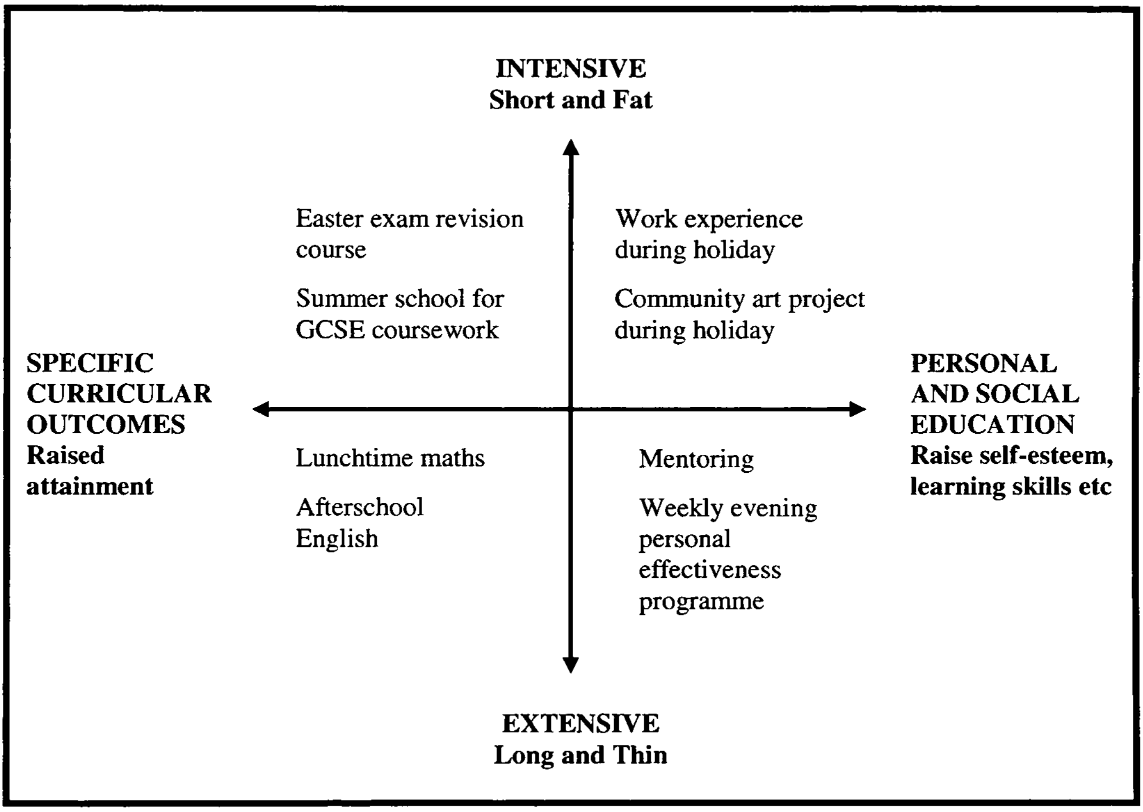
It is important to establish at the outset that study support is not new in the sense that extra-curricular activities have been provided by schools for years. What is new is an appreciation of the benefit for young people who participate in these activities and the availability of funding and other support to develop the provision of study support (DfES 2002).

Study support is one of a range of services, including 'wraparound' childcare from 8am to 6pm, adult education, parenting support programmes, community-based health and social care services and multi-agency support services, to be offered on a single site through the Government's extended schools initiative (DfES 2005). It is the Government's intention that all children and young people will be able to access these extended services by the year 2010.

A MODEL OF STUDY SUPPORT

Despite the wide variety of study support activities offered within schools (and other settings), MacBeath (1997) suggests that all of these activities can be categorized according to two main characteristics – purpose and structure. While purpose can range from specific curricular outcomes to more general outcomes for personal and social education (e.g. raised self-esteem), structure can vary from intensive (e.g. a "one off" weekend course) to extensive (such as a weekly after-school or lunchtime activity that is offered over a term or possibly a year). Figure 1.1 shows this model diagrammatically and provides some examples of how different activities are accommodated within the model.

Figure 1.1: **Dimensions of study support**



Adapted from MacBeath (1997) p.2

It is certainly possible to place most study support activities within MacBeath's model. While, factually, the structure of an activity must be either intensive or extensive, the purpose of the activity may not necessarily be as clear-cut. Most activities will have stated aims which are either curricular or personal and social, but in reality the distinction between curricular and personal and social education outcomes may be blurred. For example, an after school maths club may have the stated aim of raising pupils' attainment in maths but the fun activities undertaken by pupils at the club may attempt to do this through first raising the pupils' self-esteem and confidence (i.e. through personal and social education). Similarly, participation in a lunchtime club which has the stated aim of raising self-esteem may well result in both raised self-esteem and raised attainment. An additional factor to consider in placing study support activities within MacBeath's model is that the same activity may benefit different pupils in different ways.

This criticism of MacBeath's model suggests that a more sophisticated model is required which recognises that the benefits of participation in a study support activity can be multifaceted and interconnecting and not necessarily limited to either curriculum or personal and social outcomes. Following a review of the study support literature, such a model was developed for the research reported in this thesis. The model is presented towards the end of Chapter Two.

MacBeath's distinction between 'extensive' and 'intensive' study support is retained throughout the thesis. As is explained above, all study support activities are either 'extensive' (i.e. long-term, often spread over a term or more) or 'intensive' (i.e. short-term, possibly offered over a weekend or during a holiday week).

Given the possibility for the outcome-related categories of 'specific curricular' and 'personal and social education' to become blurred, this thesis uses instead the activity-based categories of 'subject based study support' and 'non-subject based study support'. The particular study support activities included within 'specific curricular' and 'subject based' are generally the same (i.e. activities based on coursework, especially in preparation for externally-assessed examinations), as are those included within 'personal and social education' and 'non-subject based' (i.e. activities not based on coursework, but on raising self-esteem and confidence etc).

However, by focusing on the basis of the activity, 'subject based' and 'non-subject based' are more clear cut than the outcome-related headings. The outcome of attending a particular study support activity might vary across pupils, but the basis of an activity (i.e. whether it is subject based or non-subject based) will not vary.

GUIDES TO GOOD PRACTICE

A number of guides to good practice have been published. These are targeted at teachers, and professionals in other settings (e.g. libraries), who are responsible for developing study support centres.

A key text in this respect is *The Code of Practice for Study Support: A guide for secondary schools* (MacBeath 1999) which was published in 1999 as part of the Study Support National Evaluation and Development Programme (see the later section in this chapter on organisations to support the development of study support). MacBeath (1999, p.1) argues that the publication of the code "marks an important step forward in the national drive to raise achievement". Informed by the experiences of study support centres using a trial version of the Code, the document outlines principles of good practice for those setting up or running study support centres in secondary schools and includes case studies which illustrate the Code in practice. The Code:

- identifies common principles in study support drawing on examples of good practice from around the country
- provides a framework of standards with identifiable success criteria which schools can use to evaluate and improve practice
- suggests strategies and sources of support which can help schools and other organisations to meet higher standards.

(MacBeath 1999, p.1)

The Code is designed to be a flexible planning and quality assurance tool. It is to be used as a framework for self assessment and throughout the text the reader is presented with questions to ask and suggestions of documentary evidence which might be collected and how that evidence might be tested. The Code can be used to: ensure that provision is closely linked to overall purposes and is really targeted at identified needs, pin point areas for development and help set priorities for future action, ensure that all stakeholders; students, parents and teachers are fully involved in building a quality study support programme, provide a foundation for building partnerships with other agencies; businesses, libraries, youth and community services based upon recognised standards of good practice and provide a benchmark for internal and external comparison.

Three categories of good practice in study support are described: (1) emerging, (2) established and (3) advanced, and schools are invited to use the questions to determine into which of these three categories they would place themselves. The Code offers advice on evaluating the impact of study support in individual centres and this will be returned to in Chapter 2 (see the section entitled "Evaluating study support").

A revised Code of Practice was published in 2004 (Wilson *et al* 2004). While the format of the revised Code is identical to that of the 1999 edition, the 2004 edition includes updated examples of best practice. In addition to the 1999 and 2004 Codes of Practice for secondary schools, a Code of Practice has been published for Scottish primary schools (MacBeath 2000). The importance of encouraging primary school children to get involved in extra-curricular activities is also stressed by Education Extra (undated) in, *After-School Activities in London: Examples of good practice in London primary schools* - another document that offers advice to those responsible for setting up primary school study support activities

As is reported earlier in this chapter, Codes of Practice have also been published for study support in public libraries (Botten *et al* 1999) and youth work (National Youth Agency 2001).

Based on the experiences and work of teachers involved in after-school activities, *After-School Activities in London: Examples of good practice in London primary schools* offers a checklist of good practice, including the need to consider preparation and planning, organisation and delivery, teaching and learning and outcomes (Education Extra, undated a p.20).

A further example of a guide to good practice in study support is Andrews *et al* (1996)'s *Good Policy and Practice for the After-School Hours.* Advice on art-related study support activities can be found in Education Extra and the London Institute (undated), while The Wildlife Trusts (2000) provides advice on environmental education.

As its title suggests, *Schools and Volunteers – A good practice guide to using volunteers after school* (Education Extra 1998) provides advice on the use of volunteers in study support activities. This document comments on the benefits of the increased involvement of volunteers (e.g. parents, work experience students and local business personnel) as part of the learning team within the school day and after-school.

The report was based on a research project conducted by Education Extra and funded by Lloyds TSB Foundation. The project included a survey, visits and interviews with a range of schools and schemes. The research found that there is a "pool of people with a vast array of skills and talents which schools could benefit from" (p.29), including: parents, school support staff (e.g. caretakers and administrative staff), older pupils, ex-pupils, students from other schools and colleges and members of the local community. Such volunteers help in a "glorious array of activities" (p.4), including dancing, gymnastics, flower arranging, music, Spanish, football teams, mentoring and teaching traditional games to younger children.

It was reported that the volunteers brought benefits to the school through their creativity and enthusiasm. It was also found to be beneficial for the volunteers themselves, who described their experiences as a volunteer as both enriching and pleasurable.

Some of the obstacles that schools can meet when endeavouring to involve volunteers in the school are identified by Education Extra. These include: unreliability/lack of commitment, lack of confidence, unsuitability or conflict of ethics/approach, concerns about confidentiality, individual skill base and insurance (lack of a qualified member of staff to supervise).

The report concludes:

> As we approach the new millennium, the need for extended learning experiences and a move towards lifelong learning has never been more important. Volunteers have the potential to play a vital role in enriching the education of children and young people. We hope that this report might encourage more schools to consider the benefits to be gained from enlisting the support of more volunteers, particularly in their growing after-school programmes, to enhance and enrich the life of the school.
>
> (Education Extra 1998, p.5)

The guides reviewed above have a number of positive aspects. They provide a mechanism to showcase examples of good practice and outline common standards that schools and local authorities should strive towards when providing study support activities. They encourage providers of study support to engage in self-assessment and suggest a range of evidence that can be used for that purpose. One drawback of the guides is the possibility that they stifle innovative practice. The qualitative evidence (see, for example, MacBeath *et al* 2001) suggests that study support is most effective when it is perceived by the pupils as being different for 'normal' school and this requires schools to be innovative in the delivery of activities. Schools, however, may feel obligated to simply replicate the activities described in the guides and/or lack the confidence to develop new approaches to study support.

ORGANISATIONS TO SUPPORT THE DEVELOPMENT OF STUDY SUPPORT

A number of organisations have been established to support the development of study support activities throughout the United Kingdom. Over the years, several of these organisations have evolved in terms of their titles and the services which they provide. Some of these changes have resulted from the temporary nature of the available funding.

The Study Support National Evaluation and Development Programme, the Study Support Quality Development Programme and the QISS Recognition Scheme

The National Evaluation and Development programme was formally established, with interest and funding from the then DfEE, in 1997. It had resulted from an earlier partnership, begun in 1996, involving The Prince's Trust, two Inner London local education authorities and an (English-based) training and enterprise council. The aims of the programme were to:

- ascertain the impact of participation in study support activities on the attainment, attitudes and attendance of a large sample of students in secondary schools serving disadvantaged areas
- develop and disseminate models of good practice, through the support to school of Critical Friends, and training events and publications.

(MacBeath *et al* 2001, p.13)

The schools involved in the project met termly throughout the programme, twice in residential conferences. The objectives of these training events were to feedback emergent findings, to disseminate good practice and to foster the self-evaluation aspects of the programme. The key findings from the final report of the National Evaluation and Development Programme will be discussed in Chapter 2.

The work of the Study Support National Evaluation and Development Programme has been continued through the Study Support Quality Development Programme (a

DfES initiative, established in 2003). This Programme is delivered by a team of consultants working for the QiSS (Quality in Study Support) Recognition Scheme through the Centre for Education Leadership and School Improvement of Canterbury Christ Church University. QiSS aims to support schools, LEAs and other educational organisations in raising students' achievement, motivation and self-esteem. The Scheme provides public recognition that the standards embodied in the Study Support Codes of Practice are being met. It uses a quality assurance approach based on self-evaluation, peer scrutiny and the key indicators set out in the Codes of Practice. Further information about the QiSS Recognition Scheme and the Study Support Quality Development Programme can be found on the QiSS website (www.canterbury.ac.uk/education/departments/professional-development/centres/quality-in-study-support).

Education Extra and ContinYou

Education Extra was established in 1992 with the mission of "putting after school activities within the reach of every child". The priorities of the organisation included:

- helping study support co-ordinators in local authorities to develop robust, sustainable, coherent and imaginative policies for study support
- demonstrating the links between out-of-school-hours learning and in-school achievement
- promoting family and social inclusion through study support
- enthusing, informing and enabling community partners and bringing teachers and other professionals together to share enthusiasms and skills.

(Education Extra 2000b, p.2 abridged)

The director, Dr Kay Andrews, was "well known for her articulate advocacy of out-of-school learning opportunities" and recognised as "a seminal influence in educational thinking" (Snowden 1999, p.17). The organisation published research and evaluation reports on good practice in study support. It made awards ("for Innovation and Excellence") of between £250 and £5000 each year in money and equipment to schools putting forward worthy schemes for developing and reporting.

The organisation also provided training materials for schools, local authorities, teachers and other adult helpers. In addition, the Diana, Princes of Wales Memorial Award for Young People was awarded to secondary pupils nominated by their schools for exceptional service to the school or the community, or for personal development in the face of adversity. Education Extra supported a national network of schools and education authorities.

Further information about the work of Education Extra can be found in *Good Policy and Practice for the After-School Hours* (Andrews *et al* 1996), *How We Help: Young people, school and communities, Annual Report 1999-2000* (Education Extra 2000), *Extra Class: Highlighting excellence in out-of-school-hours learning* (Education Extra 2000) and *Study Support in Extra Time in the United Kingdom* (Snowden 1999).

In November 2003, Education Extra amalgamated with CEDC (the Community Education Development Centre) to form ContinYou. Within the more general aims of the creation of lifelong learning opportunities, ContinYou has continued to develop the work instigated by Education Extra through programmes (such as breakfast clubs), training packages and conferences. A new subscription service for schools, the ETC (Extending to Communities) Network, was launched in May 2006 to replace two established networks (Extra Community and Extra Time).

The ContinYou website (www.continyou.org.uk) provides access to a range of study support-related resources, including:

- briefing papers (e.g. strategy guides, good practice guides and job descriptions for co-ordinators)
- free resources for schools, local authorities and parents (e.g. guides on setting up clubs, activity sheets and guides for parents)
- funding (e.g. advice on identifying grant-making trusts and writing successful grant application letters)

- an online reference library of documents relating to study support (including reports that provide evidence of the impact of study support and policy and guidance documents).

ContinYou, QiSS and UFA (the University of the First Age, see www.ufa.org.uk) have worked collaboratively in the development of extended learning. A joint statement of intent (published in 2005) is available on the ContinYou website.

Further information regarding ContinYou can be found in ContinYou (2004) or on the website.

The Scottish Study Support Network

The Scottish Study Support Network was established in 1999 to support all those involved in promoting and delivering study support and out-of-school-hours learning in Scotland. The Network provided local and national seminars and conferences, support to local networks, training, consultancy and publications. Funded by the then Scottish Executive Education Department, the Network was based within the Quality in Education Centre at the University of Strathclyde. The Network's management group included representatives from QIE and ContinYou. In addition to publishing a newsletter (*Engage)*, the Network also maintained a website. In 2007 the management of the Network transferred to Learning and Teaching Scotland. The website, which also transferred to Learning and Teaching Scotland, has been temporarily suspended.

The organisations described above share a number of laudable, common aims. Using a range of approaches - including conferences/training events, briefing papers/publications, networks/forums and websites (with on-line resources) - they aim to share good practice amongst schools and local authorities and promote quality assurance through self-evaluation. A limitation of some of these organisations has been their reliance on short-term funding. As is indicated above, the temporary nature of the funding has resulted in evolution for several organisations. For some organisations there has been a change of title, others have been forced to merge, change their priorities or change the services which they deliver. This has resulted in some uncertainty for the schools and local authorities who have come to depend on these organisations.

SUMMARY

By way of a prologue to the research reported in the thesis, this chapter has introduced the concept of study support. A definition of study support has been offered which demonstrates the diverse range of forms that study support can take. A basic model for categorising study support activities was presented. The model distinguishes between 'extensive' and 'intensive' study support and that distinction is used in this thesis. In the interests of clarity, the outcome-related categories of 'specific curricular' and 'personal and social education' have been replaced – for the purposes of this thesis - with the activity-related categories of 'subject based' and 'non-subject based'. The recently published guides to good practice and the growth of organisations to support the development of study support demonstrate the commitment of the Government and other agencies to the expansion of study support.

Chapter Two:
STUDY SUPPORT LITERATURE REVIEW

This chapter will review the literature on study support. As is explained in Chapter 1, this thesis is concerned with the benefits of participation in study support for pupils from socially disadvantaged backgrounds. The chapter will critique previous research studies which have investigated the impact of study support. It will explore the reported benefits of participation in study support and any additional benefits for pupils from disadvantaged backgrounds. Where appropriate, distinction is made between subject based and non-subject based study support and extensive and intensive provision. (See Chapter 1 for an explanation of these categories.) Consideration will be given to the range and strength of evidence gathered in these studies. In order to place this in context, the chapter will begin by reviewing the literature that describes examples of study support activities, attempts to quantify the provision and take-up of study support and reports on the documented benefits of participation in study support. These three introductory sections have been included to indicate the nature and extent of the study support activities reported in the literature.

SOME EXAMPLES OF STUDY SUPPORT ACTIVITIES

The literature contains many descriptive accounts (including international narratives) of study support projects. While some of these accounts take the form of "good practice guides", others have been written for more academic audiences in the form of journal articles and book chapters. Those included in this section have been selected because they indicate the wide range of activities documented in the literature and explain some of the varied reasons why they were introduced. They include subject based and non-subject based activities and both extensive and intensive provision.

An example of a "good practice guide" which includes descriptions of study support projects is Education Extra's *After-School Activities in London: Examples of good practice in London primary schools* (Education Extra, undated a). The case studies cited in this document include: Steel band project, Green fingers club, Focus on literacy and numeracy, Art and design club and Family literacy club.

Table 2.1 lists some further examples of good practice guides/documentation which provide illustrations of study support activities.

Table 2.1: **Examples of documents providing illustrations of study support activities**

Generic Activities	*Extending Opportunity: An national framework for study support* (DfEE 1998) *Code of Practice for Study Support: A guide for secondary schools* (MacBeath 1999) *Extra Class: Highlighting excellence in out-of-school-hours learning* (Education Extra 2000a) *Breaking Barriers – Provision and participation in an out-of-school centre* (Mayall & Hood 2001) *Playing for Success: An evaluation of its long term impact* (Sharp *et al* 2007) *How We Help: Young people, schools and communities, Annual Report 1999-2000* (Education Extra 2000b) *Statewide Networks Shape Future of Afterschool* (Mott Foundation 2004) *Working Together to Build Beacon Centres in San Francisco: Evaluation findings from 1998-2000* (Walker & Arbreton 2001)
Homework Centre	*Reflections on an Aboriginal Homework Centre: Progressive pedagogies and ethnomathematics* (Maratos 1998)
Environment	*The Role of Outdoor and Field Study Centres in Educating for the Environment* (Cooper 1991) *Sowing the Seeds of Success: Building a foundation of environmental learning through study support* (The Wildlife Trusts 2000)
Summer Schools	*Making the Most of the Holidays: What schools are doing in the holidays to raise achievement* (Education Extra, undated b) *The Summer Literacy Schools: An evaluation of the 1997 pilot scheme by Education Extra* (Andrews 1997)
Mentoring	*Review of Industrial Mentoring in Schools* (Golden & Sims 1997)
Art	*Art Out: Connecting art students with schools* (Education Extra & The London Institute undated)

The more academic accounts of study support projects include Burgess' (2000) description and personal reflection of her work as a Paul Hamlyn Fellow and an Extended Learning Centre Development Officer within the University of the First Age (UFA) Extended Learning Centres in Birmingham. The UFA has been working to set up opportunities for out of hours learning in Birmingham since 1996. Beginning initially with summer schools, the work progressed to include Extended Learning Centres sited in schools and community groups. UFA activity is founded on the belief that everyone has the potential to experience success and is influenced by Howard Gardner's research, in particular his theory of Multiple Intelligences (see Gardner 1984). There are four categories of UFA Extended Learning Centre activity: skill development courses (e.g. "learning to learn" and "thinking skills" courses), extension courses, enrichment courses and supported study (these tutor-led sessions are different from "drop-in" study support in that students are encouraged to make use of strategies such as accelerated learning techniques, learning-to-learn strategies and the brain gym).

As with many study support activities, at the centre of UFA philosophy is the belief that all young people have the potential to experience success. Burgess warns that teachers sometimes fail to recognise the potential of their pupils:

> How easily are we dragged into staffroom talk which scales down the possibilities for individuals? How often do we choose to use language that labels students, "more able", "less able"? Is the language we use limiting our thinking? As teachers we may aim to focus our attention on the potential of every student, making it our goal to assist each one to realise their full potential. But how often do we feel that we actually do this?...Perhaps a more creative approach to teaching and learning is needed to really open up opportunities for ALL to achieve success? (Burgess 2000, pp.235-236)

Griggs and Griggs (1993) describe the establishment of study support activities in Willingdon School, East Sussex. These activities were introduced as part of a restructuring of the school day which included earlier starting and finishing times and a reduction in the duration of the lunch break. It was undertaken in an attempt to address a number of issues including:

- the deterioration of pupils' concentration in the last two periods of the day following the afternoon break
- the GCSE needed pupils to engage in more independent study
- reduced lunch-time supervision duties and the number of accidents/incidents at lunch-time
- pupils could travel home in the daylight (even in mid-winter) and pupils do not need to travel to school during the peak time for accidents
- there would be time for after-school clubs.

The restructuring enabled the establishment of a homework club every afternoon. In addition, enrichment activities (such as handwriting and spelling, badminton and an environment club) were offered on Tuesdays and Thursdays. It was hoped that the good relationships which were formed through the less formal atmosphere of these activities would spread to other classroom lessons.

Towards the end of the first year of the restructured school day, the pupils were asked to complete a questionnaire. The completed questionnaires indicated that the majority of students found it was easier to study during lessons 7 and 8 which were now earlier in the day and they appreciated the greater opportunity to concentrate on homework and projects during the afternoon, whether at school or at home.

Restructuring the school day to create more time for study support activities is a recommendation made in *Building the Future of Learning: A guide to sustaining out of school hours learning* (Big Lottery Fund 2004). This document suggests that changes to the school day will be of particular benefit to children who live in rural areas and are unable to participate in study support activities organised at the end of a traditional school day because they have to be transported home.

In *Youth Work in a Rural School: Queen Elizabeth High School, Hexham, Northumberland*, Hand (1995b) describes two projects, a youth initiative project and a curriculum project, which were established in response to increasing vandalism in Hexham. Both of these projects aimed to strengthen young people's sense of community and to broaden students' experiences, with a view to curbing vandalism. The students who participated in the curriculum project were rewarded for their involvement through Project Trident Awards and accreditation in their Records of Achievements.

In *Work with Black Young People: Hammersmith and Fulham African-Carribean Project*, Hand (1995a) describes a Home Office-funded project aimed at addressing the disproportionate exclusion of Black pupils from school. Two youth leaders liaised with teaching staff to support pupils who were excluded or who were in danger of being excluded. The project also included seven full-time equivalent teaching staff. The main objectives of the project were:

- to provide in-class support for the underachieving African-Caribbean students in the key school identified
- to ensure that African-Caribbean students acquired the specific language skills which would enable them to gain improved access to the curriculum
- to improve communications with the parents so that students might benefit from increased parental involvement in their school careers
- to reduce the number of exclusions in the key secondary schools by improving links with parents and providing extra educational and pastoral support for pupils at risk.

Two youth workers worked with over fifty students who were at risk of being excluded and successfully ensured that none was permanently excluded. Support was also given to twelve students who had been permanently excluded. Twenty-seven young people were supported in their successful application to the borough's newly opened sixth-form centre.

The literature describing study support and extra-curricular activities is not limited to mainstream education. McFadyen and Hughes (1996), for example, provide an account and evaluation of a summer school designed and set up by the parents of children with learning difficulties in Tayside. The aim of the project was to maintain each child's level of functioning and, if possible, achieve progress. A secondary aim was to allow respite for the child's family. The project catered for 12 boys, aged between 4 and 10 years. The school relied on the involvement of the statutory and voluntary agencies which provided care throughout the year for the children. They offered a range of resources including funding, premises, transport and personnel. The results of the evaluation were positive, with more than half of the children reported as having at least maintained their level of functioning, while others made improvements in terms of their level of communication and language development, their ability to play constructively at home, improved turn-taking and sharing and being self-led in their play.

This introductory section has demonstrated the extensive range of activities provided under the heading of 'study support'. While at first sight these activities appear to vary greatly in terms of aims, format and venue (e.g. school or community setting), they all can be accommodated within the theoretical model outlined in Chapter 1. These activities are either subject based (e.g. homework clubs) or non-subject based (e.g. UFA) and all aim to raise attainment (e.g. the 'Focus on literacy and numeracy' project), attitudes (e.g. the projects aimed at strengthening young people's sense of community and reducing vandalism) and/or school attendance (e.g. the project to reduce school exclusions).

It will be noted that some of the projects described in this section included evaluations. No comment has been made on these as the issue of evaluating study support will be discussed later in this chapter.

THE PROVISION AND TAKE-UP OF STUDY SUPPORT

Many of the studies which endeavoured to measure the extent of the take-up of study support have relied on self-report questionnaires. Despite assurances to pupils of anonymity in their responses, it is possible that some pupils may have exaggerated their participation in study support activities when completing the questionnaires. Conversely, some pupils may have under-reported their participation lest they be considered 'uncool' by their classmates.

The DfEE commissioned a group of researchers from NFER (Keys *et al* 1999) to map the provision of study support activities and to provide an estimate of the proportions of pupils involved in these activities. Accordingly, NFER surveyed headteachers and pupils in mainstream secondary and primary schools and headteachers of special schools. These surveys were carried out during the spring term of 1998 and involved 1,000 headteachers and almost 9,000 pupils.

Keys *et al* argue that the research was unique because of the large-scale nature of their surveys:

> Before these surveys were carried out, estimates about the provision and take-up of out-of-lesson-time learning activities in schools were based mainly on the results of small-scale surveys and anecdotal evidence. Hard data, based on nationally representative samples of schools and pupils, did not exist. These surveys therefore provide robust baseline data on the extent and nature of out-of-lesson-time learning activities in schools against which the Government will be able to monitor the success of its policy to encourage the development of study support activities in schools. (Keys *et al* 1999, p.i)

The survey of headteachers found that almost all (99% of secondary schools and 98% of primary schools) mainstream schools and 72% of special schools provided some form of study support activities. Table 2.2 shows that 80% or more of secondary schools were offering activities such as: sports, computer/IT, drama and music. The table also shows that at least 70% of primary schools were offering activities such as sports and learning to play a musical instrument. It is interesting to note that these most commonly offered activities are non-subject based.

Table 2.2: **Specific activities and clubs reported as being provided by schools in Keys *et al* (1999)'s research**

Percentage of schools offering activity	Secondary	Primary
80% or more	Athletics/PE Computer/IT Drama Learning to play a musical instrument Singing/choir Study skills/homework Team sports	Team sports
70-79%	Revision club Racket sports	Learning to play a musical instrument
60-69%	Art/craft Design technology Library/book Science	Athletics/PE Signing/choir
50-59%	Board games Mathematics/number	
40-49%	Basic literacy Creative writing/newspaper Dance Foreign languages	
30-39%	Environment/nature/gardening Geography/geology History/archaeology Community/voluntary work Personal/social education Textiles	Arts/craft Board games Drama Dance
20-29%	Religious/ethnic minority groups	Computers/IT Environment/nature/gardening Foreign languages Library/book Racket sports
10-19%	Cookery	Creative writing/newspaper Mathematics/number Science Study skills/homework Textiles
Less than 10%	English as an additional language	Basic literacy Community/voluntary work Cookery Design technology English as an additional language Family learning Geography/geology Personal/social education Religious/ethnic minority group Revision

Source: Keys *et al* (1999), p.8, Figure 2.3

The pupil survey revealed that, during the survey week, 40% of Key Stage[1]4 pupils, 48% of Key Stage 3 pupils and 56% of Key Stage 2 pupils participated in at least one study support activity.

As Table 2.3, below, shows pupils reported that the most popular activities were team sports (33% of Key Stage 2 pupils and 20% of Key Stage 3 pupils) and computer/IT clubs (18% of Key Stage 4 pupils). The table indicates that the activities with the highest reported attendances are non-subject based.

Table 2.3: **The most popular activities (i.e. those with the highest numbers of reported attendances) in Keys *et al* (1999)'s research**

	KEY STAGE 2	
Broad Group	**Activity**	**%**
Sports	Team sports, e.g. football, netball	33
Creative & performing arts	Learning musical instrument	9
Creating & performing arts	Singing (or choir)	7
	KEY STAGE 3	
Broad Group	**Activity**	**%**
Sports	Team sports, e.g. football, netball	20
Maths/science	Computer/IT	14
English	Library/book club	8
Creative & performing arts	Drama	7
Study skills	Study skills/mentoring/homework clubs	6
	KEY STAGE 4	
Broad Group	**Activity**	**%**
Maths/science	Computer/IT	18
Sports	Team sports, e.g. football, netball	10
Creative & performing arts	Design technology	9
English	Library/book clubs	7
Creative & performing arts	Art & craft	7

Base = all attendances by pupils during the survey week (e.g. if a pupil attended a team sports activity, say, three times during the survey week, this would count as three attendances).

Source: Keys *et al* (1999), p.26, Figure 3.5

[1] Appendix A explains the age groups of children at each of the Key Stages in the education system.

Three key findings from Keys *et al*'s research applied to pupils at all three Key Stages. These were:

- slightly more girls than boys attended an activity during the survey week
- girls were much more likely than boys to have attended a creative and performing arts activity
- boys were more likely than girls to have attended a sports activity.

Keys *et al* found that there was a positive correlation between attendance at study support activities and the number of books in the pupil's home. Another important finding from this research was that, on average, schools with very high proportions of pupils eligible for FSM provided a narrower range of study support activities.

A final finding which is worthy of note from Keys *et al*'s research was that the formal monitoring and evaluation of study support activities was relatively uncommon. Indeed, only 33% of secondary schools, 15% of primary schools and 24% of special schools had included some form of monitoring arrangements for study support activities in the school development plan or other written policy document.

A survey similar to the work undertaken by Keys *et al* was carried out by Barber *et al* (1997) in the summer term of 1996. However, this earlier examination of extra-curricular provision, which also included headteacher and pupil questionnaires, involved a much smaller sample of 14 schools. Seven of the schools were among those identified by Her Majesty's Chief Inspector as worthy of special recognition in his annual report published in January 1996. The other seven schools when inspected were found to be providing an acceptable and often good level of education but were not so outstanding as to merit citation in HMCI's annual report.

Barber *et al* discovered that there was a wide range and depth of extra-curricular provision (both curriculum enrichment and curriculum extension) in the schools studied, which "contradicts the widely held view that extra-curricular provision was virtually wiped out by the teachers' dispute of the mid-1980s and has never recovered" (1997 p.6). Indeed, it was reported that headteachers and schools believe that extra-curricular provision is an important aspect of their mission. Almost two-thirds of the pupils indicated they believed that curriculum enrichment and extension are important. This is an interesting contrast with Keys *et al* (1999) who reported, almost exclusively, on participation in non-subject based activities.

The research found that over 70% of pupils in the OFSTED-cited schools and approximately 59% of pupils from the other schools involved in the study participated in extra-curricular activities. The authors acknowledge the limitations of the sample size and accept that the sample was not representative.

The National Evaluation of Study Support also involved gathering data about the provision and attendance at study support activities. Like the two previous studies, this study included collecting school level information about the types of study support activities offered and information from individual students about their attendance at these activities. One important difference between the National Evaluation and the other two studies was the size of the project. Over 50 schools and almost 10,000 students (involving two year groups) were involved in the Evaluation.

Because of the number of schools involved in the Evaluation, it was first necessary to categorise all study support activities within an eightfold taxonomy before any data analyses were carried out. The first category, 'subject-focussed' (or 'subject based', to use the terminology used in this thesis), contained separate subcategories for maths, English and science and a further subcategory for all other curriculum subjects. The other, non-subject based categories, were: study skills, sport, aesthetic, peer education, drop-in, mentoring and "other". Table 2.4, overleaf, shows some examples of the activities that were categorised within the taxonomy and the number of schools offering at least one study support activity within the categories. While such a classification was necessary for data analysis purposes, MacBeath *et al* (2001, p.22) acknowledge that the taxonomy 'fails to capture the range and inventiveness of some of the programmes designed to catch student interest and extend their repertoire of skills.'

Table 2.4: **The National Evaluation of Study Support - The taxonomy of study support activities**

	Category	Definition	Examples of Activities		No of schools offering provision in	
					Yr.10	Yr.11
Subject-focussed	**Maths**	Subject-focussed and teacher directed. (Only activities that can be uniquely coded as Maths, English or Science).	Maths Club Maths Clinic Super Maths Sessions	Maths Surgery Basic Numeracy Club Statistics	16	39
	English		Extra English English Homework Club (in E1) Twilight Revision English	English Beginners Club SDS Activities (ILS) Global English	13	39
	Science		Science Club Young Scientists Club Homework Club for Science	Physics Revision Science Study Group Science Practicals	17	38
	Subjects	**Subject-focussed and teacher directed.** **Includes:** • any combinations involving Maths, English and/or Science which cannot be *uniquely* coded above as 'Maths', 'English' or 'Science' • any other (exam related) subjects (including combinations) • Successmaker	Geography Revision Class Study Support History MFL Study Support RE GCSE A Level Art GCSE Sociology GCSE PE Theory Engineering Dance GCSE Japanese	Arabic Media Studies Technology Sessions Business Studies IT Keyboard GCSE Internet Club Food Technology Textiles Food Hygiene Certificate	37	43
Not Subject-focussed	**Study skills**	Metacognitive (including exam preparation) activities	ACE Days UFA Philosophy Course Revision Skills Day	Accelerated Learning Days Parents' Conference	9	6
	Sport	All (non-examined) Sporting activities. (Exam-related Sporting activities are coded as 'Subjects')	PE Club Football Hockey	Swimming Club Fitness Training Trampoline	36	42
	Aesthetic	All (non-examined) Aesthetic activities, including pupil performance. (Exam-related Aesthetic activities are coded as 'Subjects')	Orchestra Music Club Steel Pan Band African Drumming Group	Choir Dance Club Art Club Public Speaking	33	37
	Peer education	Being involved in Peer education	Reading Mentors with Year 7 Helping with Paired Reading Homework Club Helpers	Life Skills and Peer Mentoring Buddying Scheme	8	11
	Drop-in	Generic, student selected, cognitive activity	Study Centre Breakfast Club Lunch Club Homework Club Library Lunchtime Computer Club	Study Support Internet Café Learning Resource Centre Study in Homework Club/Quiet Room	40	39
	Mentorin g	Being mentored (Yr.11 only)	Mentoring Programme In School Mentoring Target Setting with Mr. O'Keeffe	Senior Tutor Counselling BT Roots and Wings	*Not Applic.*	20
	Other	All activities that cannot be coded in any of the above categories	Duke of Edinburgh Award Newsletter Group Careers Fairs/Work Experience	School Production Chess Club Camera Club	28	31

Source: MacBeath *et al* (2001) p.23, Table 3.1

All of the activities listed in Table 2.4 were extensive. The National Evaluation also collected data on subject based Easter Schools which were, as the title suggests, short-term and therefore intensive.

Key messages concerning the provision of study support which emerge from Table 2.4 are:

- there was much variation amongst schools in the nature and range of the study support activities offered
- compared with Year 10, there was much more subject based provision in Year 11
- most schools made provision for subject based, sporting, aesthetic and drop-in activities in Year 11, while only 11 and 6 schools made provision for peer education and study skills respectively.

While Table 2.4 is concerned with the provision of study support activities, the focus of Table 2.5 is the take-up of that provision.

Table 2.5: **The National Evaluation of Study Support - Take up of study support activities in Year 10 and Year 11 by boys and girls**

	YEAR 10 Percentage take-up by:			YEAR 11 Percentage take-up by:		
	All Pupils n=5346	Boys n=2650	Girls n=2696	All Pupils n=5103	Boys n=2471	Girls n=2632
Maths	13%	12%	15%	46%	43%	49%
English	6%	7%	6%	36%	35%	37%
Science	13%	11%	14%	40%	38%	42%
Subjects	43%	39%	48%	69%	65%	72%
Study skills	8%	7%	8%	4%	5%	3%
Sport	43%	53%	33%	43%	55%	33%
Aesthetic	21%	16%	25%	19%	14%	23%
Other	25%	23%	27%	22%	22%	21%
Peer education	5%	4%	6%	5%	5%	6%
Drop-in	53%	54%	52%	52%	52%	51%
Mentoring	*Not Applicable*			16%	14%	17%
At least one activity within any category	89%	89%	89%	92%	91%	92%

Source: MacBeath *et al* (2001) p.29, Table 3.4

Table 2.5 shows that:

- in Year 10 the category of activity with the highest percentage take-up was drop-in, with 52%. While 33% and 24% of students participated in sporting and aesthetic activities respectively, the percentage attending maths, English and science activities was much less
- in Year 11 the percentages of pupils participating in drop-in, sporting and aesthetic activities were almost identical to those for Year 10, but the percentage of pupils participating in subject-focussed activities was much greater
- girls attended subject based activities more than boys
- boys were more likely to participate in sporting activities, while girls were more likely to attend aesthetic activities.

It should be noted that the final two bullet points in the above list are findings which also emerged from the study by Keys *et al* (1999).

Other important findings from the National Evaluation in relation to participation rates include: gender and prior academic attainment do not seriously affect the likelihood of a student's participation and students from minority ethnic groups participate more than White students.

A more recent report by MORI (2004) explored the past, current and projected extent and nature of study support in maintained primary and secondary schools in England. A questionnaire was completed by a sample comprising 257 primary and 595 secondary schools in 2004. The report compared the results with those from an earlier study in 2000. The MORI research found that 90% of primary schools and 98% of secondary schools provided study support activities in 2004. The earlier study found that study support was provided in 97% of primary schools and 97% of secondary schools in 2000. These two MORI studies indicate that by far the majority of schools offer study support to some extent. The reduction in provision in primary schools from 97% in 2000 to 90% in 2004 is, however, worthy of note.

Table 2.6: **Percentage of primary and secondary schools providing study support activities in 2000 and 2004**

	Primary Schools			**Secondary Schools**		
	2000 n=101	**2004** n=257	**Change**	**2000** n=97	**2004** n=595	**Change**
PE/sports (including team games and gymnastics)	99	94	-5	100	97	-3
Music (including orchestra and choir)	85	77	-8	99	94	-5
Special interest clubs (e.g. photography and community work)	52	37	-15	84	35	-49
Curriculum-related clubs (e.g. maths and science)	45	30	-15	92	82	-10
Literacy, literature and English language-related clubs	36	30	-6	87	68	-19
Field trips	78	22	-56	100	67	-33
ICT/computer clubs	42	58	+16	94	90	-4

Reproduced from MORI (2004), p.15, Types of study support provided: 2004 versus 2000

The provision of different categories of study support activities within the schools that participated in the research has been summarised in Table 2.6. The table shows that the study support activity offered most frequently in both primary and secondary schools was physical education/sports. Indeed, 94% of primary schools and 97% of secondary schools offered PE/sports activities. In primary schools the next two most offered activities were music (77%) and ICT clubs (58%). In secondary schools, 97% of pupils provided study skills/homework/revision activities.

Within secondary schools, the decline in provision between 2000 and 2004 was particularly noticeable in terms of special interest clubs (-49%), field trips (-33%) and literacy, literature and English language-related clubs (-19%).

The most popular time for study support activities to be provided is after school – 96% of primary schools and 97% of secondary schools provided activities at this time.

Most schools, in both sectors, reported that at least some of the activities were targeted at particular types of pupils. Some examples from the provision in secondary schools were: more able/gifted pupils (84%), pupils with learning difficulties (74%), pupils at the threshold of the next level of achievement (67%), disaffected pupils (55%), minority ethnic pupils (21%) and pupils who truant (19%).

O'Brien (1996) used a self-completion questionnaire to explore the participation of secondary school pupils, aged between 11 and 16 years, in England and Wales in arts activities. Questionnaires were completed by 4,532 pupils in 192 state schools. Pupils were asked about their participation in activities 'in school during lessons', 'in school out of lessons' and 'outside school'. Table 2.7 summarises the percentage of pupils who reported participating in these activities 'in school out of lessons' as these activities would take place during study support time.

Table 2.7: **Participation in arts activities**

Activity	Percentage of pupils who reported participating in the activity since the beginning of the school year
Taking photographs	18
Read a whole novel or book of poems	16
Computer graphics	15
Played a musical instrument on own	14
Sang in a choir	14
Drawing, sketching, painting	12
Acting, drama	10
Dance	10
Played in an orchestra or brass band	10
Written stories, poetry of scripts	9
Made a video or film	9
Played in a pop band or other music group	8
Poetry of sculpture	5
None of these things/not stated	46

Adapted from O'Brien (1996), p.7 Table 3: *Have you taken part in any of the following activities since the beginning of this school year?*

All of the activities listed in Table 2.7 are non-subject based. Those reported as being most frequently participated in were: taking photographs (18%), read a whole novel or book of poems (16%) and computer graphics (15%).

As O'Brien did not collect information on the provision of these activities within each school, it was not possible to express the number of pupils who participated in the activities as a percentage of those to whom they were offered.

From this discussion of the provision and take-up of study support activities it can be concluded that:

- most schools (usually 90% or more) provide study support activities
- schools provide a wide variety of study support activities
- the study support activity offered most frequently in both primary and secondary schools is physical education/sports (i.e. non-subject based activities)
- provision may be targeted e.g. able/gifted pupil (84%), pupils with learning difficulties (74%) and disaffected pupils (55%)
- the most popular time for study support activities to be provided is after school
- boys are more likely than girls to participate in sporting activities
- girls are more likely than boys to participate in aesthetic activities.

While each of the studies concerning the provision and take-up of study support discussed above involved English schools, the findings were similar to those from a recent evaluation of provision in Scotland (Lowden *et al* 2005). This Scottish evaluation, which included surveys of local authority lead officers and schools and qualitative studies of the provision in three primary and six secondary schools, concluded that study support/out of school hours learning activities were provided in almost all secondary schools and over three-quarters of primary schools. The evaluation also found that the most commonly provided forms of activities were: support for specific subject/course work, activities offering assistance with study skills and physical activities. 67% of teachers indicated that the school targeted specific pupil groups. One difference between the findings of this evaluation and the other studies reported above is that specific subject/course work (i.e. subject based work) was included in the list of most commonly provided activities.

When considering the take-up of study support activities, it is important to acknowledge that some pupils choose not to participate. Indeed, *Building the Future of Learning: A guide to sustaining out of school hours learning* argues that:

> Before we consider what the future might hold for OSHL, we first need to address one outstanding concern...we need to tackle the challenge of non-participation – of successfully reaching hard-to-reach young people.
>
> (Big Lottery Fund 2004, p.70)

A research study conducted for the Department of Education and Skills (Education Extra 2003) sought to gain an understanding of why some young people elect not to participate in study support and identify ways in which participation by these young people could be encouraged. Group discussions were conducted with Year 6 and Year 8 pupils in two LEAs. Each group comprised up to 10 pupils who were either participants or non-participants in school-based study support activities. The study also included interviews with and questionnaires for headteachers, study support coordinators and LEA study support staff. The report recognises that the small sample size "provides directional findings only" (p.5), rather than findings that can be generalised to the entire pupil population.

The researchers found that less than 25% of the pupils in some schools regularly attend study support activities. This is in contrast with the findings from the other studies discussed above where the reported attendance at study support activities was higher. As a small sample was used in this study, it is possible that the small number of participating schools were different in nature from those that participated in the other studies. Five reasons for non-participation were identified:

1. pupils' negative attitudes towards school in general and study support in particular
2. lack of encouragement from home for pupils to participate in study support activities (some parents discourage pupils from attending study support activities that are not directly linked to academic subjects lest this distracts them from schoolwork or exam preparation)

3. poor teacher-pupil relationships - pupils avoid participating in activities organised by teachers they dislike
4. provision of solely (or mainly) run-of-the-mill, rather than creative, activities
5. practical barriers, including fees, transport difficulties and responsibilities for younger siblings.

The suggestions to encourage participation in study support include: consulting with pupils about what activities should be offered, communicating with parents about the benefits of participation, using outside providers to offset poor teacher-pupil relationships, offering a broad range of activities, including activities that are imaginative, creative and innovative and considering ways to overcome the practical barriers to participation, such as the provision of transport.

The practical issue of the provision of transport for pupils who wish to participate in extra-curricular activities but normally travel by school bus was also raised in the evaluation of the School Sport Partnerships Programme (HMI 2004).

Having considered the extent of the provision and take-up of study support, the next section considers the reported benefits of participation in study support activities.

THE REPORTED BENEFITS OF STUDY SUPPORT

In *Extending Opportunity: An national framework for study support*, it is suggested that study support benefits: pupils, other young people in the community, parents and carers and targeted pupils (e.g. by home circumstances, age, gender, performance). The document states that, for pupils, study support results in improved:

- academic performance
- self-esteem
- confidence
- new skills

- positive attitudes to learning
- motivation.

(DfEE 1988, p.6)

There is certainly much support for these suggestions in the research literature. For example, in relation to the benefits for pupils, Sharp *et al* concluded (on the basis of their ten expert interviews) that there is a 'range of benefits to young people from taking part in study support'. These benefits include:

- the development of existing and the acquisition of new skills
- the development of personal and interpersonal skills (such as autonomy, cooperation, communication and teamwork) which are 'both transferable and vocationally relevant'
- personal rewards from engaging in enjoyable activities
- improved self-esteem and motivation to learn through opportunities to pursue new interests and to experience a range of approaches to learning and to enjoy a feeling of success
- help with study skills (e.g. problem-solving, research and effective note-taking)
- the development of particular interests and skills (e.g. arts, sports and foreign languages)
- the contribution to improved academic achievement and progress at school (some programmes had an indirect effect on achievement through improved social skills, behaviour and attitudes to school and motivation to learn)
- help for pupils in particular need of support (e.g. pupils with reading problems, pupils from disadvantaged or difficult home backgrounds).

(Sharp *et al* 1999a, pp.3-4)

In his evaluation of the Schools Make a Difference project, Pocklington (1996) found that the project appeared to have resulted in a number of benefits for pupils. These included an overall rise in student achievement across all of the borough's secondary schools (although Pocklington notes that there may be other factors which led to the increased achievement) and the beginnings of a transformation of the dominant ethos in the pupil sub-culture, with improved motivation, commitment and self-esteem, increased maturity, more responsible behaviour and a greater enjoyment of school.

In their examination of extra-curricular provision in a sample of 14 secondary schools, Barber *et al* (1997) found that, from the pupils' perspective, the key benefits (identified by 60% or more students) of participation in study support are that pupils: learn more, improve their school performance, improve their examination prospects, gain confidence, make friends and enjoy what they are doing. Other perceived benefits of study support, including those perceived by headteachers, found in the study by Barber *et al* are summarised in Table 2.8, overleaf. Table 2.8 lists the benefits under 'curriculum enrichment' and 'curriculum extension'. These are, in fact, merely alternative terms for 'non-subject based' and 'subject based'.

Table 2.8: **The perceived benefits of curriculum enrichment and curriculum extension**

<table>
<tr><th></th><th>CURRICULUM ENRICHMENT
or
NON-SUBJECT BASED</th><th>CURRICULUM EXTENSION
or
SUBJECT BASED</th></tr>
<tr><td rowspan="2">Pupils</td><td>Key benefits(identified by over 70% of pupils):
• enjoyment
• learn more
• make friends
• gain confidence

Also:
• improve school performance
• improve prospects of college entry
• improve employment prospects</td><td>Key benefits (identified by over 60% of pupils):
• improved examination prospects
• learn more
• improve school performance
• gain confidence

Also:
• improve employment prospects
• better pupil-teacher relationships
• improve prospects of college entry</td></tr>
<tr><td colspan="2">"This evidence suggests that a substantial programme of both curriculum enrichment and curriculum extension has much to contribute both to pupils' interest in and enjoyment of school and to their ability to succeed academically. Far from being a distraction from academic goals, it seems that - at least from the pupils' perspective - curriculum enrichment has a contribution to make to both academic and wider goals. There is little difference between the OC and NS samples in expressing these views." (p.12)

Almost two-thirds of the pupils themselves believe curriculum enrichment and extension are important. They also enjoy participating in activities out of school and believe they benefit in terms of improved relationships with teachers and their peers as well as in terms of academic and other forms of achievement.
"......pupils believe there are many varied advantages of participation in extra-curricular activities." (p.5)

"......it is interesting that many pupils believe curriculum enrichment is as likely to help them improve their academic performance as curriculum extension." (pp.18-19)</td></tr>
<tr><td rowspan="2">Headteachers</td><td>• important for the education, social, emotional and cultural development of pupils
• spiritual development (for some teachers)</td><td>• pupils' attainment, examination performance and motivation benefit from curriculum extension</td></tr>
<tr><td colspan="2">Headteachers and schools clearly believe that extra-curricular provision is an important part of their mission. They do so because they believe it makes a major contribution to achieving a wider set of educational goals that relate to the quality of relationships, the notion of teamwork, and to the values and attitudes – such as commitment and generosity – on which both employers and the community as a whole depend so heavily.

"The headteachers in both samples were also universally positive about the importance and value of extra-curricular provision, especially enrichment. They value sport, music, educational visits and drama especially highly. Interestingly, they are significantly less positive about extension, perhaps because they believe that the formal curriculum is already adequate." (p.6)

"The headteachers also emphasise the benefits for the quality of pupil-teacher relationships across the school of both enrichment and extension." (p.12)</td></tr>
</table>

From Barber *et al* 1997, pp.10-12

Sharp *et al* (2002) argue that one of the benefits of study support is the promotion of independent, or self-regulated, learning and cite a number of researchers who have established a link between self-regulated learning and academic success. They claim that self-regulated learning is promoted through the pupil choosing to attend and through the range of skills that can be taught and promoted in study support, including: metacognitive and organisational skills, motivation, self-esteem, autonomy and competence.

For Andrews *et al* (1996), one of the benefits of after-school activities is that they provide opportunities for pupils to develop skills and talents. In addition to being fun and involving personal choice and responsibility, developing new skills can lead to encouragement for the students. Andrews, Vernon and Walton state that:

> …by enabling all pupils to show what they can do in different ways, individual successes after school can be identified and recorded within Records of Achievement, and can create a virtuous circle of encouragement and achievement… (Andrews *et al* 1996, p.8)

The notion of the virtuous circle is developed by MacBeath *et al* (2001):

> The indirect and cumulative effects of study support show that engagement leads to commitment, and participation in multiple activities adds further value. So, a student who chooses the Scrabble, the chess or the martial arts club and experiences challenge and satisfaction then feels more confident in making further choices. Participation in Science study support may lead to participation in Mathematics. Greater confidence and the removal of the anxiety may then increase motivation to attend school on a more regular, or less selective, basis. So, study support offers an exit point from the vicious circle of low achievement, low self-esteem, low expectation, low motivation and the entry point to a virtuous circle of raised self-esteem, sense of autonomy and a re-engagement with learning. (MacBeath *et al* 2001, p.59)

Woolnough (1991 and 1994) reports on the findings of a survey of 1180 18-year-old students that sought to ascertain the factors affecting a secondary school student's decision to take higher education courses in science and engineering. It was found that there was a significant positive correlation between the provision of extra-curricular science activities and:

- the proportion of sixth-formers with five GCSEs going on to pursue HE courses in science and engineering
- the school/college bias towards producing engineering undergraduates.

Woolnough's findings suggest that one way of encouraging pupils to pursue HE courses in science and engineering is to offer study support activities related to these curriculum areas. It would be interesting to know if there is a similar relationship between a student's participation in other subject based study support activities (e.g. a maths club) and the subjects studied in HE.

Andrews *et al* (1996) argue that study support has benefits other than those that appear to be directly linked with raising motivation and academic performance. For example, they argue that extra-curricular activities can play an important role in reducing opportunities for crime and encouraging responsible behaviour by providing opportunities for leisure where none exist, raising motivation by offering young people a chance to choose and engage in interests which go beyond classroom teaching and providing supervision for those who would otherwise return to an empty house or who would have no option other than to loiter around the local streets or shops. As an example, they provide a description of the SPLASH (Schools and Police Liaison for Summer Holidays) schemes which aim to reduce the level of youth related crime and the crime committed on young people by providing activities to relieve boredom and positive adult role models (see Andrews, Vernon and Walton 1996, p.19).

Andrews *et al* (1996) also suggest that extra-curricular activities have an important role to play in the provision of care for "latchkey" children. They advocate that such provision is ideal for young teenagers who are too old for childminding, but too young to return to an empty house after school.

In *Extra Class: Highlighting excellence in out-of-school-hours learning*, Education Extra (2000a) describe the work which they were undertaking in 14 schools to develop integrated care and learning for pupils aged 11-14 years. One of the schools cited in the document is Campion Boys High School in Liverpool. Campion High School serves a highly disadvantaged area and was one of the first schools to establish such provision. The student care scheme provides a range of activities every day with guaranteed pastoral support after school up to 5.30pm and a breakfast club which runs from 8am. New Opportunities Fund money is available for such integrated care and learning schemes.

One of the principal reasons why there are so many reported benefits of study support is that study support classes are qualitatively different from "normal" school. In comparison with other classes, study support classes tend to be more relaxed and informal (yet purposeful). In their report of the National Evaluation of Study Support, MacBeath *et al* (2001) suggest that study support benefits students for a number of reasons, including the fact that there is a qualitatively different atmosphere:

- it is voluntary – for students and staff
- it is learner-centred
- students and teachers experience a greater sense of control
- there is a more relaxed and informal relationship between teachers and students
- it provides a sociable learning environment
- it fosters independent self-regulated learning
- there is access to a range of resources for learning
- there is an ethos of achievement.

(MacBeath *et al* 2001, pp.57-58)

Professor Ted Wragg emphasises the fun side of study support:

> Out of school hours, learning often seems like play, whether children are studying topics they might well study during the school day, or developing interests and skills that do not figure on a school timetable.
>
> (Andrews *et al* 1996, p.vii)

While the above authors express the view that study support is different from "normal" school, a later study, commissioned by the DfES and undertaken by Elliot *et al*, of English LEAs and schools suggested that schools do not wish to distinguish between study support and mainstream schooling. They argue that these schools 'preferred to view study support as part of the continuum of opportunities to learn in a variety of contexts and an integral part of the learning entitlement for every student' (Elliot *et al* 2004, p.4).

Two possible explanations for the difference between the views reported by Elliot *et al* and other researchers are:

1. Elliot *et al*'s respondents may not be representative of all schools. They may include schools whose study support provision is closest to their mainstream schooling
2. the Elliot *et al* study is more recent. It may reflect a change in how study support is viewed in relation to compulsory schooling.

Bailey and Thompson (2008) make a similar point to that argued by Elliot *et al*, reporting on one English LEA that uses the term "out of lesson time learning", rather than "study support", to emphasise that study support should be viewed as an extension of the school's provision. However, data collected from interviews with students indicated that there were aspects of study support that made it different from "normal" school (e.g. more relaxed and informal relationships with teachers and greater opportunities for self-regulated learning).

In addition to the benefits of study support for students, the literature also documents the benefits of study support for staff, schools and the community (e.g. Sharp *et al* 1999a, Education Extra 2000a, Education Extra 2002, MacBeath 1998b, Burgess

2000 and Pocklington 1996). As this study is concerned with the impact of study support for pupils, the benefits for staff, schools and the community will not be reviewed. However, Table 2.9 provides a summary of these benefits.

Table 2.9: **The perceived benefits of study support for teachers, parents, the school and the community**

Benefits for teachers • opportunities to pursue a wide range of interests • the generation of enthusiasm • the ability to adopt different roles (e.g. facilitator and mentor) • better relationships with pupils • opportunities for personal and professional development
Benefits for parents • better communication and improved relationships with the school • opportunities to become involved in helping their children's learning and opportunities for learning themselves (e.g. through family literacy schemes) • the reassurance that children are being given additional opportunities and support for learning in a safe and secure environment
Benefits for the school • whole-school improvements (e.g. attendance, motivation and examination results) • improved liaison between the school and the local community • the promotion of a positive image of the school to parents
Benefits for the community • opportunities for economic and social regeneration • the ability to forge links between specific groups through targeted projects (e.g. bringing children into contact with elderly people) • improved behaviour of young people (e.g. a reduction in vandalism and graffiti)

From Sharp *et al* (1999a, pp.4-5)

From the preceding discussion it would appear that participation in study support results in a wide range of benefits for pupils, including improved attainment, attitudes (including attitudes to learning and the promotion of self-esteem, confidence and motivation) and attendance. Benefits are also reported for teachers, the school, the community and parents. The purpose of the next section is to review the evaluation studies which report these benefits and consider which particular forms of study support (i.e. subject based and non-subject based) are reported to impact on attainment, attitudes and attendance.

EVALUATING STUDY SUPPORT

Having considered the nature, extent and perceived benefits of participating in study support activities reported in the literature, the literature concerning the evaluations of study support activities will now be reviewed. This section is divided into two sub-sections: evaluations of subject based study support and those of non-subject based study support. Within both sub-sections, extensive and intensive provision is reviewed. Consideration will be given to the impact of study support on attainment, attendance and attitudes.

MacBeath (1999) offers some advice to individual centres wishing to evaluate their study support provision. He suggests that the baseline data collected could include: student attainment data (e.g. standardised attainment tests at the beginning of the year), student attitude data (e.g. student questionnaires to assess attitudes to study, self or school), student attendance data, staff attitudes (views/expectations, teacher questionnaires which assess teachers' knowledge and attitudes at a given point), parents' views and photographs/videos taken in and around the centre prior to innovation or development.

MacBeath stresses that:

> Before collecting any data, however, it is vital to know what it is for, what will be done with it, who will analyse it and how much time it will take. It should do nothing to compromise the ethos and spontaneity of work or relationships. Students and staff need therefore to be clear about purposes and potential benefits and the exercise carried out in a climate of trust and purposefulness.
>
> (MacBeath 1999, p.28)

Some authors (e.g. Ofsted 2002) argue that formal monitoring and evaluation of study support activities is undertaken in some schools only because of an obligation to report on the use of external funding.

The research studies described in this section attempted to evaluate study support and extra-curricular activities. A variety of approaches was adopted across the evaluations. These included measuring attainment (typically using GCSE results), student attitude questionnaires, interviews and observations. In their discussion of the benefits of study support, Malcolm *et al* (2002) make the distinction between 'hard' evidence of improvements in performance (e.g. examination results) and perception-based evidence (such as evidence gathered through questionnaires and interviews). Sharp *et al* (1999a) suggest that study support research should combine quantitative and qualitative methods to explore the process through which study support affects the lives of pupils.

When reviewing evaluations of study support projects it is important to consider whether the evidence is 'hard' or 'soft' and whether or not the evidence is sufficient to support the author's conclusions. In their review of opinion and research on the benefits of study support, Sharp *et al* (1999a) conclude that the research evidence generally confirms that study support achieves it aims (meeting academic, personal and inter-personal skills), but make the point that most of that evidence is 'suggestive, rather than conclusive' (p.vi).

Sharp *et al*'s criticisms of study support evaluations include: a lack of background information relating to the size, composition and selection of the samples; the response rates; the methods used and the analysis and/or findings of the research. They also express a concern at the lack of a control group, pointing out that pupils who participate in study support may differ from the general population (e.g. in academic achievement, motivation and family background – perhaps it is the pupils who are most likely to achieve who attend study support and they would achieve anyway?) and it is possible that successful/innovative schools may be more likely to offer study support activities. They suggest that evaluation studies compare the progress of pupils who choose to take part in study support with two other groups: those in the same schools who choose not to take part and those with similar characteristics attending similar schools that do not offer study support.

Sharp *et al* cite the example of a one-to-one mentoring programme in the USA (see Tierney *et al* 1995) in which the researchers asked for volunteers to take part in the scheme and randomly allocated them to a treatment group (who were immediately entered into the mentoring programme) or to a control group (who received the mentoring at a later stage). Offering a study support activity to the control group at a later stage permits a true experimental design to be followed without raising the ethical dilemma of denying a group of pupils the benefit of the activity.

Where it is not possible to use a true experimental design - with participants randomly allocated to one of two conditions: treatment (e.g. study support) and control (no intervention) – Sharp *et al* suggest using matched groups of pupils to act as a control. They suggest matching pupils on the basis of background characteristics (e.g. age, gender, socio-economic status, ethnicity) and on other key variables, such as prior attainment, examination predictions and attitudes. Sainsbury *et al* (1998) used a matched group of pupils in their evaluation of the pilot Summer Literacy Schools initiative. Other researchers have attempted to establish the equivalence of the groups by using existing attainment data (Pocklington 1996, Tower Hamlets Study Support Project 1997 as cited in Sharp *et al* 1999a and Watts & Hillman 1997 as cited in Sharp *et al* 1999a). Some of these studies considered the performance of students (at GCSE) relative to predictions made by their teachers or on the basis of predictive tests (Miller 1998, MacBeath *et al* 2001, Tower Hamlets Study Support Project 1997).

One limitation of the evaluations of many study support activities is that they tend to rely on self-report questionnaires to record the pupils' attendance at the activities. As is discussed in the introduction to the earlier section on the provision and take-up of study support, there is a possibility that recording attendance in this way will result in over- and/or under-reporting. This is a concern when an evaluation is attempting to relate the impact of study support activity with the frequency of the pupils' attendance at that activity.

It is common for the evaluations of study support activities to involve, through interviews and/or questionnaires, the adults (usually, but not always, teachers) who deliver the activities. It is important to question the extent to which their views will be subjective, particularly if these teachers were responsible for setting up the activity and have a vested interest in demonstrating its success.

The criticisms and limitations outlined above are, of course, not peculiar to the evaluation of study support. The absence of a true experimental design, the possible over-reliance on self-report questionnaires and the involvement of teachers who deliver the initiative in the evaluation process are issues for educational research in general.

Subject Based Study Support

Extensive provision

Schagen *et al* (2002)[2] undertook an evaluation of extensive subject based study support provided through *Playing for Success*. Using the medium and environment of sport to support pupils' work in literacy, numeracy and ICT, *Playing for Success* sought to establish study support centres in professional football grounds in England. Schagen *et al*'s research is of particular relevance to the present study because it made use of multilevel modelling and included measurements of attainment and attitudes. The use of multilevel modelling enabled the creation of a model which incorporated four levels: centre, key stage within centre, pupils and time point (pre- or post-course). The evaluation involved: short tests in reading and numeracy, attitude questionnaires (relating to literacy, numeracy, study skills and self-esteem) and self-assessment questionnaires relating to ICT skills. The findings included:

- computer scores were generally higher for key stage 3 pupils than for key stage 2 pupils

[2] See also Sharp *et al* 2007.

- girls tended to have higher scores than boys for reading enjoyment, writing enjoyment and independent study skills. The opposite was true for numeracy, mathematics confidence, self-esteem and all computer scores
- pupils eligible for free meals tended to have lower scores for all the computer outcomes
- pupils eligible for free school meals appeared to make more progress in numeracy, computer basis and word processing than other pupils.

One contrast between the *Playing for Success* evaluation and the research reported in this thesis is that short tests were administered specifically for the purpose of the evaluation at the start and end of the individual's period of attendance at the Study Support Centre, rather than the "real life" Key Stage 3[3] SATS and GCSE examinations used in the present study.

Mason *et al*'s (2004) evaluation of 39 summer and term-time schemes in England, Scotland, Wales and Northern Ireland included both subject based study support and non-subject based study support activities. Funded through the New Opportunities Fund, these schemes operated between 2000 and 2003. The evaluation found that a variety of types of activities was offered in each of the four countries. The most common term-time activities were: homework clubs, literacy and numeracy focussed projects, sports and physical education projects, performance arts, arts and crafts and IT/ICT. The summer school schemes tended to focus on core subjects or key skills (support for numeracy, literacy and ICT). The evaluation included interviews with key providers, participants and others with an involvement in the schemes (e.g. parents, in-school scheme staff, Local Education Authority/Education Authority/Education and Library Board Officers). The activities were also observed by a researcher (or researchers).

Overall, both term-time and summer school schemes were successful in meeting the needs of the young people involved and offering new experiences to young people. It was found that the involvement of partner organisations (LEA/EA/ELB schemes or

[3] See Appendix A for an explanation of the age groups of children at each of the Key Stages in the education system.

multiple schools schemes) added to the quality of the schemes. Some activities were partly or entirely based at non-school sites (such as community libraries, community centres, sports centres, outdoor education centres and youth centres) – this helped to widen the horizons of the young people and provided them with learning activities outside the formal school-site context. Most term-time projects were entirely open access for young people from particular year groups or key stages. In contrast, most of the summer schools had a clearly-defined target group within a particular year group or range of year groups. All schemes were required to record the attendance of young people. The extent to which substantial numbers of young people from the most disadvantaged groups were involved was questionable.

While Mason *et al*'s study included both subject based study support and non-subject based study support activities, the most comprehensive evaluations were concerned with longer-term, subject based activities and these evaluations included GCSE results as the attainment output measure. This was usually through an analysis of the young peoples' GCSE grades against their predicted grades. At the time of the research, the general view across the term-time and summer school schemes regarding the likelihood of large-scale sustainability was relatively pessimistic.

Mason *et al* warn that, although the projects which included GCSE results in their evaluations were convinced that the GCSE analysis provided evidence of raised achievement, the analysis was based on relatively few numbers of young people and difficulties were encountered with classifying participants according to the extent to which they accessed the provision. In contrast with the present study, a greater proportion of Mason *et al*'s evaluation was based on softer evidence (i.e. interviews with stakeholders) rather than evidence from the analysis of GCSE examination performance.

Brooks *et al* (1997) explored the relationship between the reading attainment of 5,299 eight year olds in England and Wales and their participation in leisure activities (including reading for pleasure) outside the school day. Although not strictly speaking study support, as the initiative was concerned with children's reading it had a number of features common to extensive subject based provision. The children were invited to complete a questionnaire that indicated how often ('most days', 'some days' or 'never') they participated in each of six leisure activities outside school: reading for fun, watching television and videos, playing with friends, playing sports, doing jobs at home and playing computer games. For each of these activities, the pupils who participated 'some days' had higher average test scores than those who reported that they never participated. However, pupils who spent the largest amounts of time on activities other than reading achieved lower test scores. The average test scores for those who read for fun on 'most days' were among the highest. The authors concluded that pupils who have more varied lives out of school tend to achieve higher reading scores and low frequency of leisure reading is associated with low reading attainment.

It is important to acknowledge that poor readers are unlikely to read for pleasure in their leisure time. It would therefore be wrong to conclude that the study provides evidence that a high frequency of leisure reading results in high reading attainment. As with many of the other studies described above, Brooks *et al* relied on self-report questionnaires for some of their data.

Intensive provision

The evaluations of intensive, subject based study support include Pocklington's (1996) evaluation of the Schools Make a Difference Project (SMAD). While the project, which operated in all eight secondary schools in one London borough, aimed to raise student levels of attainment, achievement and morale through a range of short- and extensive subject- and non-subject based study support activities, it was the intensive, subject-focussed activities that were evaluated most comprehensively. The schools were invited to offer suggestions for initiatives and these included: flexible learning centres, revision centres and coursework clinics and extended day provision. The evaluation comprised semi-structured interviews with key participants (including school coordinators, headteachers and students), attendance at two residential conferences, a questionnaire which was completed by a random sample of teachers and examination of relevant documentation (including statistical information) provided by the LEA's research and statistics unit. A conclusion from the evaluation of the intensive, subject based provision was that "a good many students subsequently attained better than expected GCSE examination grades" (Pocklington 1996 p.140). 52% of the Year 11 pupils entered for GCSE exams attended an Easter revision centre for at least some time and scored 10 points (i.e. 2 GCSE C grades per pupil) more than the pupils who did not attend. Pocklington acknowledged that it would be wrong to infer that examination success was directly dependent on attendance at the revision classes as it may be that the pupils who attended the revision classes would have achieved higher grades anyway. Pocklington writes:

> The conclusion that may be drawn, however, is that some students in some of the schools do appear to have benefited from having experienced this additional provision. It does appear to be the case that making available such provision can have a critical effect on the level of typically those of average or below average ability and/or motivation. The positive impact of this provision characteristically was greater in those schools with a history of low academic achievement. (Pocklington 1996, p.140)

The Schools Make a Difference Project is very relevant to the research described in this thesis because GCSE results were used as the attainment output measure. While Pocklington makes the important point that pupils who attended the SMAD revision classes may have achieved higher grades anyway and it would be wrong to conclude from the analysis that the higher grades were solely the result of participation in the revision classes, he ignores his own words of caution when he asserts, in the above quotation, that "some students in some of the schools do appear to have benefited from having experienced this additional provision".

A number of authors report on evaluations of summer schools which provided subject based study support. By definition, summer schools are intensive. Sainsbury *et al* (1998), for example, undertook an evaluation of Summer Literacy Schools which were introduced in England as a pilot scheme by the Government in the summer of

1997 in an attempt to improve children's literacy skills at the age of 11 (the time of transfer from primary to secondary education). The evaluation looked at the pupils' reading attainment between national testing in May and similar tests in September. Using background data, it was possible to construct a control group comprising pupils who had not participated in a Literacy School. A possible criticism of this study is that the pupils were not randomly allocated to either the treatment or the control group – indeed the average pre-test score of the control group was higher than the treatment group and it was not possible for the researchers to check the equivalence of the two groups in terms of background factors. The authors concluded that there was no evidence that the summer schools led to an increase in scores on the key stage 2 reading tests. They also found that there was a decline in test scores between May and September for all pupils – i.e. those who had attended the summer schools and the control group. As Sharp *et al* (1999a) comment:

> The results of this study are somewhat disappointing in relation to the aims of the pilot scheme. It seems surprising that an intervention targeted at boosting reading achievement did not achieve the desired outcome, and that the reading scores of all pupils showed such a large decline between May and September.
>
> (Sharp *et al* 1999a, p.141)

The Summer Literacy Schools 1997 pilot scheme was also evaluated by Education Extra (Andrews 1997). The Education Extra analysis explored the effects of the Summer Literacy School on pupils by four main indicators:

- retention and attendance
- learning gains
- attitudes towards reading
- confidence and commitment.

The children who had attended the Literacy Schools appeared to benefit in terms of each of these indicators. Much of the data gathered was qualitative. Unlike many of the evaluations reported above, data on student attendance was recorded by the schools (rather than through a self-report questionnaire).

Non-Subject Based Study Support

Extensive provision

Studies of extensive non-subject based study support include Marsh's (1992) follow-up to the US High School and Beyond (HSB) study, Marsh (1992). Working in Australia, Marsh explored whether participation in extra-curricular activities had a negative effect (because attention was diverted away from academic pursuits), little or no effect or a positive effect on academic outcomes. The data were collected in three tranches: sophomore outcome variables (e.g. academic ability, absenteeism and time spent on homework), senior outcome variables (these were identical to the sophomore outcome variables) and post-secondary outcome variables (e.g. employment status). In addition, background data were collected. A two-stage probability sample was used, resulting in a sample of 4,422 students. Using multiple regression analysis, Marsh found that extra-curricular participation was positively associated with a number of background factors: college expectations, attending a smaller high school, attending a rural high school, being black, being female, coming from a family with higher socio-economic status and certain outcomes after the "sophomore" year (social self-concept, grade point average and educational aspirations).

After controlling background variables and sophomore outcomes, participation in extra-curricular activities was significantly positively related to 13 out of the 22 outcomes. These included: social self-concept, academic self-concept, taking advanced courses, time spent on homework, postsecondary educational aspirations and grade point average.

Marsh found that the benefits from participation differed substantially, depending on the type of activity. Participation in sports activities, for example, was particularly strongly associated with social self-concept. Three self-concept variables were used as predictors, rather than outcome variables in the regression analysis. The three variables were: general self-concept, academic self-concept and social self-concept. While general self-concept did not influence the relationship between participation in extra-curricular activities and positive outcomes, academic and social self-concept were influential and controlling for these factors reduced the strength of the relationship between extra-curricular involvement and positive outcomes. The effects of participation in extra-curricular activities were consistent across the sample, although there was some evidence that students from lower SES backgrounds benefited more from participation in extra-curricular activities than students from more affluent families. When considering Marsh's conclusions, it is important to remember that it is not possible to determine causality on the basis of macro-level regression coefficients. These merely indicate that when one variable varies, so does the other. It is also important to remember that much of the data was gathered through a self-report questionnaire.

Sharp *et al* (1999a)'s review of Marsh's research points out that only 17 percent of the variance in total extracurricular participation was explained by background factors and less than 50 percent of the variance in senior year outcomes was explained by a combination of extracurricular participation, background factors and sophomore variables. This would suggest that factors other than those considered in the study may have influenced both participation in extra-curricular activities and senior outcomes or that the factors included in the study had a great deal of measurement error in them.

Like Marsh, Camp (1990) was interested in exploring whether participation in extracurricular activities is harmful to academic achievement because students have less time to study. Working in the US, Camp undertook a secondary analysis involving a subset of 7,668 sophomores from the initial High School and Beyond large-scale database of 30,000 students. Although the subset was selected on the basis of students for whom data was available on the variables of interest, Camp explains that, in terms of these variables, there were only "minor differences" between the means of the original sample and his subset. While Camp's research supported a number of the trends identified in the literature (e.g. females watch less television, study more, participate in more student activities and achieve better grades), his work questioned other beliefs:

> ...the findings of this study bring into question some other assumptions. The popularly held beliefs that grades suffer as television viewing increases and that students who work make lower grades than nonworking students are not supported by the findings. (Camp 1990, p.277)

Two comments, which are also pertinent to Marsh's study, should be made regarding Camp's research: (1) much of the data relied on self-report questionnaires (2) it may be that the students who attended the study support activities and achieved better grades would have achieved these grades whether or not they had participated in these activities.

Brown and Steinberg (1991) report on a study of noninstructional influences on the engagement and achievement patterns of US high school students, namely: family (especially parents), peers, part-time employment and school-sponsored extracurricular activities. A self-report survey questionnaire was administered in two phases (in the fall and spring) to all students present on the day of testing in nine high schools. The questionnaire data were supplemented by interviews with a sample of students and parents in six of the schools. Although the sample was not deliberately constructed as a nationally representative sample of high school students, it did share a number of important characteristics with the national samples used in other studies. The authors therefore suggest that the findings could be generalised beyond the schools that participated in the survey.

Brown and Steinberg concluded that both parental and peer influences are quite diverse, but contrary to popular belief they tend to be more complementary than oppositional - students with the highest grade averages reported strong support for academic achievement from both parents and peers. They found that students from economically disadvantaged and single-parent families did worse academically than those from higher socio-economic backgrounds or intact families. They also found that specific parental attitudes and behaviours that had an impact on student achievement levels included: parental involvement in the life of the school, parental expectations and parenting styles. Parental actions (monitoring, involvement in school, parenting styles) had more impact on student achievement levels than their values or expectations. While most students reported that their friends encouraged achievement, the study revealed some variation in this.

Brown and Steinberg found some interesting differences between the students' involvement in paid employment and extracurricular activities. 40% of the sample had part-time jobs during the school year (most worked 15 hours a week or more). Over 2/3rds of the sample were involved in at least one school-sponsored extracurricular activity (averaging 10 hours or less per week). Working *per se* had less of an influence than the number of hours worked, with those working less than 10 hours a week enjoying a modest 'academic edge' over students without jobs. As the number of hours worked increased, time spent on homework decreased and rates of school deviance and psychosomatic disturbance increased. In contrast, participation in extracurricular activities was associated with positive school outcomes – the more extensive a student's participation (in terms of number of hours, number of activities and the number of types of activities) the more time was spent on homework and the higher was the student's GPA. However, the extent of the academic advantage was dependent on the type of activity in which the student participated. Those who concentrated on "glory" sports (football, basketball, baseball) or performing activities had significantly lower academic records than those who concentrated on leadership activities or clubs and interest groups. One explanation for this may be that less academically able pupils elected to participate in these activities.

Sport

The School Sport Partnerships Programme aims to increase the percentage of 5- to 16-year-old school children in England who spend a minimum of two hours each week on high-quality PE and school sport within and beyond the curriculum. An evaluation of the Programme, which included specific references to extra-curricular activities, was undertaken by Her Majesty's Inspectors (HMI 2004). The evaluation, involving 34 secondary and special schools and many of their associated primary schools, included discussions with teaching staff, pupils' views, lesson observation and reading documentation pertaining to action, development plans and progress reports. The conclusions from this evaluation include:

- the quality of teaching in extra-curricular activities is good or better in a third of the sessions
- in a fifth of extra-curricular sessions teaching is unsatisfactory. This is often because there is an overemphasis on managing pupils and resources without sufficient focus on learning activities matched to pupils' needs and capabilities.

Mentoring

Golden and Sims (1997) used a combination of face-to-face interviews, telephone interviews and a postal survey to review Industrial Mentoring in Schools. Their review aimed to map out the range and models of school-industry mentoring, ascertain the benefits and disadvantages for schools, students and employers and identify examples of good practice. Information was ascertained from 72 mentoring schemes in England, Scotland and Wales. These involved nearly 17,000 students, 4,500 mentors, 500 schools and 2,000 companies. A number of strengths were identified in relation to mentoring. One of the key strengths was that mentoring focussed on the individual - the students were given encouragement and their self-confidence and self-esteem were both raised. However, the researchers did acknowledge that it can be difficult to attribute changes in student attitudes or achievement to mentoring.

Tierney *et al* (1995) report on the impact of the Big Brothers/Big Sisters (BBBS) of America mentoring programmes. A sample of 959 young people aged between 10 and 16 years of age were randomly assigned to either the treatment group (who were immediately matched with adult volunteers) or the control group (who remained on a waiting list for 18 months). Both groups were interviewed 18 months later. The researchers found that the treatment group were less likely to have started using drugs or alcohol, felt more competent about doing school work, attended school more often and had better relationships with their parents and peers. In addition, the treatment group achieved higher grade-point averages (mean = 2.71) than the control group (mean = 2.63). This difference was found to be statistically significant ($p<0.01$). As with a number of the other studies discussed above, this research relied on a self-report questionnaire for the behavioural data.

A DfEE Research Report (Miller 1998) explored business and community mentoring schemes for Key Stage 4 pupils. Data were collected, using questionnaires and interviews, from 103 Year 11 students and 59 of their mentors in 7 English schools. School coordinators identified a control group of students who were similar, in terms of gender, ethnicity, ability and range of GCSE subjects studied, to the mentored students. The report identified, *inter alia*: the advantages and disadvantages of group mentoring, the objectives for mentoring and student selection criteria. The impact of mentoring is discussed – on average mentored students improved their GCSE performance by almost half a grade. Other reported benefits of mentoring include:

- improved attitude to work and greater determination to succeed in GCSEs
- better quality of coursework, resulting in higher grades
- higher marks in tests and mock examinations
- improved attendance and punctuality.

This DfEE report is relevant to the research described in this thesis because of the use of GCSE results as the attainment output measure. One possible criticism of the research is that the students were not randomly assigned to the treatment and control groups. It may be that those who choose to participate in mentoring would have achieved better results anyway.

Outdoor Activities

Hattie *et al* (1997) undertook a meta-analysis of 96 studies of adventure education and outward bound courses, many of which were conducted in the USA and

Australia. Two types of outward bound programmes were identified: outdoor education programmes based in schools and more challenging outward bound programmes. The school-based programmes were omitted from the analysis because they were shorter in duration and provided less challenging experiences. They reduced the 40 major outcomes identified in the adventure literature to six encompassing categories: leadership, self-concept, academic, personality, interpersonal and adveturesomeness. The authors concluded that the outdoor activities promoted each of these categories. However, the extent to which the findings from this meta-analysis can be generalised to school pupils in the UK is limited because:

1. three-quarters of the courses were attended by university students or adults
2. 14 of the programmes were designed for young people with personal and social problems
3. none of the studies was conducted in the UK (all were based in the USA, Australia, Australasia or New Zealand).

Intensive provision

Few studies have evaluated intensive non-subject based study support programmes, possibly because most intensive programmes are subject based. A rare example is Mason *et al's* (2000) evaluation of 25 study support summer school pilots in 1999. Although the schemes varied in size and scope, their aims all related to the development of either life skills (e.g. self-confidence and self-esteem) or learning skills (e.g. independent learning and self-motivation). The evaluation included interviews and group discussions with providers and participating young people and observation of the summer school activities. Pre- and post-course questionnaires were completed by 1,409 participants. The evaluation findings included:

- most schemes were successful in developing participants' skills
- the activities were well received by the majority of young people, generating enthusiasm and commitment

- many schemes resulted in the development of partnerships with organisations from the public, private and voluntary sectors.

Cooper *et al* (1996) undertook a meta-analysis of 39 (mainly American and Canadian) research reports that contained empirical studies which were designed to test the effect of summer vacation on school achievement. Across the 39 reports there were 47,994 students from 66 samples. Like Sainsbury *et al* (1998), Cooper *et al* (1996) found evidence that achievement test scores declined over the summer vacation. The decline equalled approximately one month on a grade-level equivalent scale or one tenth of a standard deviation relative to spring test scores. It was reported that maths and spelling suffered more than reading during the summer vacation and suggested that this is a result of reading being practised as home, while maths and spelling are usually confined to the classroom.

Extended Schools

As Chapter One states, study support is one of a range of services to be offered through the Government's extended schools initiative (DfES 2005). An evaluation of the first year of the initiative (Cummings *et al* 2005) reported positive outcomes which included raised attainment and increased pupil engagement with learning. However, this was based on anecdotal evidence (interviews with school leaders, LA officers, pupils, parents and community members) and the authors of the report admit that 'none of this yet amounts to robust evidence of "effectiveness" at this early stage of the evaluation' (Cummings *et al* 2005, p.1).

Specific Areas for Further Study

The evaluation studies reviewed above provide an indication of the range of study support activities that have been evaluated. Sharp *et al*, however, list a number of study support activities on which they found little UK research, namely: arts activities, sports activities, outward bound courses and summer universities.

They call for more research into study support initiatives designed to help specific target groups such as:

- children requiring help with basic skills
- young people with special educational needs (including gifted pupils)
- disaffected young people
- young people from ethnic minorities
- young people living in rural areas. (Sharp *et al* 1999a, p.18)

They also call for further research into study support related issues such as the extent of 'summer loss' (i.e. the detrimental effect on pupil progress of the summer holiday – see Cooper *et al* 1996) and initiatives to restructure the school day or to provide year-round schooling.

The preceding discussion demonstrates the range of study support activities that have been evaluated and the variety of 'hard' and 'soft' evidence that has been used in these evaluations. Many of these evaluations exhibit some of the features criticised at the beginning of this section. Most, for example, involved the teachers delivering the activities in the evaluation process. As most have no control group, it is impossible to argue conclusively that the changes documented in the pupils' attainment and attitudes etc were due – either in whole or in part - to their participation in study support. Where a control group was used, generally there was no random allocation of pupils to the control group or the experimental group. Some of the evaluations used only a small sample or included pupils from a limited geographical area and could not be considered representative.

Laying aside these criticisms, the evaluation studies reviewed above suggest that there are benefits for pupils who attend study support. For example, extensive and intensive subject based study support can result in increased attainment (e.g. Schagen *et al* 2002, Mason *et al* 2004 and Pocklington 1996). There is also some evidence that intensive subject based provision can result in improved attitudes and school attendance (Andrews 1997). While some researchers found that extensive non-subject based provision can result in improved attainment (e.g. Tierney *et al* 1995 and Miller 1998), such provision tends to be associated more commonly with improved attitudes and life skills (including self-confidence and self-esteem) and improved school attendance (e.g. Golden & Sims 1997 and Miller 1998). Intensive non-subject based provision appears to be much less common than intensive subject based provision and only one such evaluation (e.g. Mason *et al* 2000) is reviewed in the preceding section. The conclusion from that study was that such provision results in improved attitudes.

The evaluations reviewed in this Chapter suggest that, generally speaking, subject based study support results in improved attainment while non-subject based activities result in improved attitudes and school attendance. However, there is evidence that subject based provision can result in improved attitudes and school attendance while non-subject based provision can result in improved attainment. This reinforces the point made in Chapter 1 that MacBeath's model is too simplistic and a more complex model is required to capture the interconnections between participation in different forms of study support and attainment, attitudes and school attendance.

THE NATIONAL EVALUATION OF STUDY SUPPORT

In the previous section there was some discussion of the criticisms of evaluations of study support programmes. Previous research has tended to rely on 'soft' outcomes and limited samples. It was the dearth of quantitative research on the effects of attendance at study support activities using 'hard' outcomes that gave rise to the National Study Support Evaluation programme. In explaining the importance of the Evaluation, MacBeath wrote:

> If Study Support is to develop we need to find out just how effective it is, and how we can maximise its effectiveness. We need evidence to show that it

> works the way we think it should. We need hard data to convince policy-makers, as well as the individual testimony and success stories of individual young people. We need to know what approaches and techniques work best, and to share that knowledge with those who organise and run Study Support Centres. If this does not happen, the wheel will have to be reinvented every time the idea takes root in a new community. That is why the Prince's Trust-Action has set up an evaluation programme. (MacBeath 1997, p.14)

Andrews *et al* (1996) called for such harder evidence a year earlier:

> Given the added benefits which can flow from all these forms of after-school provision, what proof is there that participation in after-school activities as a whole can add to the effectiveness of schools and lift achievement? It must be said that, where research exists, it is partial, scattered and often confined to the more transparent links between direct curriculum support manifest in study support. (Andrews *et al* 1996, p.8)

The Study Support National Evaluation and Development Programme (SSNEDP) was a three-year longitudinal evaluation of the impact of participation in study support on the academic attainment, attitudes and school attendance of secondary school students. Set up by the Department for Education and Skills (formerly the Department for Education and Employment) and the Prince's Trust in Autumn 1997, the programme grew out of a research consortium of the Prince's Trust, two Inner London local education authorities and an (English-based) training and enterprise Council. The management of the programme was transferred from the Prince's Trust to the National Youth Agency in 1999.

The research design used in the National Evaluation is described in detail in Chapter 3. In summary, it involved the collection of baseline and post-test data on attainment, attitudes and school attendance.

Key findings from the research were:

1. In all the schools studied pupils who participated in study support did better, than would have been predicted from baseline measures, in academic attainment, attitudes to school and attendance at school than students who do not participate
2. The effects were large, an average of 3.5 grades or more for Best 5 GCSE scores or one A-C pass at GCSE. Study support can improve attainment in maths and English by half a GCSE grade. (GCSE attainment is most affected by subject-focused, drop-in provision and Easter revision courses)
3. Study support appeared to be especially effective for students from minority ethnic communities and, to a lesser extent, for students eligible for free meals.
4. The effects of study support are widespread. Subject-focussed activities have an impact not only on attainment but also on attitudes and attendance. Sports, aesthetic activities, peer education and drop-in provision impact not only on attitudes and attendance but also on attainment.

In terms of who benefits most from participation in study support activities, MacBeath *et al* (2001, p.35) conclude that: all students who participated in study support derived benefit from it, girls and boys benefited to roughly the same extent, students eligible for free school meals benefited slightly more and students from minority ethnic groups benefited significantly more.

The outcomes from the National Evaluation were developed into *The Essential Guide to the Impact of Study Support* (DfES 2002) – a practical guide aimed at headteachers, depute headteachers and the staff in schools who are responsible for developing study support.

Writing prior to the publication of the National Evaluation report, Sharp *et al* (1999a)'s review of the study support research literature comments on the lack of a control group:

> ...it should be noted that the evaluation has not adopted an experimental design: all the schools offer study support and there is no control group of schools. Although it will be possible to compare the outcomes of students who have (and have not) chosen to take part in study support activities, questions may still remain about the equivalence of the two groups, particularly in relation to attitudes, which will make it difficult to establish the nature of any relationships between participation and outcomes. (Sharp *et al* 1999a, p.129)

While it is true that the National Evaluation did not involve a control group of schools, it is important to recognise that the identification of an appropriate group would have been problematic. The group would have required to comprise schools that did not offer study support and such schools may have been quite different from the National Evaluation schools.

Sharp *et al* suggest that the longitudinal nature of the study and the inclusion of verbal reasoning assessments and attitudinal measures are particular strengths of the National Evaluation.

The National Evaluation produced a number of very important findings in relation to study support. However, because of the tight deadlines (and resources) set for publishing the report it was necessary to restrict the data analyses undertaken. For example, while the Evaluation did explore the benefits of participation in study support for particular groups of young people (i.e. those from socially disadvantaged backgrounds and those from different ethnic backgrounds), these analyses were not as detailed as those for the entire sample. The Evaluation included – through the use of school dummy variables in multiple regression analysis – an analysis of school effects, but these effects were not explored with particular reference to pupils from disadvantaged backgrounds.

The research described in this thesis resulted from further interrogation of the National Evaluation dataset. Relationships were explored between attendance at subject based and non-subject based study support activities and the impact on attainment, attitudes and school attendance. These relationships were explored for all pupils and for those from socially disadvantaged backgrounds in comparison with other pupils. As it was anticipated that the impact of study support might be different in different schools, multilevel modelling software was used as this permitted analyses which explored the variance between schools.

Entitlement to free school meals was used as an indicator of social disadvantage. It was anticipated that there would be important policy implications arising from the research if it was found that study support can be used as an effective mechanism for addressing the needs of pupils from disadvantaged areas.

Common sense would suggest that study support will have much to offer young people from socially disadvantaged backgrounds. Andrews *et al* write:

> ...we see after-school provision as a means of opening more equal opportunities for children threatened with cultural as well as material poverty. Few homes can provide studio or workshop facilities; some homes cannot provide the space or time required for pursuing hobbies, or doing homework; many parents cannot afford the cost of musical instruments or advanced computers, or the cost of specialist sporting activities such as canoeing, gymnastics or horse-riding; some cannot afford a trip to a leisure centre, or even the local swimming pool (if there is one). (Andrews *et al* 1996 p.xiv)

Posner and Vandell (1994) report on a study which explored the link between low-income children's after-school care arrangements and their social and academic functioning. The research involved a sample of 216 children with a mean age of 9.05 years. Almost 60% of the children qualified either fully or partially for the federally subsidised lunch plan and 55% came from single parent households. Each of the 216 children participated in one of four after-school care arrangements (maternal care, informal care, self-care and formal after-school programmes) for three days a week or more. The formal after-school programmes were attended by 34 of the children who, compared with the other children in the study, spent:

- more time engaged in academic activities

- more time in enrichment lessons (e.g. music, dance and team sports – the children concerned did not generally participate in these activities other than through the after-school programmes)
- more time in structured activities with adults and peers
- less time watching television
- less time in outdoor unorganised activities (such as playing tag, hide and seek and cycling).

The study involved assessing the children's conduct and attainment in reading and maths. Children who attended formal care received better grades in these three areas.

An earlier study by Mayesky (1980) explored the effectiveness of a school day-care programme. Statewide reading and mathematics tests were used and it was concluded that the young people who participated in the day-care programme achieved significantly higher scores than non-participants. There were, however, no socio-economic or racial differences between participants and non-participants.

Research undertaken by NFER suggests that:

- there is a particular role for study support in helping children from disadvantaged backgrounds
- pupils from more economically advantaged backgrounds are more likely to take part in study support activities
- many study support programmes are based in areas of social deprivation in an attempt to address the needs of specific target groups.

(Sharp *et al* 1999a, pp.14-15)

Writing prior to the publication of the National Evaluation report, Sharp *et al* (1999b) argued that the lack of firm evidence of a correlation between participation in study support and improved attainment meant that it was not possible to argue conclusively that attending study support had particular benefits for pupils from socially disadvantaged backgrounds. While some researchers (e.g. March 1992) had reported that study support had particular benefits for these pupils, the research was not UK-based. The National Evaluation had gone some way to addressing the lack of UK evidence, but – as is reported earlier in this Chapter – the outcomes considered in relation to pupils from socially disadvantaged backgrounds were limited to attainment and one of the five attitude factors. Futhermore, school effects were not explored in relation to these pupils. It was these deficiencies that provided the impetus for the present study.

THE DEVELOPMENT OF A THEORETICAL MODEL

The findings reported in the National Evaluation support the conclusions from other evaluations of study support reported in this thesis that there is no simple relationship between the type of study support activity attended (i.e. subject based or non-subject based) and the improved outcome (or outcomes). While subject based provision is generally reported to result in improved attainment and non-subject based provision appears to generally result in improved attitudes and school attendance, subject based activities are sometimes reported to increase attitudes and attendance and some non-subject based study support appears to result in improved attainment. For the purposes of this thesis, a theoretical model was developed in an attempt to conceptually map and subsequently test participation in study support activities with improved attainment, attitudes and school attendance.

The model is grounded in school effectiveness research which has demonstrated that the progress made by a pupil at school – or, in the terminology used in this thesis, 'the school experience' - is determined in part by the school attended (e.g. the approaches to learning and teaching adopted in the school, the support provided to pupils and the ethos of the school), but also by the pupil (depending on his/her background characteristics, such as gender and ethnicity, and prior measures of attainment, attitudes and school attendance) and his/her home experience. Certain aspects of the home experience are known to contribute to children's learning and attainment: is there a culture of learning, a suitable area in the house for the pupil to study and access to resources such as books and newspapers? Previous research has shown that such facilities and resources tend to be absent from socially disadvantaged households. In the present study, entitlement to free school meals was used as a proxy indicator of social disadvantage. There are a number of important considerations associated with the use of free school meals as an indicator of social disadvantage. For example:

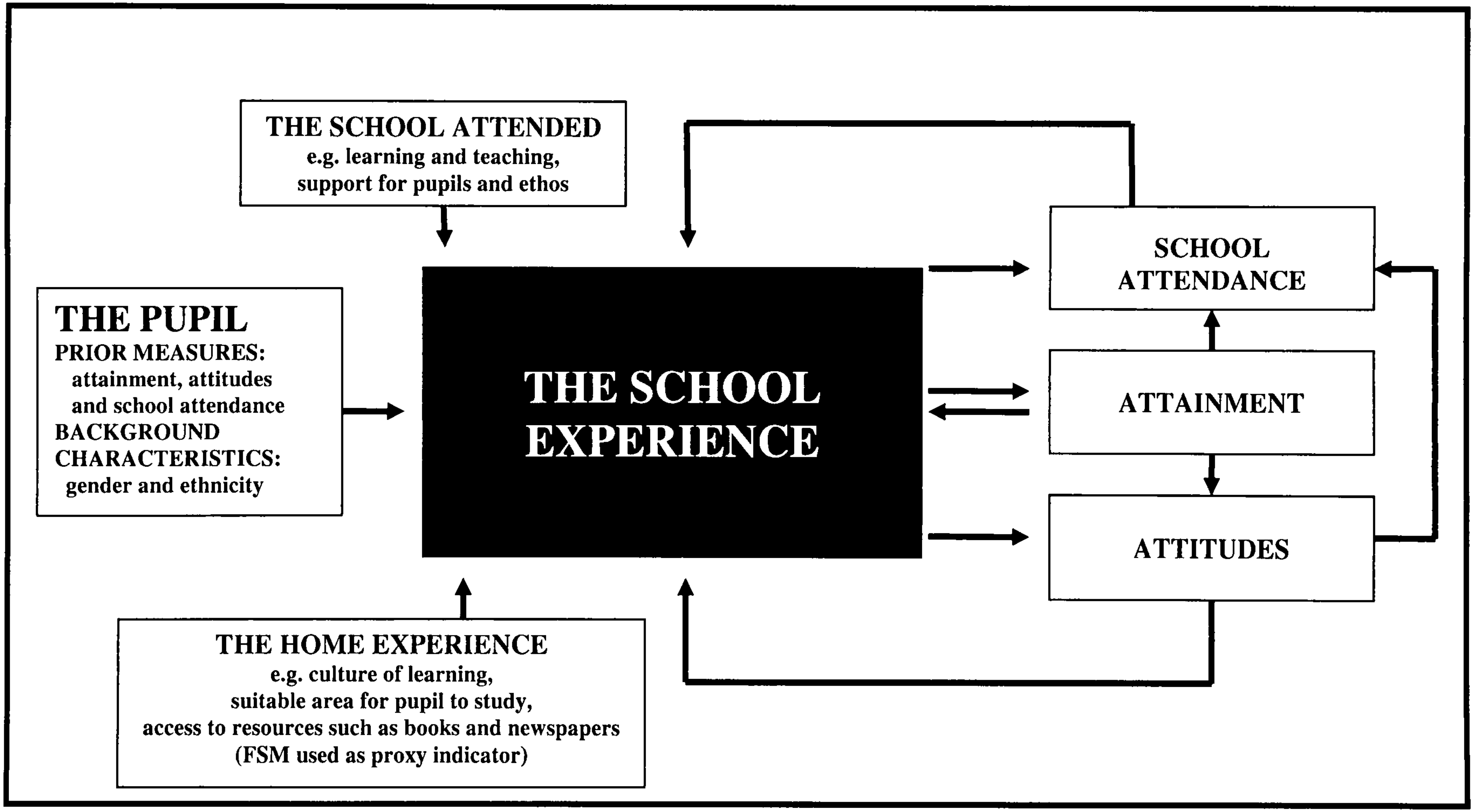
- should pupil and/or school level FSM data be used?
- individual FSM eligibility can change over time
- some pupils who are eligible for free meals will not be recorded as such.

These, and other, FSM-related issues are discussed in detail in Chapter Four of this thesis.

While some previous research (e.g. Thomas *et al* 2001) has demonstrated that contextual effects - such as the percentage of pupils in the school in receipt of free meals - contribute to school effectiveness, other research (e.g. Thomas & Mortimore 1996) has demonstrated that contextual effects have no significant effect once the pupil's background and prior attainment have been taken into consideration. In terms of free school meal entitlement, the model used in this thesis follows that suggested by Thomas & Mortimore and is limited to pupil-level data, rather than including contextual effects. One advantage of limiting the model to pupil-level data is that additional degrees of freedom are not taken up by the contextual effects. Furthermore, there is no need to consider the inclusion of additional interaction terms which involve the contextual variables.

The basic model is represented diagrammatically in Figure 2.1. In relation to the school experience, it shows three 'inputs': the school attended, the pupil and the home experience. Three outputs are also shown: attendance, attainment and attitudes. These outputs are more than ends in themselves, as they loop back into the box and contribute further to the school experience. For example, the 'feel good' factor experienced by a pupil who has experienced raised attainment is likely to result in additional improvement in his/her attainment. There are interconnections between the outputs which also feed back into the pupil's experience of school. For example, a pupil with good attendance is likely to attain and this attainment will reinforce the pupil's belief in the importance of regular attendance at school. The pupil therefore continues to attend school regularly and experiences further improvements in his/her attainment. Similarly, a pupil with a positive attitude towards school is likely to attain and this attainment will increase – or at least maintain - his/her positive attitude and result in continued improvement in his/her attainment.

Figure 2.1: The classic 'black box' experience

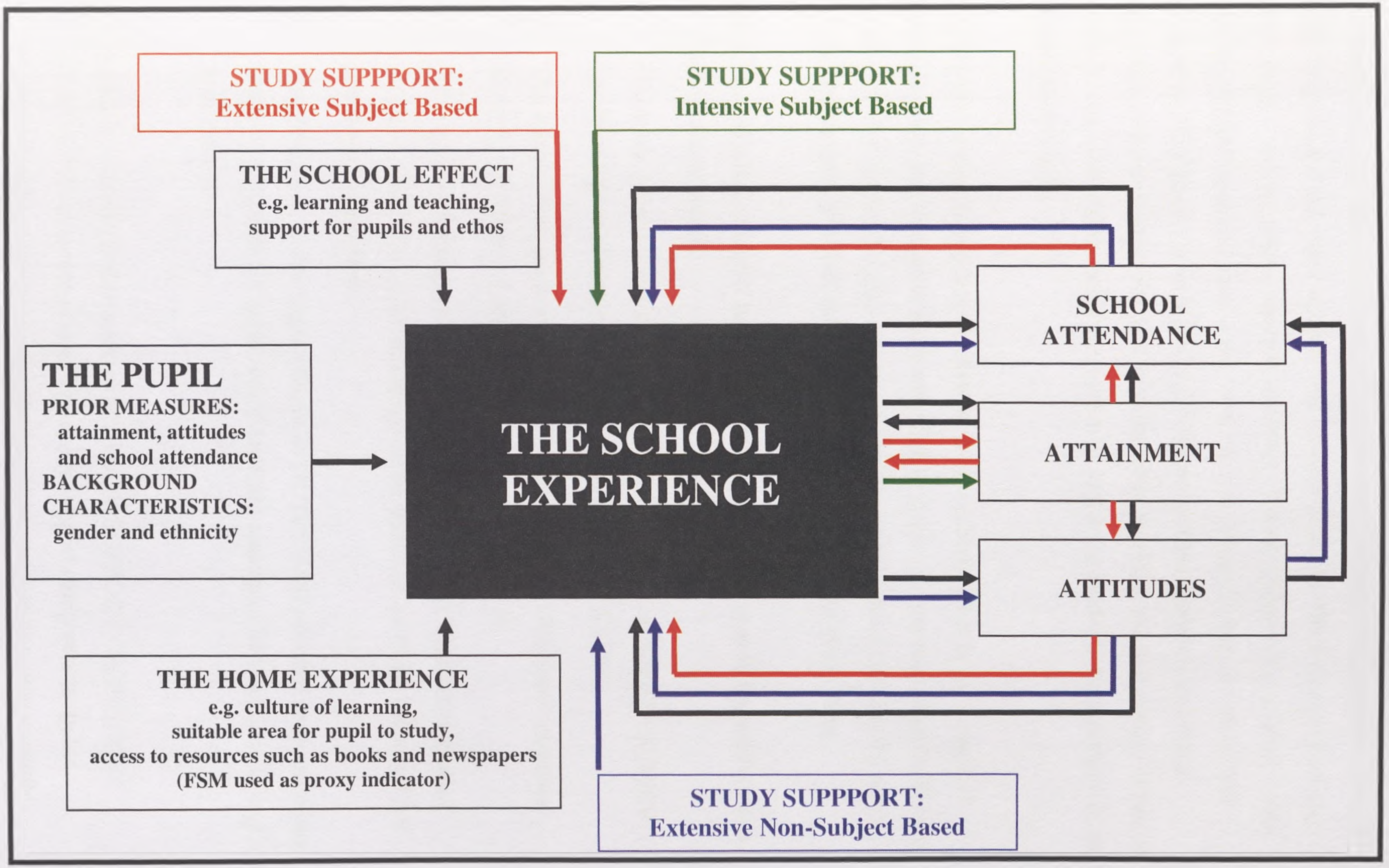


The basic model shown in Figure 2.1 is developed in Figure 2.2 to include three additional ‘inputs’: attendance at extensive subject based study support, attendance at intensive subject based study support and attendance at extensive non-subject based study support. Figure 2.2 suggests possible sets of relationships between these ‘inputs’ and the three outputs (attainment, attitudes and school attendance). These relationships will be tested in this thesis. It is anticipated that participation in study support activities will result in added value as measured by the three outputs. Intensive non-subject based activities are not incorporated in the model as such activities are not common in the research literature and non-existent in the National Evaluation of Study Support (the data from which were used in the present study). The relationships between attendance, attitudes and attainment shown in Figure 2.1 have been well researched and will therefore not be explored in the present study.

It is expected that an extensive subject based study support activity (e.g. a lunchtime Maths club) will contribute initially towards improved attainment, but this in turn contributes towards improved attitudes and school attendance. In contrast, an extensive non-subject based activity (e.g. a drama club) will contribute firstly towards attitudes and attendance rather than attainment. However, the improved attitudes and attendance loop back into the school experience and contribute towards improved attainment. It is anticipated that an intensive subject based activity, such as an Easter School, will result in raised attainment. In the case of an Easter School, the raised attainment is unable to impact on school attendance or attitudes as this particular form of study support is offered immediately before the exam diet when it is too late to impact on these outcomes.

Figure 2.2 acknowledges that the impact of participation in study support may not be the same for all pupils. It assumes that study support will be an additional factor that will contribute to ‘the school experience’ and the impact for an individual pupil may be dependent on the other factors - the school attended, the pupil (gender, ethnicity and prior measures of attainment, attitudes and school attendance) and the home experience.

Figure 2.2: A theoretical model showing the benefits of participation in study support



As this thesis is interested in the role of study support for pupils from socially disadvantaged backgrounds, the strengths of the relationships between participation in study support and the three outputs will be considered for these pupils in relation to other pupils. It is hypothesised that all forms of study support (i.e. extensive and intensive subject based activities and extensive non-subject based activities) will have more to offer pupils from socially disadvantaged backgrounds and that a stronger set of relationships will be found for these pupils than other pupils. If this is found to be the case, the theoretical model will require to be developed to show these different relationships.

The study also aimed to explore whether there is a school effect in the benefit of study support – is study support more effective in some schools than others? If study support is more effective for socially disadvantaged pupils, does this vary by school? If school effects are identified, the model will be developed to show these.

Based on the theoretical model being explored, a set of four generic hypotheses was developed for the research:

a Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE.

b The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school.

c The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school.

d The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level.

The hypotheses were applied to a series of STUDY SUPPORT CATEGORY/ OUTPUT MEASURE combinations. The study support categories included extensive and intensive subject based activities and extensive non-subject based activities, while the outputs (and baselines) were measures of attainment, attitudes and school attendance.

The hypotheses were explored through the creation of a series of multilevel models (see Chapter Four of this thesis). The multilevel models included the pupil, the school effect and the home experience 'inputs' shown in the theoretical model. The pupil 'inputs' were gender and ethnicity. The multilevel models were designed to permit school effects, thereby taking cognisance of the school attended. (Where significant differences were found between schools, the extent of these differences was explored through an examination of the school residuals.) The home experience 'input' was free school meal entitlement.

Hypotheses (a) and (b) make no distinction between FSM and non-FSM pupils. They were required before differences between these two groups of pupils could be explored in hypotheses (c) and (d).

Hypotheses (c) and (d) assume that there will be differences in the impact of study support for FSM and non-FSM pupils. As is stated earlier in this Chapter, it is hypothesised that study support will have more to offer FSM pupils than non-FSM pupils - it is expected that a stronger set of relationships will be found between participation in study support and improved outcomes for FSM pupils.

Hypotheses (b) and (d) assume that there will be differences in the impact of study support according to the school attended. If this is the case, different relationships will be found between participation in study support and outcomes depending on the school attended.

The word 'impact' has to be used with considerable caution in studies such as the present one. There is an assumption that any change to one of the 'inputs' (e.g. attendance at study support) will result in a direct change in one or more of the 'outputs' (i.e. attainment, attitudes and school attendance). The reality is that the outputs may be determined by a number of factors. It may well be that something else, which is unknown to the researcher, has resulted in the change.

The study was essentially a correlational one which looked for a link between participation in study support and the three outcomes of attainment, attitudes and school attendance. A key criticism of the use of correlational data is that a correlation merely indicates that when one variable varies, so does the other. In the 'real' world two variables often correlate even when there is no clear causal link, for example:

- the size of children's feet and their ability to spell
- ice cream sales and the number of deaths through drowning
- dental cavities in children and the extent of their vocabulary.

There is no direct causal link in these examples and the correlations exist because of the presence of an intermediary variable - in the case of children's feet and the ability to spell is it age, while with the sale of ice cream and the number of deaths through drowning it is the presence of sunshine. The emerging paradigm in educational research of Complexity Theory (see, for example, Cohen, Manion & Morrison 2007) argues that simple cause-and-effect models are insufficient and that a holistic approach, which examines multiple causality and multidirectional causes and effects, is necessary. Complexity Theory suggests the need for case studies, action research and participatory forms of research.

Given the possibility of the influence of an intermediary variable (or variables), it is necessary for all researchers using correlational data to be cautious about their findings. The present study is no exception, as the impact of study support on a pupil's attainment, attitudes and school attendance could rely on a number of other variables, including the school attended, social background, gender and ethnicity. The impact may also be dependent on other unknown variables.

With regard to the present study, two points are worthy of note. Firstly, the correlations explored do 'make sense' – unlike the size of children's feet and their ability to spell, it does make sense to suggest that participation in study support will have a direct result on attainment. Secondly, the multilevel models used in the research do include a number of explanatory variables, such as school attended, social background and gender, which might influence the impact of study support. While the models cannot replace the depth of information that could be gathered through the case studies or action research called for in Complexity Theory, they do at least acknowledge that these other variables may influence the impact of participation in study support for pupils from different backgrounds and do permit a breadth of coverage not possible through qualitative research.

In spite of the above two points, it is important to reiterate that unknown intermediary variables may influence the impact of study support and the results of the present study must therefore be interpreted with caution.

SUMMARY

This chapter has reviewed the study support literature. Before discussing the literature on the evaluation of study support programmes, the literature on the nature, the provision and take-up and the reported benefits of study support was reviewed. The review of the evaluation of study support programmes considered the nature and strength of the evidence used in each evaluation and common criticisms and limitations of these evaluations. Notwithstanding the criticisms and limitations of the evaluations, the research reviewed suggests that participation in study support can result in improved attainment and attitudes. However, there is no simple relationship between the type of study support activity attended (i.e. subject based or non-subject based) and the improved outcome (or outcomes). While subject based provision is generally reported to result in improved attainment and non-subject based provision appears to generally result in improved attitudes and school attendance, subject based activities are sometimes reported to increase attitudes and attendance and some non-subject based study support appears to result in improved attainment. For the purposes of this thesis, a theoretical model was presented in an attempt to conceptually map and subsequently test participation in study support activities with improved attainment, attitudes and school attendance. This chapter has introduced the National Evaluation of Study Support for which an extensive and unique dataset was created. This extensive dataset was used in the research reported in this thesis to explore further the impact of participation in study support on attainment, attitudes and school attendance. In particular, the impact was considered in relation to pupils from disadvantaged backgrounds. The differential effect between schools was explored through the use of multilevel modelling. A set of four generic hypotheses was listed. The hypotheses will be explored in Chapter Five. The focus of the following chapter, Chapter Three, is a detailed description of the National Evaluation.

Chapter Three:

THE NATIONAL EVALUATION OF STUDY SUPPORT

The research described in this thesis was an extension study of the National Evaluation of Study Support (MacBeath *et al* 2001). This chapter will outline the background to the National Evaluation. It will describe – in greater detail than the main evaluation report - the data collection instruments, the dataset that was created and the sample of schools and pupils that participated in the research.

BACKGROUND TO THE NATIONAL EVALUATION

During 1996 the Prince's Trust, in partnership with two Inner London local education authorities and an (English-based) training and enterprise council, developed a programme to evaluate the effectiveness of study support. By the autumn of 1997, a large-scale pupil tracking study had been incorporated into the evaluation and the programme was established with the title "The Study Support National Evaluation and Development Programme" (SSNEDP). Two cohorts of pupils were involved: the junior cohort comprised 1902 pupils who entered Year 7 in the autumn of 1997 (average age = 11.5 years), while the senior - and larger - cohort comprised 8390 pupils who began Year 9 in the autumn of the same year (average age = 13.5 years). The research reported in this thesis focused on the 8390 pupils in the senior cohort.

The aims of the Study Support National Evaluation and Development Programme were to:

- ascertain the impact of participation in study support activities on the attainment, attitudes and attendance of a large sample of students in secondary schools serving disadvantaged areas

- develop and disseminate models of good practice, through the support to schools of Critical Friends, and training events and publications.

(MacBeath *et al* 2001, p. 13)

The Project quickly spread to include thirteen local education authorities (including two in Scotland and one in Wales). The focus of the Prince's Trust's work is on disadvantaged young people and it was for this reason that the sample was heavily biased towards schools in disadvantaged areas in the major conurbations. The sample was limited to secondary schools because the Trust's charitable status excludes work with primary school-aged children.

A key aspect of the Programme was the appointment of a team of eight "Critical Friends". The notion of the Critical Friend was developed from earlier work by MacBeath (1998a). The role of the Critical Friend in relation to the present Programme was to support schools:

- in extending and enhancing their study support provision using the framework provided by the Study Support Code of Practice (MacBeath 1999)
- with the process of self-evaluation.

Throughout the Programme the schools met at termly training events and residential conferences.

To ensure that the research was seen as "objective, disinterested and independent" (MacBeath *et al* 2001, p.13), it was decided that there should be demarcation between the research and development strands of the Project. This was achieved through:

- the appointment of a team (independent from the Development/Critical Friend team) to gather, enter, process and analyse the data using standardised instruments which were administered to a strict protocol
- the appointment of two independent readers
- the commissioning of an independent qualitative set of case studies on a subset of the schools in the research project.

The team appointed to gather, enter, process and analyse the data comprised staff from the Quality in Education Centre at the University of Strathclyde. Included in the team was the present author, whose role within the main evaluation study had been that of Data Manager. The responsibilities of the Data Manager included creating spreadsheets for data entry, training the data entry staff, cleansing and tidying the data in preparation for the analysis. He was also involved in the development of the written instructions issued to schools for the administration of the various student questionnaires.

The Study Support National Evaluation and Development Programme was funded by the DfEE, the Prince's Trust and by contributions from the LEAs whose schools were partners in the Programme.

As a result of a review of its operations and in the light of the fact that its original objectives had been achieved, the management of the SSNEDP was transferred from the Prince's Trust to the National Youth Agency (NYA) in April 1999. The staff were seconded to the NYA to continue the work. This arrangement continued until the end of the Programme.

THE DATASET

The data were collected in three tranches. These involved the collection of:

1. baseline data (Autumn 1997)
2. data on attendance at study support activities (Summer 1999 and Easter 2000)
3. output measures (Summer 2000).

Baseline Data

Baseline data were collected for each pupil in Autumn 1997. These included attainment, attitude and school attendance data.

The Non-Verbal Reasoning Inventory (NVR), published by NFER-Nelson, was used as the baseline attainment measure in Autumn 1997. The decision to use the NVR assessment was made on the basis of the predictive capability of the test and the costs involved.

The inventory comprised 52 questions which test a pupil's ability to recognise similarities, analogies and patterns in unfamiliar designs. These processes are believed to be fundamental to understanding and assimilating new information and ideas. The accompanying manual (Smith & Hagues 1993) suggests possible uses of the test results by class teachers. The manual also explains how the test should be administered, marked and scored. The scoring process includes the conversion of a pupil's raw score into a standardised score.

An extract of the NVR inventory can be found in Appendix C. (As the document is availably commercially, it is not possible to reproduce the entire document in Appendix C.) Frequency tables of the standardised scores are presented in Appendix B Table B1.

Year 9 KS3 SATS scores (or Year 7 KS2 SATS scores in the case of the junior cohort) were also collected. The overall test level achieved by each student was recorded within the dataset. These levels ranged from 1 to 8, with 8 being the highest. Frequency tables for the KS3 levels are shown in Appendix B Tables B2-B4.

Attitudinal data were collected (also in Autumn 1997) using the NFER Student Attitude Inventory *You and Your School* which was developed for research commissioned by the National Commission on Education. Normative data is available (Keys & Fernandes 1993). The inventory comprised 69 items that included questions about attitudes towards school, school work, rules and discipline, teachers, activities outside lesson time and plans for the future.

Two main types of questions were used in the inventory. The first part of the questionnaire asked pupils to indicate their level of agreement with each in a number of statements by circling a number on a five-point scale. The statements were grouped in four blocks, with each block having its own five-point scale, namely:

- strongly agree/agree/not sure/disagree/strongly disagree
- all lessons/most lessons/some lessons/hardly any lessons/no lessons
- always/nearly always/sometimes/hardly ever/never
- all teachers/most teachers/some teachers/hardly any teachers/no teachers.

The other questions required the pupils to select one or more pre-coded responses by circling a number or ticking a box.

The original (NFER) study identified five factors. These five factors were also found in the National Evaluation data. The factors are shown, along with some exemplar questions, in Table 3.1.

Table 3.1: **Attitude questionnaire – The five factors and some exemplar questions**

Factor 1	**Positive attitudes towards school work** I am very happy when I am at school I like lessons where I can work on my own
Factor 2	**Positive attitudes to school ethos** My school is clean and tidy My teachers praise me when I do my schoolwork well
Factor 3	**Acceptance of utilitarian purposes of school** Schools should teach things that will be useful when we get jobs My parents think school is a waste of time
Factor 4	**Academic self-esteem** I work as hard as I can in school I think I am very good at school work
Factor 5	**Commitment to participation in class and individual discussions with teachers** I am keen to answer questions in class I often talk to my form tutor about my career plans

From MacBeath *et al* (2001) p.38, Table 3.8

A total attitude score was calculated for each pupil. The total score was used in the analyses reported in this thesis[1]. The scores for each factor have, however, been included in the summary of baseline measures (see Table 3.2) as these show the range associated with each factor.

An excerpt from the *You and Your School* questionnaire is shown in Appendix D. It is not possible to reproduce the complete questionnaire in Appendix D because the document is available commercially.

Attendance data were provided by the schools as a single percentage figure for each pupil (authorised absence was treated as absence). Only 32 schools provided attendance data. A frequency table showing the percentage attendance can be found in Appendix B Table B5.

All of the baseline data were entered into a database designed especially for the study. Each pupil was allocated a unique identification number. In the subsequent rounds of data collection, this unique identification number (as well as the pupil's name) was pre-printed on each of the research instruments. Using the unique identification number, it was possible to match the responses given by the respondents across the different tranches of data collection.

During each round of data collection, the schools were asked to arrange for the questionnaires to be completed under "examination conditions". Some schools arranged for this to happen within individual classes (typically form periods or PSD[2] lessons), while others arranged for the entire year group to complete the questionnaires together in the assembly hall. The schools were provided with a list of detailed instructions regarding the completion of the questionnaires. This included information that they were requested to read to the pupils before the questionnaires were completed. In order to provide the pupils with an assurance that no one in the

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[1] See page 93 for information regarding the internal consistency of the total attitude score.
[2] PSD is a common abbreviation for Personal, Social and Development lessons. In some schools these lessons are entitled PSE (Personal and Social Education) or PSHE (Personal, Social and Health Education).

schools would read their responses, the school staff were asked to seal the completed questionnaires in large envelopes in front of the pupils at the end of the period during which they were completed. The pupils were advised that this would happen in the information that was read to them before they began completing the questionnaires. Appendix E provides an example of the detailed guidance that was given to the schools.

All of the baseline variables used in the research are listed in Table 3.2. The table shows the number of valid responses and the minimum, maximum and mean values for each variable.

Table 3.2: **Summary of baseline measures**

Baseline Measure	Number of Cases	Missing Cases	Total	Min	Max	Mean	SE of Mean	Median	Mode	SD
ATTAINMENT										
NVR Standardised	6030	2360	8390	70	135	92.1	.161	91.0	86.0	12.5
SATS English	5580	2810	8390	1	8	4.8	.014	5.0	5.0	1.1
SATS Maths	6174	2216	8390	2	8	4.5	.015	4.0	4.0	1.2
SATS Science	6045	2345	8390	1	8	4.3	.014	4.0	4.0	1.1
ATTITUDE										
Factor 1	6169	2221	8390	15	65	48.1	.092	49.0	50.0	7.2
Factor 2	6210	2180	8390	12	51	39.6	.065	40.0	40.0	5.1
Factor 3	6406	1984	8390	17	45	40.9	.040	42.0	43.0	3.2
Factor 4	6020	2370	8390	5	25	19.1	.035	19.0	18.0	2.7
Factor 5	3713	4677	8390	6	22	12.9	.044	13.0	13.0	2.7
Total Attitude Score	3365	5025	8390	87	206	161.1	.260	162.0	162.0	15.1
SCHOOL ATTENDANCE	5629	2761	8390	1	100	87.0	.202	92.0	99.0	15.2

Attendance at Study Support Activities

The intention had been that the records maintained by the schools of participation in study support activities would be used to ascertain each pupil's attendance at these activities. However, it became apparent that record keeping of participation at study support activities was "variable and inconsistent" (MacBeath *et al* 2001) and that an alternative method of record keeping would be required. It was decided that a questionnaire would be designed for the pupils to use to record, retrospectively, the study support activities in which they had participated. Two questionnaires were devised for each cohort: one for completion during summer 1999 (for the senior cohort this was concerned with activities attended during Years 9 and 10) and the other for completion in Easter 2000 (this asked the senior cohort about activities attended during Year 11). These questionnaires asked the respondents to indicate whether they attended the study support activities listed in the questionnaire "regularly", "occasionally" or "never". An example of one of the questionnaires can be found in Appendix F. For the purposes of the statistical analysis, a dichotomous variable was created in which the three response categories were recoded into two: "regularly/occasionally" and "never". Using these two categories, each pupil was considered to be either an attender or a non-attender in relation to each study support activity.

Data were also collected on the pupils' attendance at Year 11 Easter Schools. This information was obtained directly from school records, rather than through a self-report questionnaire, as the Easter Schools took place after the main data collection period. All subject based Easter Schools were included – the database did not record the particular subjects attended. As with participation in other study support activities, pupils were simply coded as attenders or non-attenders.

Given the different range of study support activities provided in each school and the variety of names given to these activities, it was necessary to provide a questionnaire that was customised for each school and for the specific year group involved. Some examples of the range of activities offered can be seen in Table 3.3.

Before each individual questionnaire could be devised, a list of all the out-of-school-hours activities available within each school had to be obtained. The purposes, methods and locations of the activities and the name by which the students knew the activity had to be ascertained from the schools. All of this information was obtained through telephone calls to the schools from members of staff from the Study Support

National Evaluation and Development Programme or through telephone calls to the schools from the schools' Critical Friends. The approach of telephoning the schools had the added benefit of prompting the contact person in each school to consider including the full range of out-of-school-hours activities covered by the definition in *Extending Opportunity* (DfEE 1998).

While the customisation of the questionnaires helped to facilitate their completion by the pupils, the downside was that the activities listed in each questionnaire required to be categorised in order that the analysis could incorporate comparisons between schools. The categories devised required to be small enough to be manageable, yet large enough to reflect the diversity in provision. An initial matrix comprised the following factors:

- when the activity took place (e.g. before school or at the weekend)
- the duration of the activity (e.g. a week or less or more than a term)
- the focus of the activity (from curriculum support to personal and social education)
- the pedagogy (from teacher directed to student directed)
- the location of the activity (from "entirely on school premises" to "entirely off school premises").

As the research progressed and the research team became more familiar with what the schools were doing and the features of good practice that were emerging from the work of the Critical Friends, it became apparent that some of the factors in the matrix were so context dependent that it was unlikely that they would have any explanatory power. MacBeath *et al* wrote:

> ...the time when activities are offered is highly dependent on how the majority of students travel to school, parental beliefs about their children's safety and the availability of staff. The location of activities on or off school premises is dependent on the resources available in the school or elsewhere as much as on the beliefs of staff about students' responsiveness. (MacBeath *et al* 2001, p.92)

Following further consideration, a revised taxonomy of Study Support activities was devised by the research team. This was derived from the insights gained from the developmental aspects of the Development Programme. It consisted of:

1. the most common forms of provision (including drop-in sessions in libraries and learning resource centres, sports, and aesthetic activities such as music, drama and art clubs)
2. activities which *prima facie* might show an effect on the outcome measures (e.g. curriculum extension and revision classes with specific categories for mathematics, English and science and for all other subjects of the curriculum clustered as one category)
3. innovative provision for which claims were being made (including study skills, meta-cognitive activities and accelerated learning, peer education, and mentoring)
4. a catch-all category of "other" which included a wide range of hobby clubs (e.g. chess and rocketry) and community and service activities (such as Changemakers and the Duke of Edinburgh's Award Scheme).

The finalised taxonomy distinguishes between 'subject-focussed' and 'not subject-focussed' study support. These terms are equivalent to the 'subject based' and 'non-subject based' used within this thesis. All of the activities included in the taxonomy were extensive. The taxonomy is shown in Table 3.3.

Table 3.3: **The taxonomy of study support activities**

	CATEGORY	DEFINITION	EXAMPLES OF ACTIVITIES		No of schools offering provision in Yr. 10	No of schools offering provision in Yr. 11
Subject-focussed	**Maths**	Subject-focussed and teacher directed. (Only activities that can be *uniquely* coded as Maths, English or Science).	Maths Club Maths Clinic Super Maths Sessions	Maths Surgery Basic Numeracy Club Statistics	16	39
	English		Extra English English Homework Club (in E1) Twilight Revision English	English Beginners Club SDS Activities (ILS) Global English	13	39
	Science		Science Club Young Scientists Club Homework Club for Science	Physics Revision Science Study Group Science Practicals	17	38
	Subjects	Subject-focussed and teacher directed. Includes: • any combinations involving Maths, English and/or Science which cannot be *uniquely* coded above as 'Maths', 'English' or 'Science' • any other (exam related) subjects (including combinations) • Successmaker	Geography Revision Class Study Support History MFL Study Support RE GCSE A Level Art GCSE Sociology GCSE PE Theory Engineering Dance GCSE Japanese	Arabic Media Studies Technology Sessions Business Studies IT Keyboard GCSE Internet Club Food Technology Textiles Food Hygiene Certificate	37	43
Not Subject-focussed	**Study skills**	Metacognitive (including exam preparation) activities	ACE Days UFA Philosophy Course Revision Skills Day	Accelerated Learning Days Parents' Conference	9	6
	Sport	All (non-examined) Sporting activities. (Exam-related Sporting activities are coded as 'Subjects')	PE Club Football Hockey	Swimming Club Fitness Training Trampoline	36	42
	Aesthetic	All (non-examined) Aesthetic activities, including pupil performance. (Exam-related Aesthetic activities are coded as 'Subjects')	Orchestra Music Club Steel Pan Band African Drumming Group	Choir Dance Club Art Club Public Speaking	33	37
	Peer Education	Being involved in Peer education	Reading Mentors with Year 7 Helping with Paired Reading Homework Club Helpers	Life Skills and Peer Mentoring Buddying Scheme	8	11
	Drop-in	Generic, student selected, cognitive activity	Study Centre Breakfast Club Lunch Club Homework Club Library Lunchtime Computer Club	Study Support Internet Café Learning Resource Centre Study in Homework Club/Quiet Room	40	39
	Mentoring	Being mentored (Yr.11 only)	Mentoring Programme In School Mentoring Target Setting with Mr. O'Keeffe	Senior Tutor Counselling BT Roots and Wings	NA	20
	Other	All activities that cannot be coded in any of the above categories	Duke of Edinburgh Award Newsletter Group Careers Fairs/Work Experience	School Production Chess Club Camera Club	28	31

Source: MacBeath *et al* (2001) p.23, Table 3.1

The analyses reported in this thesis explored the effects of attendance at maths, English and science activities in Year 10 and Year 11. In addition, four variables were included that indicated whether a pupil had attended:

1. at least one Year 10 subject based activity
2. at least one Year 11 subject based activity
3. at least one Year 10 non-subject based activity
4. at least one Year 11 non-subject based activity.

In addition to the above extensive study support activities, attendance at Easter School (i.e. intensive subject based provision) was included in the analyses.

Table 3.4 shows the number (and percentage) of pupils who reported attending these activities. The high number of 'no responses' in both Year 10 and Year 11 is due to pupils who did not complete the relevant questionnaire.

Table 3.4: **The number (and percentage) of pupils attending the study support categories included in the analysis**

STUDY SUPPORT CATEGORY			YEAR 10			YEAR 11		
			Yes	No	No Response	Yes	No	No Response
Subject based	Extensive	Maths	724 13.6%	4618 86.4%	3048	2355 46.0%	2765 54.0%	3270
		English	343 6.4%	4999 93.6%	3048	1853 36.2%	3267 63.8%	3270
		Science	682 12.8%	4660 87.2%	3048	2063 40.3%	3057 59.7%	3270
		Subject based	2599 48.7%	2743 51.3%	3048	4073 79.6%	1046 20.4%	3271
	Intensive	Easter School	Year 11 only			1475 24.7%	4492 75.3%	2423
Non-subject based	Extensive	Non-subject based	4339 81.3%	1000 18.7%	3051	4075 79.6%	1042 20.4%	3273

Table 3.4 reveals a number of trends in participation in study support activities by the pupils in the sample. These include:

- in Year 10, participation in extensive non-subject based study support activities was considerably greater than participation in extensive subject based activities. Indeed, over 80% of pupils reported participating in non-subject based activities while less that 50% reported participating in subject based activities
- participation in extensive subject based activities increased between Year 10 and Year 11. The percentage of pupils reporting participation in a Year 11 subject based activity (79.6%) was identical to the percentage reporting participation in a non-subject based activity.

Output Measures

The attainment of the senior cohort was measured through GCSE results. The pupils' results in maths, English and science were provided by the schools in Summer 2000. The results were entered by the schools onto a proforma designed for the study and sent to the Quality in Education Centre for data processing. Orignally entered as letters (i.e. A, B and C etc), the results were later recoded into numerical values - with 8=A*, 7=A, 6=B and 5=C etc - for the analysis. In addition to entering the maths, English and science results onto the performa, the schools also listed the 'Best 5' score for each pupil. The 'Best 5' score is frequently used as a measure of pupil attainment. In the National Evaluation it was calculated by converting each pupil's five highest awards into numerical values using the convention of 8=A*, 7=A and 6=B etc and then adding these together. Detailed instructions for calculating the Best 5 score were included with more general instructions that were issued to the schools concerning the completion of the proforma (see Appendix G).

Standard Grade, rather than GCSE, results were collected for the pupils who attended the Scottish schools. These pupils were excluded from the analyses involving GCSE results. (The attainment of the junior cohort was measured using SATs scores in maths, English and science.)

Frequency tables for each of the GCSE measures collated for the evaluation are presented in Appendix B Tables B6-B9.

MacBeath and his colleagues acknowledged the limitations of using GCSE results and SATS scores to measure attainment:

> The measures of attainment are narrow and do not cover the personal and social skills and qualities that the schools in the sample were striving to develop in their students. They are however, standard and robust measures of academic achievement and are those used across the education system to compare the attainment of individual students and the value added by schools. The use of SATs and GCSEs as attainment output measures did not require schools to undertake additional work in the administration of further tests. Insights into the wider benefits of participation in study support were sought in the qualitative research. (MacBeath *et al* 2001, pp.93-94)

The NFER Attitude Inventory *You and Your school* was readministered at Easter 2000. This provided the attitude output measure. Given that the questionnaire was identical in content to the baseline instrument, it was possible to make direct comparisons between the responses given in the pre- and post-test questionnaires. The internal consistency of the total (Year 11) attitude score was tested using Cronbach's Alpha. This resulted in a value of 0.81.

As with the baseline data, the school attendance data were collected from the schools as a single percentage figure for each student (with authorised absence being regarded as absence). These data were collected in Summer 2000. Only 23 schools provided data. Appendix B Table B10 shows a frequency table of the Year 11 attendance.

Each of the output variables used in the research are listed in Table 3.5. The table shows the number of valid responses and the minimum, maximum and mean values for each variable.

Table 3.5: **Summary of output measures**

Output Measure	Number of Cases	Missing Cases	Total	Min	Max	Mean	SE of Mean	Median	Mode	SD
ATTAINMENT										
GCSE English	5561	2829	8390	1	8	4.0	.021	4.0	5.0	1.6
GCSE Maths	5525	2865	8390	1	8	3.6	.022	3.0	3.0	1.6
GCSE Science	5068	3322	8390	1	8	3.8	.023	4.0	4.0	1.6
Best 5 GCSE	5420	2970	8390	1	40	20.4	.117	21.0	26.0	8.6
ATTITUDE										
Factor 1	4809	3581	8390	13	65	46.5	.108	47.0	50.0	7.5
Factor 2	4833	3557	8390	11	51	35.5	.086	36.0	37.0	5.9
Factor 3	4974	3416	8390	12	45	40.0	.050	41.0	41.0	3.5
Factor 4	4734	3656	8390	5	25	18.6	.043	19.0	18.0	2.9
Factor 5	3744	4646	8390	6	22	13.9	.049	14.0	14.0	3.0
Total Attitude Score	3376	5014	8390	61	199	154.6	.286	156.0	156.0	16.6
STUDY SUPPORT Y10 ATTENDANCE QUESTIONNAIRE COMPLETED	5342	3048	8390							
STUDY SUPPORT ATTENDANCE Y11 QUESTIONNAIRE COMPLETED	5120	3270	8390							
SCHOOL ATTENDANCE	3323	5067	8390	0	100	85.4	.286	91.0	99.0	16.5

Table 3.6, overleaf, summarises the data gathered for the National Evaluation at each of the collection times.

Table 3.6: **Data collection times for the variables held in the National Evaluation of Study Support database**

SENIOR COHORT (Year 9 to Year 11)			
Autumn 1997	**Summer 1999**	**Easter 2000**	**Summer 2000**
STUDENT BACKGROUND DATA DOB, gender, ethnicity etc **BASELINE DATA** NVR Test Scores Key Stage 3 SATs results: Maths, English and Science Attitudinal data School Attendance	Degree of participation in any of the types of study support offered, for academic years 97-98 & 98-99	Degree of participation in any of the types of study support offered, for academic year 99-2000	**OUTPUT DATA** GCSE results: Maths, English and Science No. of A-C passes, No. of A-G passes, Best 5 point score Attitudinal data School Attendance

JUNIOR COHORT (Year 7 to Year 9)			
Autumn 1997	**Summer 1999**	**Easter 2000**	**Summer 2000**
STUDENT BACKGROUND DATA DOB, gender ethnicity etc **BASELINE DATA** NVR Test Scores Attitudinal Data School Attendance	Degree of participation in any of the types of study support offered, for academic years 97-98 & 98-99	Degree of participation in any of the types of study support offered, for academic year 99-2000	**OUTPUT DATA** Key Stage 3 SATs results: Maths, English and Science Attitudinal Data School Attendance

Source: MacBeath *et al* (2001), p.18
Table 2.4: Data set and collection times for senior cohort (Yr.9 to Yr.11)
Table 2.5: Data set and collection times for junior cohort (Yr.7 to Yr.9)

ANALYSING THE DATASET

It is clear from the preceding discussion that a tremendously rich dataset was created for the National Evaluation. However, the richness of the data did raise issues in terms of the analysis. For example, not only was the data rich in terms of quantity (i.e. the number of cases and the number of variables), it was also rich in terms of the different types of variables that were collected since ordinal, nominal and scale data were included in the dataset:

- the *ordinal data* (i.e. data where the values represent categories with some intrinsic order) included the responses to the attitude questionnaires such as *I am very happy when I am at school, My teachers praise me when I do my schoolwork well* and *I think I am very good at schoolwork* because the pupils were asked to respond to the questions using likert scales. The data concerning the pupils' attendance at study support activities was also recorded as ordinal data because the pupils were asked to indicate whether the participated in these activities "never", "occasionally" or "regularly"
- the *nominal data* (where the values represent categories with no intrinsic order) included variables such as: Male/Female, FSM/Non-FSM and the school identification numbers
- the NVR and school attendance variables were held as *scale data* – as the values were on an interval scale. (Had the GCSE and/or SATS results been stored as percentage marks, they would also have been scale variables. However, they were both stored as bands and were therefore ordinal data.)

The National Evaluation made use of SPSS (and multiple regression in particular) for the analysis, but that analysis was limited in that it did not allow for the creation of multi-level models. A criticism that has been made of some quantitative research studies is that they focus on individuals, rather than on the social and institutional contexts in which these individuals are located. Individuals may, for example, be part of families, schools and workforces and their beliefs and behaviours can be modified and constrained through their membership of these groups.

Multilevel modelling was developed as an attempt to give recognition to the hierarchical (or nested) structures within which data exist, thereby introducing "a degree of realism often absent from single-level models such as multiple regression" (Plewis 1998). The technique was used in the extension study on which this thesis is based. The previously published research largely made use of single-level analyses only.

THE SAMPLE

The Schools

A total of 51 schools were involved in the National Evaluation, including one school that withdrew during the study. Of the 50 remaining schools, 10 contributed to the junior cohort (Year 7 pupils) while 45 contributed to the senior cohort (Year 9). The schools (and education authorities) that participated in the study are listed in Appendix B Table B11[3].

Both the junior and senior cohorts comprised all the pupils within the relevant year group in each school at the start of the new school session in August/September 1997. Any pupils who enrolled in the schools after the evaluation period had begun were given the opportunity to complete the evaluation instruments, principally because it was administratively easier for the teachers involved as they did not require to make alternative arrangements for these pupils, but they were excluded from the final analysis as complete sets of data were not available. Similarly, pupils who left the schools during the evaluation period were excluded from the final analysis as resources were not available to ascertain their attendance at study support activities in other schools and/or their GCSE results (senior cohort) or SATs results (junior

[3] Although it is common for schools to participate in research studies anonymously, it is possible to list the National Evaluation schools in Appendix B because the schools were named within the main evaluation report (MacBeath *et al* 2001).

cohort). The pupils who attended the Scottish schools were excluded from all analyses involving GCSE results because Scotland has its own examination system.

The schools contributing to the analysis were mainly English, as were most of the report's authors. The quantitative analysis was, however, undertaken in Scotland.

As the focus of the Prince's Trust's work is on disadvantaged young people it was acknowledged from the outset of the National Evaluation and Development Programme that the sample of schools involved would not be representative of all schools, but would include some of the most disadvantaged in the country. The sample was heavily biased towards schools in disadvantaged areas in the major conurbations.

The Pupils

Table 3.7: **Background characteristics of the pupils**

Pupil Characteristics		Number of Pupils	Percent	Valid Percent
Gender	Male	4141	49.4	49.6
	Female	4200	50.1	50.4
	Total	8341	99.4	100.0
	Missing	49	0.6	
	Total	8390	100.0	
Free School Meals	Yes	2978	35.5	40.0
	No	4466	53.2	60.0
	Total	7444	88.7	100.0
	Missing	946	11.3	
	Total	8390	100.0	
Ethnic Background	White	4135	49.3	63.4
	Black	2387	28.5	36.6
	Total	6522	77.7	100.0
	Missing	1868	22.3	
	Total	8390	100.0	

Table 3.7 shows the background characteristics of the 8390 pupils in the senior cohort. In summary, for those pupils whose details were known:

- 49.6% were male

- 40.0% were in receipt of free school meals
- 63.4% were White.

The second (free school meal entitlement) and third (ethnic origin) of these points are worthy of comment.

Free School Meal Entitlement

The prevalence of Free School Meals within the sample of 40% is indicative of the fact that the sample included some of the most disadvantaged schools in the country. Free school meal status was known for 7444 pupils and when this was transferred into school level data it provided percentages for 39 schools. These varied across the schools from 10% to 74%, with a mean of 41%. Table 3.8 shows that in 21 schools (more than half the sample), 40% or more of the pupils were entitled to free meals.

Table 3.8: **Percentage of pupils entitled to free school meals in each of the 45 schools**

Percentage of pupils entitled to FSM	*Number of Schools*
<20%	6
20-39%	12
40-59%	15
60%+	6
Total known	39
Missing	6
Total	45

At the time of the National Evaluation, the national average for free school meal entitlement was 17% and Ofsted regarded values above 32% as indicative of severe disadvantage (MacBeath *et al* 2001). Of the 39 National Evaluation schools for which school level FSM entitlement was available, 35 (90%) had an entitlement that was greater than the national average and 28 (over 70%) had an FSM entitlement of 32% or more.

A more recent DfES (2003) publication reports that the percentage of pupils attending grant maintained secondary schools in England and known to be eligible for free meals is 15%. This is in stark contrast to the 42% FSM entitlement (English schools only) found in the present study.

Table 3.9: **Percentage of pupils known to be eligible for free school meals: DfES (January 2003) statistics compared with the study support evaluation sample**

REGIONAL AREA	DfES STATISTICS Percentage of pupils known to be eligible for free school meals	STUDY SUPPORT EVALUATION	
		Percentage of pupils known to be eligible for free school meals in each area	Number of pupils in study from each area
Inner London	39%	52%	1976
North West	19%	50%	561
North East	18%	35%	1406
Outer London	17%	-	0
Yorkshire and The Humber	16%	44%	475
West Midlands	16%	28%	1362
East Midlands	11%	-	0
East of England	10%	44%	160
South West	9%	-	0
South East	8%	-	0
All English Schools	15%	42%	5940
Scotland		21%	392
Wales		38%	1112
All Schools		40%	7444

DfES statistics are taken from DfES (2003) p.34 Table 14
Maintained Secondary Schools: School Meal Arrangements, January 2003

Table 3.9 compares the DfES percentages of pupils eligible for free school meals in each region with the percentages identified in the present study. Caution should be exercised when comparing regional percentages in this way because in certain regional areas only small numbers of pupils were involved in the study (e.g. East of England and Yorkshire and the Humber). Despite this, it is clear that overall the pupils who participated in the National Evaluation were more disadvantaged than pupils in general. Furthermore, the table indicates that in each of the regions in which pupils were involved in the National Evaluation the pupils were amongst the most disadvantaged. For example, the DfES statistics show that 10% of the pupils living in the East of England were eligible for free meals. The equivalent figure for the sample was 44%. In the North West the DfES statistics indicated that 19% of pupils were eligible for free meals while the equivalent statistic for the sample was 50%.

The DfES statistics show that the regional area with the highest percentage of FSM entitlement is Inner London, where 39% of pupils are eligible for free meals. In the National Evaluation, three additional areas had entitlement higher than this: North West, Yorkshire and the Humber and East of England. Indeed, the free meal entitlement of 42% for the English schools participating in the study indicates that overall the pupils were more deprived than the pupils living in Inner London.

The above statistics indicate that the schools involved in the study were not typical of all secondary schools. Rather, they were schools with high percentages of free school meal entitlement and were schools attended by some of the most disadvantaged young people in the country.

Given that the focus of the research reported in this thesis was on the role of participation in study support activities for free school meal pupils, a comparative analysis was undertaken of the participation rates of FSM and non-FSM pupils in study support. The results are summarised in Table 3.10. The table indicates that the percentage of pupils participating in all Year 10 study support categories was greater for FSM pupils. The difference in participation was statistically significant at the .05 level for each of these categories. Non-FSM pupils participated statistically more in Year 11 science and were more likely to attend an Easter School. FSM pupils participated more than non-FSM pupils in all other Year 11 categories, but these differences were not statistically significant. (It should be noted that pupils whose FSM status was unknown have been excluded from Table 3.10. Summing the number of FSM and non-FSM pupils will therefore result in a different total from that shown in Table 3.4 which reports on participation in study support activities by all pupils.)

Table 3.10: **Comparison of the participation rates of FSM and non-FSM pupils in study support activities**

Study Support Category		FSM Status	Number of Valid Cases	Number of Participating Pupils	Percentage of Participating Pupils	Difference in Participation by FSM and Non-FSM Pupils		
						χ^2	df	p
Year 10	Maths	FSM pupils	1746	315	18.0%	76.405	1	.000
		Non-FSM pupils	3010	281	9.3%			
	English	FSM pupils	1746	128	7.3%	8.474	1	.004
		Non-FSM pupils	3010	158	5.2%			
	Science	FSM pupils	1746	204	11.7%	3.870	1	.049
		Non-FSM pupils	3010	297	9.9%			
	Subject focused	FSM pupils	1746	891	51.0%	16.216	1	.000
		Non-FSM pupils	3010	1354	45.0%			
	Non-subject focused	FSM pupils	1745	1471	84.3%	12.107	1	.001
		Non-FSM pupils	3008	2414	80.3%			
Year 11	Maths	FSM pupils	1554	745	47.9%	1.222	1	.269
		Non-FSM pupils	2986	1380	46.2%			
	English	FSM pupils	1554	598	38.5%	2.016	1	.156
		Non-FSM pupils	2986	1085	36.3%			
	Science	FSM pupils	1554	597	38.4%	7.616	1	.006
		Non-FSM pupils	2986	1274	42.7%			
	Subject focused	FSM pupils	1553	1263	81.3%	0.339	1	.560
		Non-FSM pupils	2986	2407	80.6%			
	Non-subject focused	FSM pupils	1554	1255	80.8%	2.856	1	.091
		Non-FSM pupils	2984	2346	78.6%			
	Easter School	FSM pupils	2331	497	21.3%	28.239	1	.000
		Non-FSM pupils	3152	870	27.6%			

Note: Pupils whose FSM status was unknown have been excluded from this table. Summing the number of FSM and non-FSM pupils will therefore result in a different total from that shown in Table 3.4 which reports on participation in study support activities by all pupils.

Ethnic Origin

The ethnic origin of the pupils within the sample was largely dictated by the ethnic composition of the neighbourhoods in which the schools were located. Some of the schools were attended almost exclusively by pupils from a particular ethnic group. Where these schools were single-gender, this raised issues for the analysis as it resulted in higher percentages of pupils of specific genders from particular ethnic groups.

In any longitudinal study it is inevitable that there will be some decrease in the sample size throughout the duration of the research for a variety of reasons, such as some of the subjects moving away from the area and/or deciding that they no longer wish to participate in the research. This is especially true of education research, where changes in school rolls impact directly on the cohorts of pupils. The National Evaluation research team found that the turbulence within the inner city schools was higher than they had anticipated. Given the nature of the research, in addition to the general concern about the reduced sample size there was also a particular concern that the pupils who change schools most often will include those who are most disadvantaged and may benefit most from study support activities. MacBeath *et al* (2001, p.91) suggest that complete data sets are likely to be held "on those students who are good at attending school and completing questionnaires".

A second issue associated with a large-scale longitudinal study (such as the National Evaluation) is that, due to pupil absences, it may not be possible to access all pupils during each of the data collection periods. While schools can be encouraged to seek the completion of all data collection instruments by all pupils, it is inevitable that there will be at least some missing data at each collection period. The research reported in this thesis required the completion of 31 data items from the National Evaluation study. All 31 items were available for only 260 (i.e. 3.1%) of the 8390 pupils. Appendix B Table B12 shows the number of missing responses for each of the data items.

Comparison of the attainment, attitudes and school attendance of FSM and non-FSM pupils

Comparisons were undertaken of the baseline and post-test attainment, attitudes and school attendance of FSM and non-FSM pupils before attendance at study support was considered. The differences between the two groups are summarised below. Further information (including standard deviations) concerning these differences can be found in the detailed tables reported in Appendix B.

Attainment

The mean scores for all four baseline attainment measures (i.e. SATS English, SATS maths, SATS science and NVR) were lower for the pupils in receipt of free school meals. In terms of SATS results, FSM pupils achieved on average half a grade less for maths and science and a third of a grade less for English than non-FSM pupils. With regard to standardised NVR, free school meal pupils scored an average of 3.6 less than other pupils. All of these differences were found to be statistically significant and are reported in Appendix B Table B13.

The mean scores for all GCSE attainment measures were also lower for pupils in receipt of free school meals. FSM pupils obtained on average 0.5 of a grade less for science and 0.6 of a grade for English and maths. In addition, they achieved an average of 3.16 points less than other pupils in Best 5. All four of these differences were found to be statistically significant. They are shown in Appendix B, Table B14.

Other studies have reported that FSM pupils achieve lower mean GCSE scores than non-FSM pupils (e.g. Shuttleworth & Daly 2000). Thomas *et al* (2001) report similar differences in the Scottish-based Standard Grade examinations.

Attitudes

The mean scores for Factors 1 to 4 in the baseline attitude questionnaire were lower for the pupils in receipt of free school meals. The differences between the two groups of pupils in Factor 3 *Acceptance of utilitarian purposes of school* and Factor 4

Academic self-esteem were 0.43 and 0.67 respectively and were found to be statistically significant. The differences in Factors 1 and 2 were smaller and not statistically significant. In the case of Factor 5 *Commitment to participation in class and individual discussions with teachers*, pupils receiving free school meals scored higher than pupils not in receipt of free meals – although the difference was very small (0.01) and not statistically significant. The differences in the baseline attitude questionnaire scores can be found in Appendix B Table B15.

FSM pupils also scored less than non-FSM pupils for Factors 1 to 4 in the Year 11 attitude questionnaire, but the differences between the two groups of pupils increased and were statistically significant for Factors 1, 3 and 4. Given that the attitude questionnaire used in Year 11 was identical to the questionnaire used in Year 9, the increasing differences between FSM and non-FSM pupils indicate that the attitudes of FSM pupils worsened relative to non-FSM pupils over the two-year period. Another trend common to both the Year 9 and Year 11 attitude data was that FSM pupils scored slightly higher than non-FSM pupils in the case of Factor 5 *Commitment to participation in class and individual discussions with teachers*, although the difference in Year 11 was still small (0.02) and not statistically significant. The differences in the Year 11 attitude questionnaire are shown in Appendix B Table B16.

Given the differences between the scores of FSM and non-FSM pupils in the five factors that comprised the attitude questionnaire, it is not surprising that there were statistically significant differences between the two groups in the total attitude scores in both Year 9 and Year 11. These differences are shown in Appendix B Tables B15 and B16.

The conclusion that FSM pupils achieve lower scores in attitude questionnaires than non-FSM pupils is consistent with the findings from previous research. Ridley *et al* 2006 and Cox 1983, for example, found pupils from socially disadvantaged backgrounds achieved lower scores than other pupils.

Attendance

The mean percentage attendance for pupils in receipt of free school meals was less than that for pupils not receiving free school meals in Year 9 and Year 11, with the differences being 4.24 and 5.54 respectively. These differences were found to be statistically significant and are shown in Appendix B Table B17.

Other research studies (e.g. Morris & Rutt 2004 and Cox 1983) have also reported lower attendance rates for pupils from socially disadvantaged backgrounds

SUMMARY

This chapter has explained the background to the National Evaluation of Study Support. It has described both the sample and the dataset. Given the hierarchical nature of the data, multilevel modelling was used in the extension study on which this thesis is based. Multilevel modelling is one of the key themes in Chapter Four which outlines the importance of multilevel modelling in social research and explains how MLwiN (a multilevel modelling package) was used, alongside the traditional regression analysis available within SPSS, to analyse the data in the present study.

Chapter Four:

METHODOLOGICAL ISSUES IN THE PRESENT STUDY

This chapter is concerned with the methodological issues associated with the research described in this thesis. It comprises three inter-related sections. The first section outlines the aims of the study. The method used in the research was multilevel modelling and this is the focus of the second section. The technique of multilevel modelling is described and the importance of its use in social research, both in general and in the present study in particular, is outlined. Examples are cited of other studies that made use of the technique - these include studies within educational research (school effectiveness studies in particular) and studies in a range of other substantive areas. Some criticisms of multilevel modelling are considered in relation to the present study. The models used in the research are described in detail and their relationship with each of the hypotheses is explained. MLwiN, the multilevel modelling package used in the research, is introduced. The third section of this chapter is concerned with the use of entitlement to free school meals (FSM) as a measure of social deprivation in research studies. Some examples are given of previous studies which have used the FSM variable. Criticisms of its use are discussed and the implications of these are considered within the context of the present study.

The research adopted the normative paradigm. The normative paradigm is based on two key principles (Douglas 1973, as cited in Cohen, Manion & Morrison 2007): (1) human behaviour is rule-governed and (2) should be investigated using the methods of natural science. Normative studies are positivist and, as such, regard knowledge as hard, objective and tangible. They require the researcher to take on the role of an observer and make use of quantitative techniques, including questionnaires. Following a scientific approach, normative studies attempt to devise universal laws that explain and govern the topic being observed and try to validate these through the use of complex research methodologies (Cohen, Manion & Morrison 2007). The present study sought to establish rules regarding participation at different forms of study support and the impact on attainment, attitudes and school attendance. Some of these rules related to all pupils, while others were concerned with differences in outcomes for FSM and non-FSM pupils. A set of hypotheses was prepared and then tested using the dataset gathered through the National Evaluation of Study Support. Where the hypotheses were supported, these were used as evidence in support of the rules. Hypotheses that were not supported were used to dismiss or modify the rules.

Normative approaches can be contrasted with interpretive, or anti-positivist, approaches. Such approaches regard knowledge as personal, subjective and unique (Cohen, Manion & Morrison 2007). They are concerned with individuals and attempt to understand how individuals create, modify and interpret the world, rather than on establishing general laws that predict how people will behave. While a normative approach requires the researcher to take the role of an observer, interpretive approaches require the research to become involved with his/her subjects. Interpretive approaches therefore rely on techniques such as interviews, participant observation and personal constructs.

Anti-positivists argue that positivists regard human behaviour as passive, determined and controlled and that intention, individualism and freedom are ignored. The criticisms of anti-positivism include the opportunity for researchers to impose their own definitions of situations on participants and ignore the power of external forces such that they become ‘hermetically sealed from the outside world’ (Cohen, Manion & Morrison 2007, p.26).

AIMS OF THE RESEARCH

As stated in Chapter Two, the principal aim of the research was to explore the value of participation in study support for pupils from socially disadvantaged backgrounds. This included an exploration of the school effect on the value of study support for these pupils – i.e. to what extent does the school attended influence the benefit for pupils of attending study support? While some previous research studies (see Chapter Two) have investigated the benefits of study support for socially disadvantaged pupils, none has explored the school effect in relation to these pupils.

A set of four generic hypotheses was developed for the research. In order that the benefits for socially disadvantaged pupils could be considered within the context of the benefit for all pupils who participated in the study, the first two hypotheses did not distinguish between FSM and non-FSM pupils. The four hypotheses were:

a Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE.

b The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school.

c The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school.

d The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level.

All four hypotheses were tested within 10 combinations of variables, each of which consisted of a baseline measure, an output measure and a study support category. The 10 combinations, or groups, were as follows:

Group 1: NVR/Best 5 and Subject Based Study Support

Group 2: NVR/Best 5 and Non-Subject Based Study Support

Group 3: SATS Maths/GCSE Maths and Maths Study Support

Group 4: SATS English/GCSE English and English Study Support

Group 5: SATS Science/GCSE Science and Science Study Support

Group 6: Year 9 School Attendance/Year 11 School Attendance and Subject Based Study Support

Group 7: Year 9 School Attendance/Year 11 School Attendance and Non-Subject Based Study Support

Group 8: Year 9 Attitudes/Year 11 Attitudes and Subject Based Study Support

Group 9: Year 9 Attitudes/Year 11 Attitudes and Non-Subject Based Study Support

Group 10: NVR/Best 5 and Easter School

The 10 groups are summarised in Table 4.1.

***Table 4.1:* Summary of the 10 hypotheses groups**

Group	Baseline Measure	Output Measure	Study Support Category
1	NVR Score	GCSE Best 5	Subject
2	NVR Score	GCSE Best 5	Non-Subject
3	SATS Maths	GCSE Maths	Maths
4	SATS English	GCSE English	English
5	SATS Science	GCSE Science	Science
6	Year 9 School Attendance	Year 11 School Attendance	Subject
7	Year 9 School Attendance	Year 11 School Attendance	Non-Subject
8	Year 9 Attitudes	Year 11 Attitudes	Subject
9	Year 9 Attitudes	Year 11 Attitudes	Non-Subject
10	NVR Score	GCSE Best 5	Easter School (with Subject)

In the case of Group 1 (NVR/Best 5 and Subject Study Support), the hypotheses took the form of:

1a Controlling for NVR, attendance at subject study support will result in improved Best 5 GCSE attainment.

1b The extent of the improvement in Best 5 GCSE attainment from attending subject study support will vary by school.

1c The extent of the improvement in Best 5 GCSE attainment from attending subject study support will be different for FSM and non-FSM pupils within a school.

1d The difference in the improvement in Best 5 GCSE attainment from attending subject study support for FSM and non-FSM pupils will vary at school level.

The research on which this thesis is based was an extension study of the National Evaluation of Study Support. The main evaluation study was undertaken by the Quality in Education Centre at the University of Strathclyde (see Chapter Three of this thesis or MacBeath *et al* 2001). Tight deadlines were imposed on the funded-research and it was necessary for restrictions to be placed on the analyses that were undertaken. While the main study did include some analyses of the benefits of participation in study support for particular groups of young people (i.e. those from socially disadvantaged backgrounds and those from different ethnic backgrounds), this was not as detailed as the analyses for the entire sample. In relation to pupils from socially disadvantaged backgrounds the funded-research explored the benefits of participating in study support in terms of attainment, but the analysis of attitudes was limited to one of five factors (academic self-esteem) and there was no analysis of the impact of study support on school attendance. Furthermore, while the main evaluation included - through the use of school dummy variables in multiple regression analysis - an analysis of school effects for the entire sample, time and resources did not permit an exploration of school effects with particular reference to pupils from disadvantaged backgrounds.

The purpose of this extension study was to extend all of the outcomes from the original study to pupils from socially disadvantaged backgrounds (as defined as those recorded as being in receipt of free school meals). This was done through the comparison of the benefits of participation in study support for pupils recorded as being entitled to free meals with those not so recorded. In line with the theoretical model outlined in Chapter 1, relationships were explored between attendance at curriculum-based and personal and social education activities and the three outcomes (attainment, attitudes and school attendance). As a particular focus of the study was an exploration of school effects in relation to FSM pupils, multilevel modelling (in particular, the multilevel modelling programme 'MLwiN') was used. While traditional regression analysis (which was undertaken in the original study, using SPSS) and multilevel modelling both result in fixed effects estimates that are unbiased, the use of single-level models produces standard errors that are biased downwards. Where a random sample has been used, a further advantage of multilevel modelling is that inferences can be made about the variation in schools in general and not just those that participated in the sample.

The next section of this chapter will outline the importance of using multilevel modelling in social research, both in general and in the present study in particular. Examples will be cited of other studies that made use of the technique. These include studies within educational research and studies in a range of other substantive areas. Some criticisms of the technique are considered in relation to the present study.

THE USE OF MULTILEVEL MODELLING IN SOCIAL RESEARCH

The Importance of Recognising Hierarchical Data Structures

Multilevel modelling is important as it permits the researcher to take cognisance of hierarchical data structures. By acknowledging the hierarchical nature of the data, multilevel modelling results in unbiased fixed effects and standard errors.

Hierarchical data structures are common in the social, medical and biological sciences. For example: pupils are taught in classes, classes are taught within schools and schools are administered within local authorities. Other examples of hierarchical data structures include individuals within households and employees within firms. Repeated measures nested within persons, i.e. where several measurements are available for each person, are a further example. Small wonder that Kreft and De

Leeuw (1998, p.1) write: "Once you know that hierarchies exist, you see them everywhere".

Plewis (1998) suggests that hierarchically structured populations can be thought of as pyramids with different numbers of levels. As an example he discusses a pyramid with three levels: the base level (level one) comprises individuals, while households constitute the intermediate level (level two) and communities are the highest level or apex (level three).

It is important for researchers to recognise the existence of these hierarchical structures because they can have implications for the data collected. As the Centre for Multilevel Modelling explain:

> ...if we are measuring educational achievement, it is known that average achievement varies from one school to another. This means that students within a school will be more alike, on average, than students from different schools. Likewise, people within a household will tend to share similar attitudes etc so that studies of, say, voting intention need to recognise this. In medicine it is known that centres differ in terms of patient care, case mix, etc and again our analysis should recognise this. (Centre for Multilevel Modelling 2000, p.7)

Multilevel Modelling

A consultation undertaken by the Teaching & Learning Research Programme's Research Capacity Building Network (Taylor 2002) identified a need to help researchers understand and interpret research that uses multilevel modelling. The consultation found that there is limited use and knowledge of quantitative research generally.

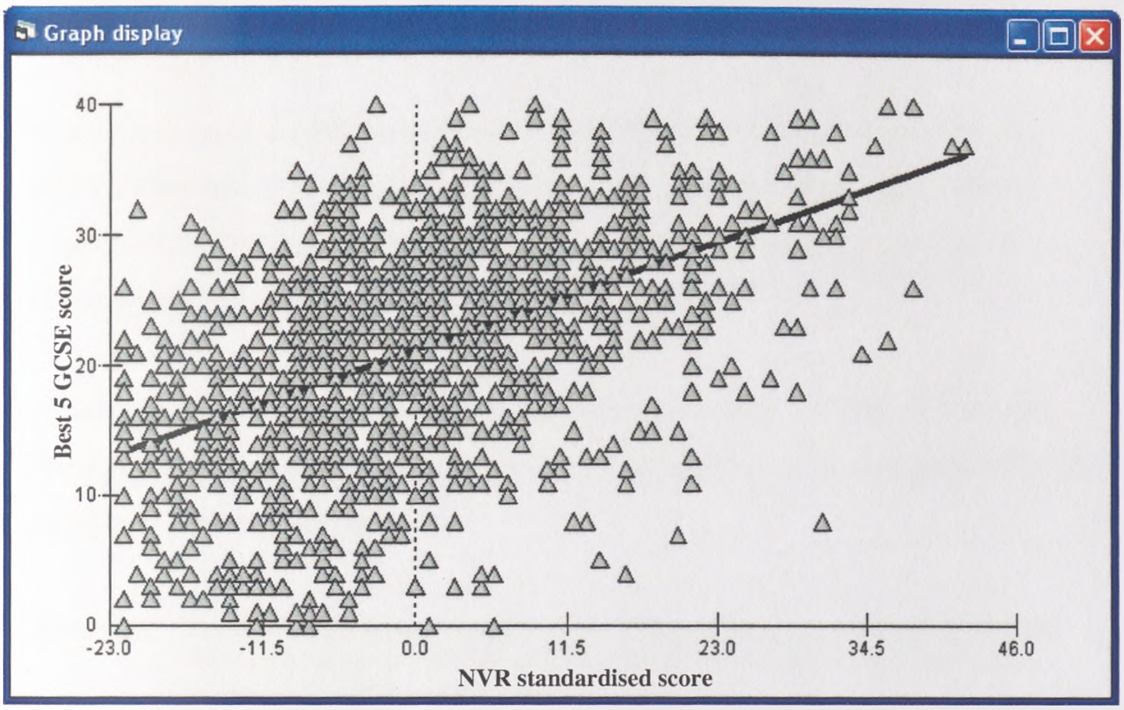
Multilevel modelling is a development of standard multiple regression which attempts to "explain" the variation in a dependent variable (the outcome) in terms of one or more independent variables (the inputs). Gorard reminds his readers that regression cannot be used to prove that the independent variables *determine* the variation in the dependent variable, although it can show if it is possible. He warns: "Whatever you do with regression, ...cannot overcome this limitation" (Gorard 2003a, p.48).

The graph presented in Figure 4.1 shows a multiple regression in which the Best 5 GCSE scores[1] for a sample of 1921 students - attending 10 different schools - have been regressed on the standardised scores of the same students from a non-verbal reason test (undertaken approximately two years before the GCSE examinations). In terms of multilevel modelling, this would be regarded as a single level model.

The non-verbal reason test scores shown in Figure 4.1 (and the other Figures included in this section of the thesis) were 'centred'. Centering a variable involves subtracting the mean from each value and results in the mean becoming zero. This does not change the relations in the data: there is no change to the variance of the variable, its covariances or its correlations with other variables in the models (provided that the model contains only first order terms). The only changes are to the magnitude and interpretation of the intercept. In raw score models the intercept is the value of the dependent variable when all the explanatory variables are zero, but the variables concerned have no meaningful zero.

[1] See Chapter 3 for an explanation of how the Best 5 score is calculated.

Figure 4.1: **Example of a graph plotting the Best 5 GCSE scores in relationship to NVR standardised score with the estimate of the relationship under a single level model superimposed**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001). The same dataset was used in the extension study on which this thesis was based.

The generic equation for such a line is $y_i = \alpha + \beta x_i$. where:

- y_i is the Best 5 score for the i-th pupil (i takes the values from 1 to the number of pupils in the school)
- α is the intercept where the regression line meets the y axis (i.e the vertical axis)
- β is the slope of the line

The above equation assumes that all points lie on the regression line. However, in practice the points do not all lie on the line but deviate by ε_i - the error or residual. The addition of the error term results in the equation $y_i = \alpha + \beta x_i. + \varepsilon_i$ where:

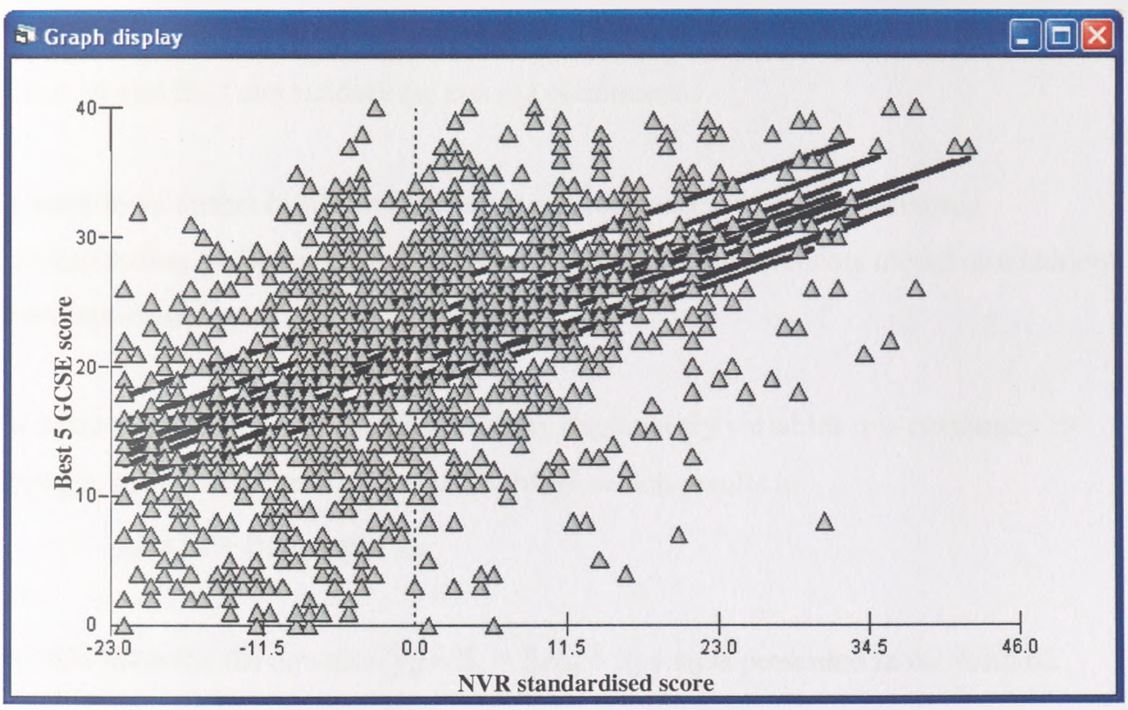
- ε_i is the departure of the i-th pupil's actual exam score from the predicted score.

The expression $\alpha + \beta x_i$ is the fixed part of the model. The error term, ε_i, is the part of the score y_i that is not predicted by the fixed part of the regression relationship – i.e. ε_i is the random part of the model. The mean of ε_i is zero.

Figure 4.1 is an example of a level 1 variation because it is concerned with the variation between level 1 units (i.e. the students). It does not recognise that the students are taught in different schools and that it is possible that there will be variations between schools – known as a "school effect".

A level 2 variation does acknowledge differences between schools. It treats the school effect as a random effect and estimates its variance. An example of level 2 variation is shown in Figure 4.2.

Figure 4.2: **Example of a graph plotting the Best 5 GCSE scores in relationship to NVR standardised score with the estimate of the relationship under a variance components model superimposed**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001). The same dataset was used in the extension study on which this thesis was based.

Each of the 10 lines shown in Figure 4.2 represents a school. Each line has a different value for α (the intercept), but an identical value for β (the slope) – i.e. the lines are parallel. For each line the average value of ε is zero.

The equation for these 10 lines is:

$$\mathbf{y_{ij} = \alpha_j + \beta x_{ij} + \varepsilon_{ij}}$$

where: $\boldsymbol{i}$ = individual (within school) and $\boldsymbol{j}$ = school

The difference between this equation and the equation for a single level model is the addition of the j subscripts to α and ε. These allow the intercept and residual to vary by school and result in the 10 parallel lines.

It is common practice to replace α_j with $\alpha + u_j$ (the average value of u is zero), thus giving: $\mathbf{y_{ij} = \alpha + u_j + \beta x_{ij} + \varepsilon_{ij}}$.

The equation can be rearranged to: $\mathbf{y_{ij} = \alpha + \beta x_{ij} + u_j + \varepsilon_{ij}}$. This groups together the fixed (α and βx_{ij}) and random (u_j and e_{ij}) parameters.

A multilevel model in which the only random parameters are the variances corresponding to the intercept is known as a variance components model or a random intercept model.

In order to allow for applicability to many explanatory variables it is customary to replace, in this case, α with β_o and β with β_1 which results in:

$$\mathbf{y_{ij} = \beta_o + \beta_1 x_{ij} + u_j + \varepsilon_{ij}}$$

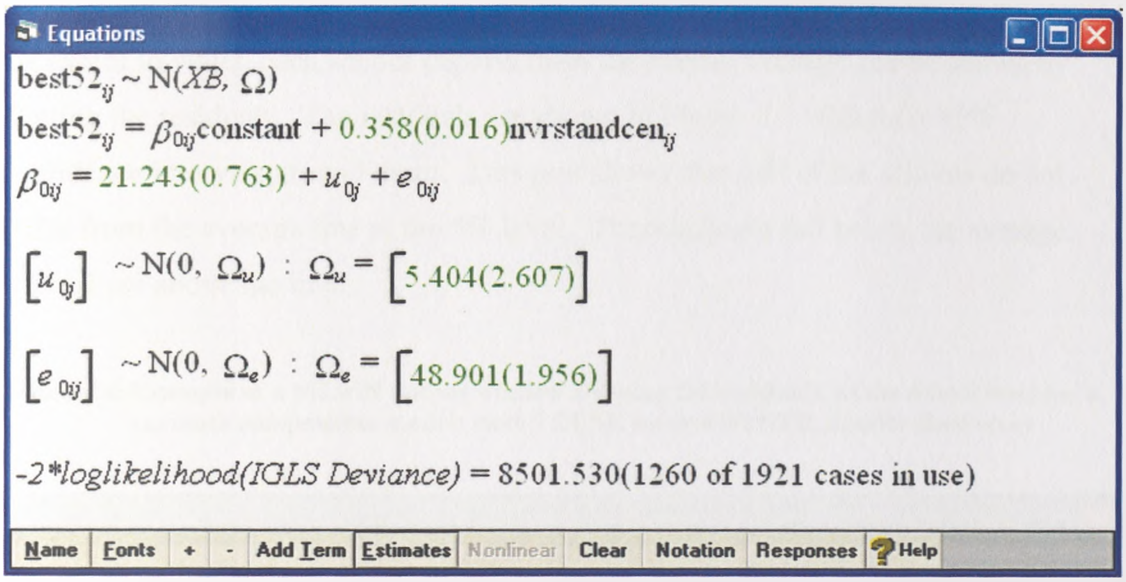
Within MLwiN, the equation $\mathbf{y_{ij} = \beta_o + \beta_1 x_{ij} + u_j + \varepsilon_{ij}}$ is presented in the form of:

$$\mathbf{y_{ij} = (\beta_o + u_j + \varepsilon_{ij}) + \beta_1 x_{ij}}$$

This can be seen in Figure 4.3 in which lines 2 and 3 indicate that:

- $y_{ij} = \beta_{oij}x_o + \beta_1 x_{ij}$ (where $x_o = 1$)
- $\beta_{oij} = \beta_o + u_{oj} + e_{oij}$

Figure 4.3: **Example of a MLwiN output window showing the equation for a variance components model (or level 2 variation): Best 5 GCSE score with NVR standardised score**



This equation draws on data from the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

The equation shown in Figure 4.3 produces a set of parallel straight lines – one for each school. The fitted value of the common slope is 0.358 (standard error 0.016). The predicted value of the intercept is 21.243 (standard error 0.763). The level 2 residuals, u_{oj}, are distributed around their mean (zero) with a variance of 5.404 (standard error 2.607).

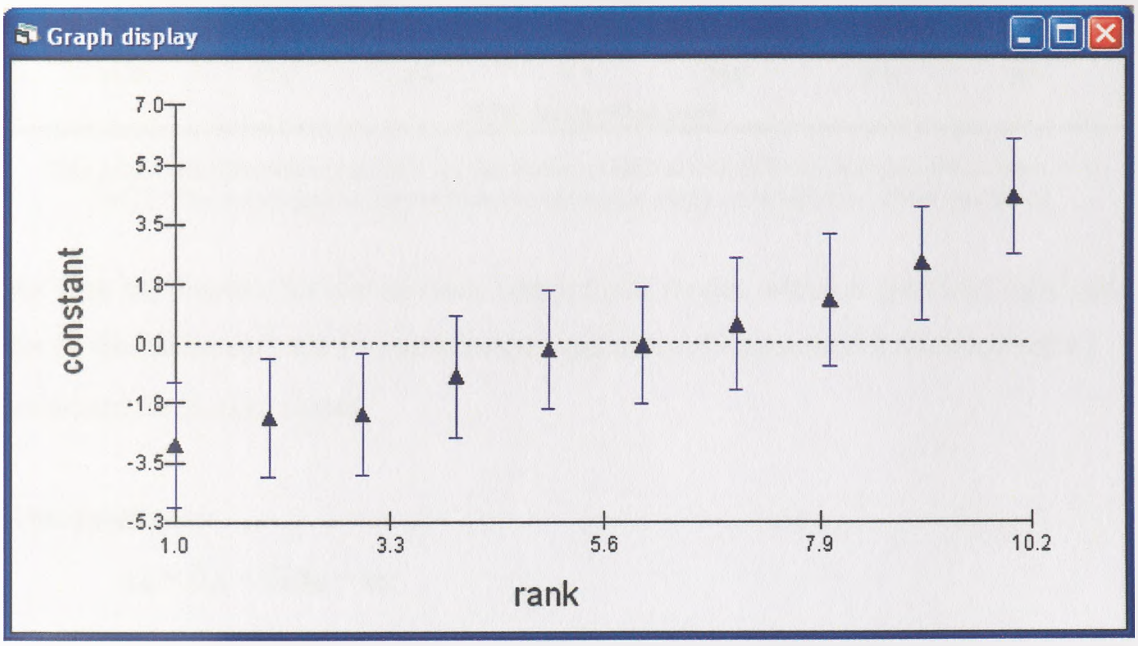
The actual data points do not lie exactly on the straight lines, but vary about them with amounts given by the level 1 residuals, e_{oij}, and these have an estimated variance of 48.901 (standard error 1.956).

Taking children at random from the whole population, their variance would be the sum of the level 2 and level 1 variances – i.e. 5.404 + 48.901 = 54.305.

The *intra-school correlation*, a measure of the between-school variation, is 5.404/54.305 = 0.100. This measures the extent to which the scores of children in the same school resemble each other as compared with those from children at different schools.

As is stated above, the intercepts for the different schools - the level 2 residuals, u_{oj} - are distributed around their mean (21.243) with a variance of 5.404. Using MLwiN, the extent to which each school departs from the overall average can be shown by plotting the residuals. The residuals are shown in Figure 4.4 with their 95% confidence intervals around them. This plot shows that half of the schools do not differ from the average line at the 5% level. Three schools fall below the average, while 2 are above the line.

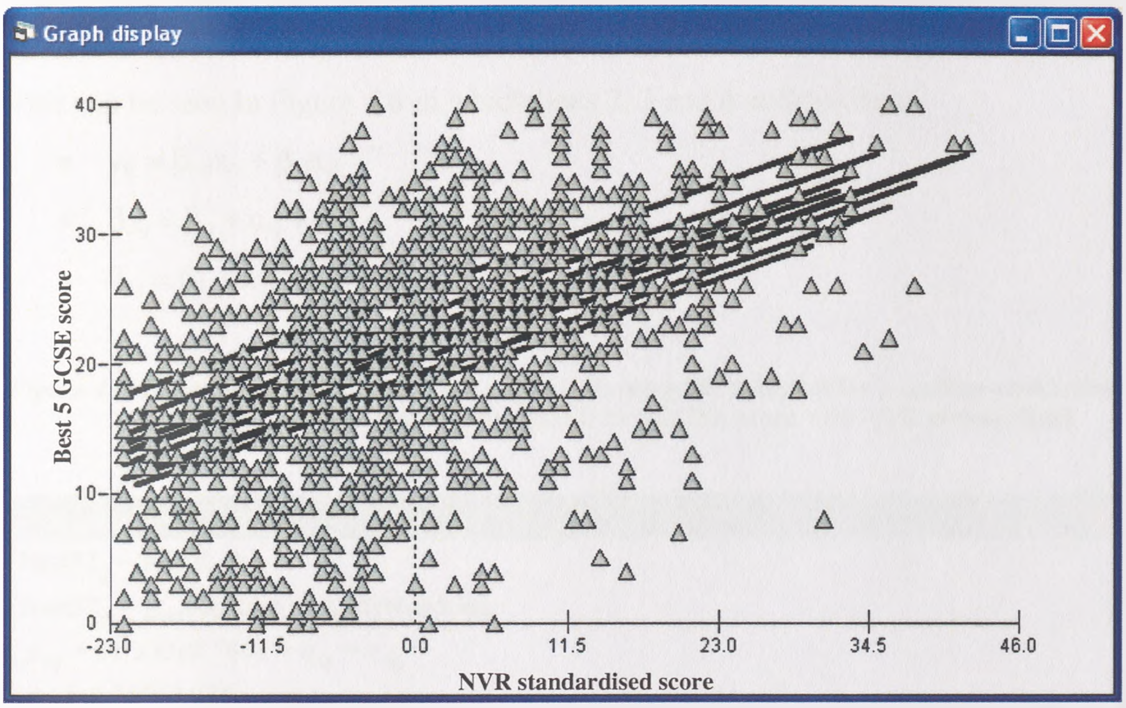
Figure 4.4: **Example of a MLwiN output window showing the residuals at the school level for a variance components model: Best 5 GCSE score with NVR standardised score**



This equation draws on data from the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

The variance components model described above is developed in Figure 4.5 which shows a complex level 2 variation. While the variance components model and the complex level 2 variation both display a separate line for each of the 10 schools, the complex level 2 variation allows the lines to vary by both slope and intercept. The slopes are therefore no longer parallel.

Figure 4.5: **Example of a graph plotting the Best 5 GCSE scores in relationship to NVR standardised score with the estimate of the relationship under a random coefficient model superimposed**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001). The same dataset was used in the extension study on which this thesis was based.

As with the formula for the variance components model, which requires a *j* subscript for β_o (the intercept), the formula for the random coefficient model also requires a *j* subscript for β_1 (the slope).

This results in:

$$y_{ij} = \beta_{oj} + \beta_{1j}x_{ij} + e_{ij}$$

We can replace β_{oj} with $\beta_o + u_{oj}$ and β_{1j} with $\beta_1 + u_{1j}$ thus giving:

$$y_{ij} = (\beta_o + u_{oj}) + (\beta_1 + u_{1j})x_{ij} + e_{ij}$$

Reordered this becomes: $y_{ij} = \beta_o + u_{oj} + \beta_1 x_{ij} + u_{1j}x_{ij} + e_{ij}$.

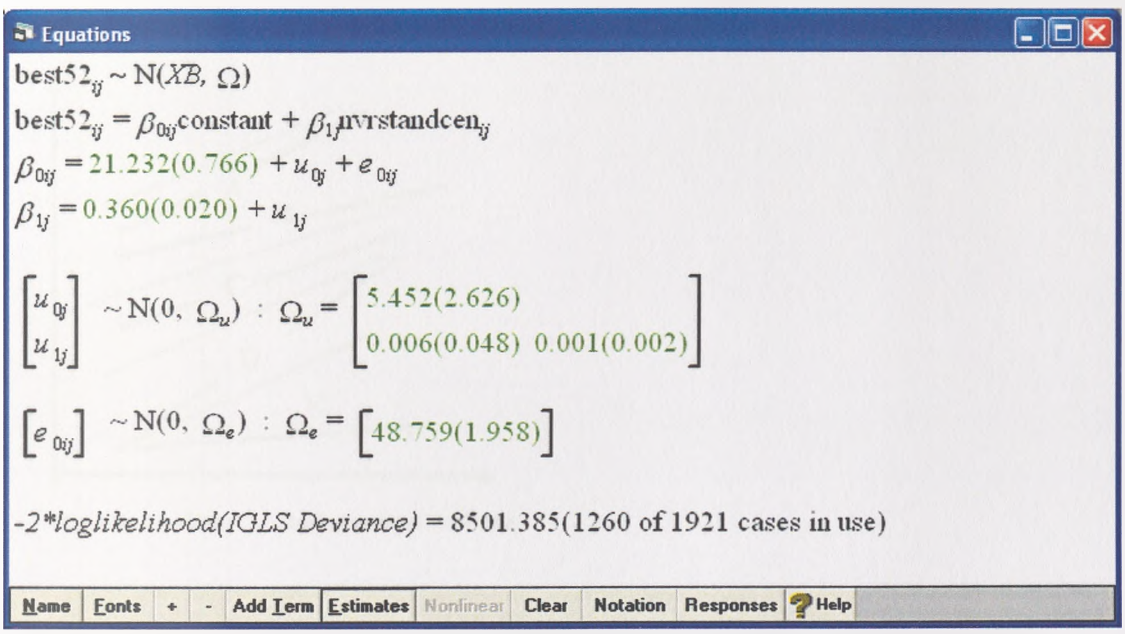
Further reordering results in: $\mathbf{y_{ij} = \beta_o + \beta_1 x_{ij} + (u_{oj} + u_{1j}x_{ij} + e_{ij})}$. This groups together the fixed ($\beta_o + \beta_1 x_{ij}$) and random ($u_{oj} + u_{1j}x_{ij} + e_{ij}$) parts of the model.

Within MLwiN, the equation $\mathbf{y_{ij} = \beta_o + \beta_1 x_{ij} + (u_{oj} + u_{1j}x_{ij} + e_{ij})}$ is presented in the form of: $\mathbf{y_{ij} = (\beta_o + u_{oj} + e_{ij}) + (\beta_1 + u_{1j})x_{ij}}$.

This can be seen in Figure 4.6 in which lines 2, 3 and 4 indicate that:

- $y_{ij} = \beta_{oij}x_o + \beta_{1j}x_{ij}$
- $\beta_{oij} = \beta_o + u_{oj} + e_{oij}$
- $\beta_{1j} = \beta_1 + u_{1j}$

Figure 4.6: **Example of a MLwiN output window showing the equation for a random coefficient model (or complex level 2 variation): Best 5 GCSE score with NVR standardised score**



This equation draws on data from the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

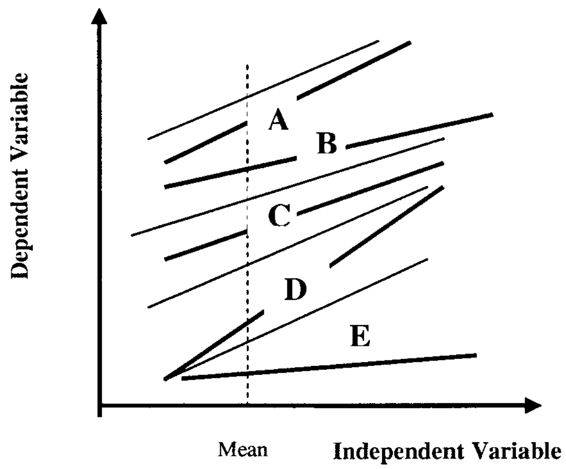
Line 2 of Figure 4.6 shows that the coefficient of nvrstand has acquired a suffix *j*, thus indicating that it varies from school to school. Line 4 shows that the mean slope is 0.360 (standard error 0.020), which is very close to the model with the single slope (0.358). The individual school slopes vary about the mean with a variance estimated as 0.001 (standard error 0.002). The intercepts of the individual school lines also differ: their mean is 21.232 (standard error 0.766) and their variance is 5.452 (standard error 2.626).

The covariance between intercepts and slopes is estimated as 0.006 (standard error 0.048).

The correlation between the intercept and slope (across schools) is:
0.006/sqrt(0.001*5.452) = 0.006/sqrt0.005 = 0.006/0.071 = 0.085

In the case of a random coefficients model, the covariance between the intercepts and slopes is of interest. Figure 4.7 shows a graph of a hypothetical random coefficients model with nine summary school lines.

Figure 4.7: **Graph of hypothetical coefficients model showing 9 school summary lines**

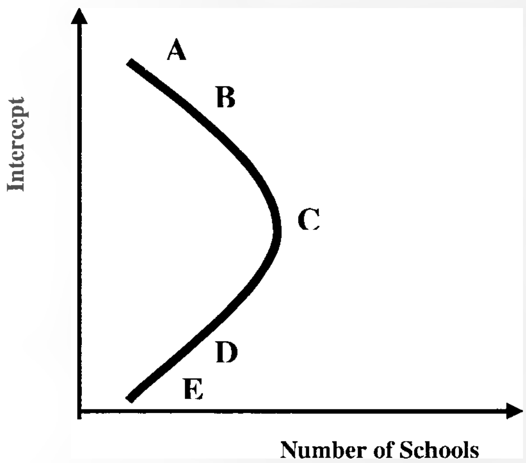


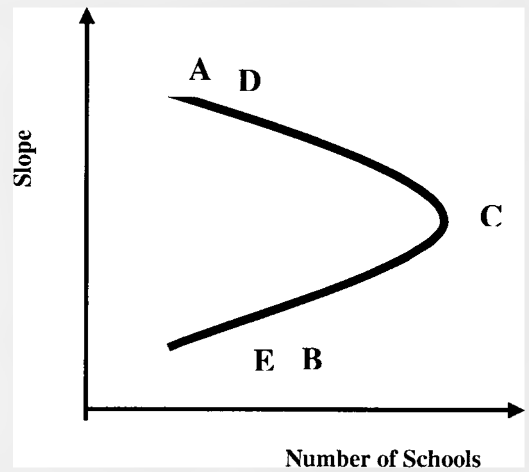
The intercepts and slopes of the five labelled lines in Figure 4.7 are as follows:

School A - high intercept, high slope
School B - high intercept, low slope
School C - medium intercept, medium slope
School D - low intercept, high slope
School E - low intercept, low slope

It is possible to plot the intercept and slope of each line from Figure 4.7 in separate graphs. The two graphs in Figure 4.8 show the number of schools with each intercept and slope.

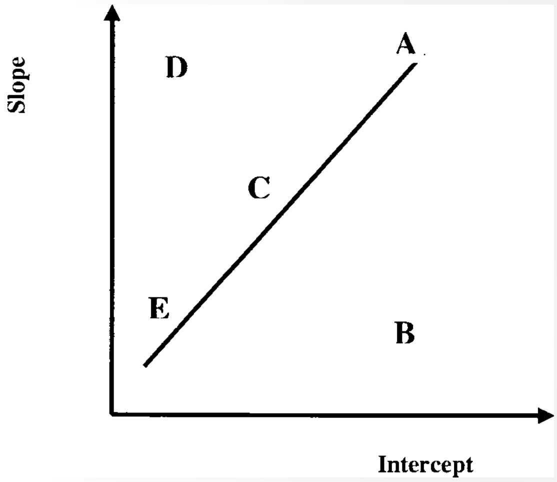
Figure 4.8: **Graphs of intercepts and slopes for hypothetical model**





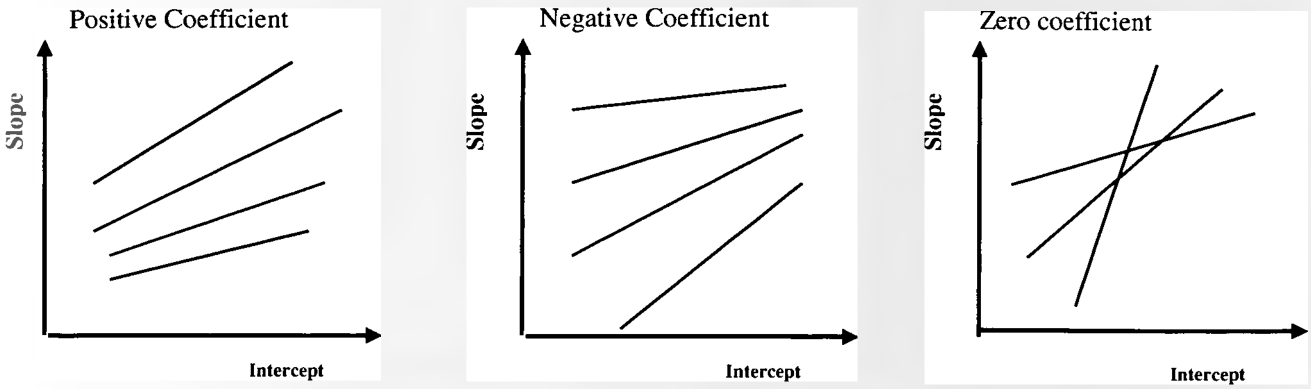
In addition to plotting the intercepts and slopes of each line in separate graphs, it is possible to plot both in a single graph in which one axis represents the intercept and the other represents the slope. This is shown on Figure 4.9. A single line drawn through the points shows the covariance between intercept and slope. In this example, the line has a positive coefficient.

Figure 4.9: **Graph combining intercepts and slopes of hypothetical model**



There are, in fact, three possibilities for the covariance of intercept and slope which are shown in Figure 4.10: a positive coefficient, a negative coefficient and a zero coefficient.

Figure 4.10: **Three possibilities for covariance in hypothetical model**



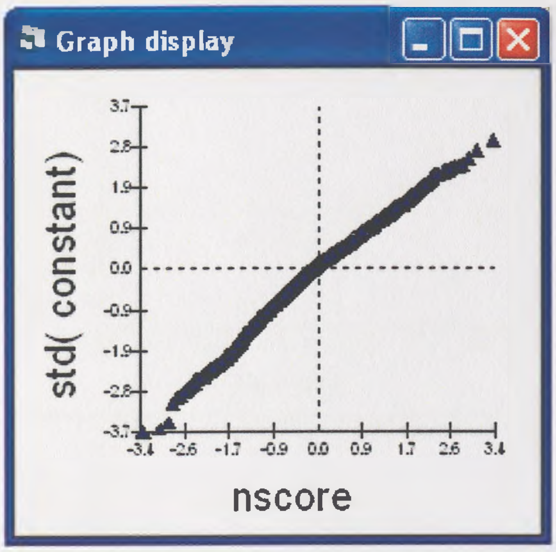
In common with traditional regression analysis, multilevel modelling includes two assumptions:

1. the residuals (or errors) are normally distributed
2. the variance of the residual is constant at each value of the predictor variable (homoscedasticity).

The graphing facilities within MLwiN enable the user to check both of these assumptions. These are checked at each of the levels of the model separately. Figures 4.11, 4.12 and 4.13 illustrate these checks for the prediction of Best 5 GCSE scores of the 1921 students - attending 10 different schools – included in the earlier examples provided in this chapter.

Figure 4.11 is a plot of standardised level 1 (i.e. pupil) residuals against their equivalent Normal scores. As the points lie close to a straight line it can be concluded that the residuals follow a Normal distribution.

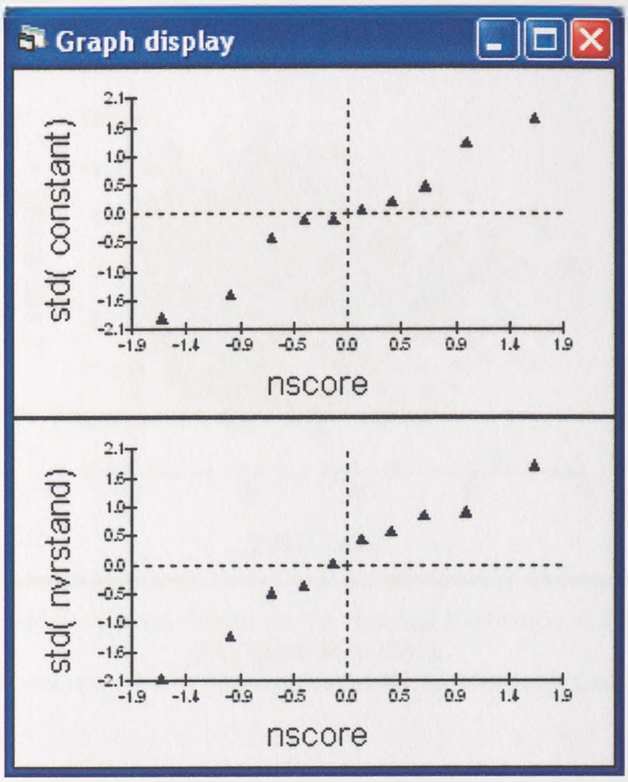
Figure 4.11: **Example of a graph plotting standardised level 1 residuals by normal equivalent scores: Best 5 GCSE score with NVR standardised score**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

Figure 4.12 plots the standardised level 2 (i.e. school) residuals against their equivalent Normal scores. All schools lie on an almost straight line. This indicates that, like the level 1 residuals, the level 2 residuals are normally distributed.

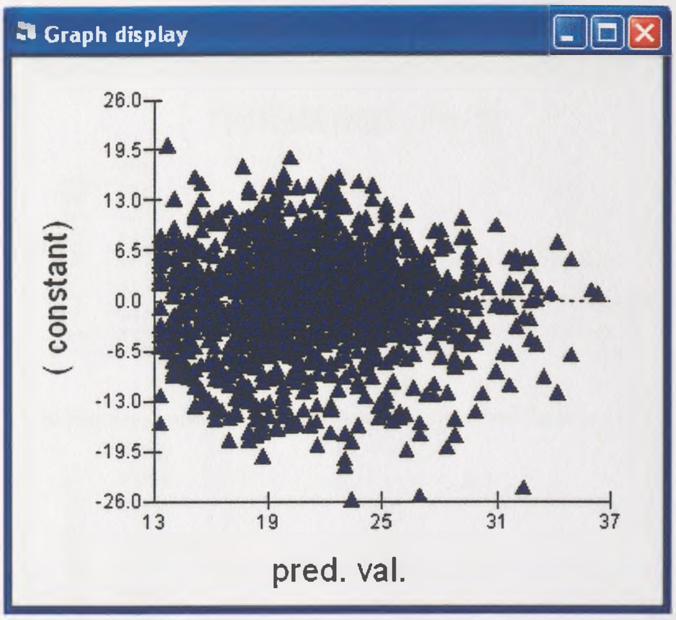
Figure 4.12: **Example of a graph plotting standardised level 2 residuals by normal equivalent scores: Best 5 GCSE score with NVR standardised score**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

In Figure 4.13, the standardised level 1 residuals are plotted against the fixed part predicted value to check for homoscedasticity. The distribution of the points in the graph indicates homoscedasticity.

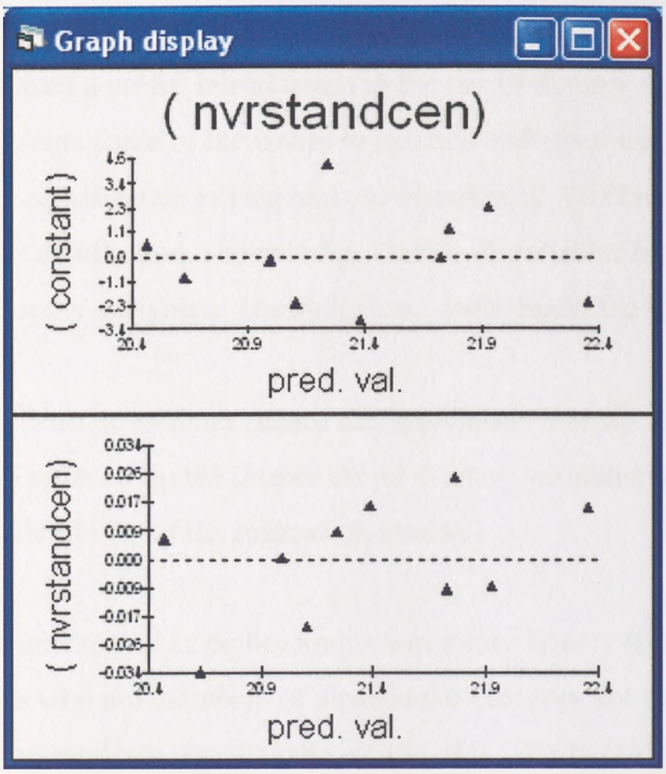
Figure 4.13: **Example of a graph plotting standardised level 1 residuals by predicted values: Best 5 GCSE score with NVR standardised score**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

In Figure 4.14, the standardised level 2 residuals are plotted against the fixed part predicted value to check for homoscedasticity. The distribution of the points in the graph indicates homoscedasticity.

Figure 4.14: **Example of a graph plotting standardised level 2 residuals by predicted values: Best 5 GCSE score with NVR standardised score**



This graph uses the dataset created for the National Evaluation of Study Support (MacBeath *et al* 2001).
The same dataset was used in the extension study on which this thesis was based.

Using Dummy Variables

The creation of dummy variables (also known as 'indicator variables') is a familiar practice within multiple regression analysis. It provides an opportunity for independent variables based on categorical data (i.e. data not measured on an interval scale) to be used as predictors. Both ordered and unordered values can be represented as dummy variables.

Dummy variables were used in the multilevel modelling analysis on which this thesis is based. They were created from a range of variables, including: gender, ethnicity, FSM and participation in each of the categories of study support. School dummy variables were created for use in the multiple regression analysis that was undertaken for the main evaluation study.

Hardy (1993) provides a useful introduction to the use of dummy variables within regression and explains some of the issues associated with their use (e.g. heteroscedasticity, significance testing and curvilinearity). Working though the example of income distribution, she recodes a series of variables based on race and occupation into dummy variables. Hardy is in no doubt about the value of dummy variables:

> Although students sometimes regard the appellation *dummy variables* as humorously deprecating, the proper use of dummy variables can greatly enhance the flexibility of the regression models. (Hardy 1993, p.84)

Dummy variables are created as dichotomous variables. Binary (0,1) coding is used and all respondents who are members of a particular category are assigned a code of 1, while all other respondents are assigned a code of 0. Hardy (1993) suggests that binary coding is similar to an electrical switch, with code 1 signalling that the given category is "on" for the respondent (i.e. s/he is a member of a particular group or a particular characteristic is present) and code 0 indicating that the category is "off".

Where an original variable has only two categories, only a single dummy variable is required. For example, if all of the respondents in a survey were coded as either 'male' or 'female' and a new variable labeled 'male' was created in which all males were coded 1 and all other respondents were coded 0, it would not be necessary to create a second variable (labeled 'female') as all females would be coded 0 within the 'male' variable.

When a single dummy variable is created, the non-named category (in the above example 'female') serves as the reference group. If the original variable has more than two categories, the number of dummy variables required is J-1 (J equals the number of original categories) (see Hardy 1993 and Werts & Linn 1972). In such cases the category not named in any of the dummy variables is the reference group.

Hardy (1993) suggests that the reference group should be well defined (e.g. a residual category of 'other' may not be a good choice if it is unclear exactly what the composition of the 'other' group is) and contain a sufficient number of cases to allow a reasonably precise estimate of the subgroup mean (i.e. the reference category should be one of the more heavily populated categories). She points out that, when there is an underlying ordinality to the qualitative categories, some researchers choose as the reference group a category at the upper or lower boundary while others prefer to designate a category that is roughly midrange.

The opportunity for continuous and categorical variables to be included as independent variables is advocated by Hinkle and Oliver (1986) as one of the reasons why multiple regression analysis is superior or the only method of analysis. They suggest that a four-step multiple regression analysis be followed:

1. Determine the regression model
2. Determine whether this model results in a statistically significant multiple correlation coefficient
3. Determine the proportion of the variation in the criterion variable (*Y*) that can be attributed to the variation in the linear combination of the predictor variables (*X*s)
4. Determine the relative importance of each of the predictor variables in the regression model. (from Hinkle & Oliver 1986)

Wolf and Cartwright (1974) proposed a general coding scheme which they argued could be applied to both equal and unequal (including fixed and randomly determined) samples. They adopted an analytic, rather than an inductive, approach which "forces the user to make clear the hypothesis being tested and the nature of the sample" (Wolf & Cartwright 1974, p.177). Bogartz (1975) criticised Wolf and Cartwright's work and offered a model which obviated the need for dummy variables. He argued that:

> ...the entire business of coding dummy variables was from its inception an artifact of the undigested knowledge and some nameless computer programmer

> and can be replaced by a straightforward solution which is simple and costs considerably less in computation time. (Bogartz 1975, p.180).

In response, Wolf and Cartwright (1975) argued that Bogartz's model was equivalent mathematically to their own, but added that researchers tend to use dummy variables when working with background categorical variables such as sex or race. They concluded their response with the following:

> For those who do use dummy variables, our method ensures that the variables are the dummies and not the user or the method.
>
> (Wolf & Cartwright 1975, p.181)

While O'Grady and Medoff (1988) acknowledge the value of dummy (and also nonsense) coding categorical variables for use as predictors in multiple regression analysis, they suggest that the technique should be used with caution and restraint. They argue that dummy (and nonsense) coding yield the same sums of squares as other coding methods only in a limited set of circumstances:

a) analyses that do not include any interaction terms
b) analyses for orthogonal designs in which the tests of significance are determined with the incremental variance approach to significance testing
c) analyses for nonorthogonal designs in which an incremental variance approach to significance testing is employed to perform an analysis based on one of the following:
    1. an adjustment of each effect as a given order of complexity
    2. hierarchical approach
    3. weighted means approach analysis.

(O'Grady & Medoff 1988, p.248)

The literature contains a wide range of studies which made use of dummy variables. Like Hardy (1993), Reed and Miller (1970)'s work was concerned with earnings (specifically, the influences on the earnings of men with college degrees). The dummy variables used in the analysis included: age, college rank, father's employment and education.

Studies in the field of education which used dummy variables in the analyses have included Ainley *et al* (1991)'s investigation of the school factors which influence students to continue at school beyond the minimum leaving age and Peterson's (1992) exploration of the characteristics of high school students electing to study economics and the impact of school economic courses on the attainment of economic knowledge. Wasik (1981) cites two further examples: the analysis of the out-of-seat behaviour of one group of children during group activities in an open classroom arrangement within a kindergarten and the use of a computer terminal by a sample of twelfth grade mathematics students and their performance in a mathematics test. Dummy variables have been used to analyse the selection procedures to higher education courses. Rolph *et al* (1979), for example, analysed the probability of applicants being admitted to medical school based on both academic and non-academic attributes while Messmer and Solomon (1979) explored the selection procedures in one institution for graduate students enrolling on an MBA course.

Other researchers have made use of dummy variables in the analysis of training and work-based matters. For example, Lehmann (1988) cites Lawler (1967) who used dummy variables to measure managerial performance. Ball and Freeland (2002) report on a study which examined the provision of apprentice and trainee training opportunities in Australian small and medium-sized businesses. Regression analysis, involving more than 100 dummy variables, was used. These included: the nature of the industry (e.g. mining, manufacturing or construction), the number of employees, the gender and education of the decision–maker, the extent of trade union membership among the workers and training practices (e.g. structured training, on the job training, management training and health and safety training).

A final example of a study which used dummy variables is the work of Liang and Chaloupka (2002) who undertook an investigation of the differential effects of cigarette price on the intensity of youth cigarette smoking.

Examples of Studies Using Multilevel Modelling

The literature contains many examples of studies in which the data had a hierarchically nested structure that was analysed using multilevel modelling techniques. A considerable number of these studies were concerned with educational research, and school effectiveness research in particular.

The use of multilevel modelling within educational research

The role of multilevel modelling within educational research is explained in the following quotation from a lecture by Goldstein:

> In schools children learn and achieve as a result of what they themselves bring but also as a result of what the school provides, through its teaching, physical facilities and ambience. Children also learn from their peers and the characteristics and achievement of the other pupils in the school will impinge on the development of any particular child. If we wish to capture such complex relationships then we need to have tools which are capable of matching that complexity. (Goldstein 1998)

In the introduction to what has been described by Schagen and Hutchison (2003) as a "seminal paper", Aitkin and Longford (1986) raise the question of the appropriate unit of analysis when undertaking research involving one or more outcome variables, school and teacher processes and the characteristics of the pupil intake. For example, where the researcher is interested in the importance of school-level variables and individual (pupil-level) outcomes are available, should these be aggregated to school level? Aitkin and Longford (1986) remind us that pupils in the same school share common experiences, which make their results more homogeneous than those of a random sample of pupils drawn from the population of all schools.

Using the O-level/CSE examination results for a 25% random sample (n=907) of the 5th year cohort in all 18 schools of one Local Education Authority, Aitkin and Longford described five models that were used by them to analyse the data. Verbal

Reasoning Quotients (VRQ), a measure of intellectual ability, was used as an "intake score". Two of the models were extended to allow variable slopes among schools. The five models are described in Table 4.2.

Table 4.2: **The five models used by Aitkin and Longford (1986)**

	Using the terminology adopted in this thesis
Model 1: Pupil level with no school effects; comparisons based on school mean residuals; OLS fitting $y_{ij}=\alpha+\beta x_{1ij}+\gamma x_{2ij}+\varepsilon_{ij}$ (j=pupil, i=school, ε_{ij}=pupil level error) Gives one single slope *Does not recognise individual schools, so cannot be extended* Large differences in school means can skew the model, so grammar school effects can be observed.	$y_{ij}=\beta_0+\beta_1 x_{1ij}+\beta_2 x_{2ij}+\varepsilon_{ij}$ (i=pupil, j=school)
Model 2: School fixed effect; comparisons based on school parameters, OLS fitting $y_{ij}=\alpha_i+\beta x_{1ij}+\gamma x_{2ij}+\varepsilon_{ij}$ *Extension: School by slope interactions* ($y_{ij}=\alpha_i+\beta_i x_{1ij}+\gamma_i x_{2ij}+e_{ij}$) Includes specific intercept parameters for each school, so almost unaffected by the grammar schools.	$y_{ij}=\beta_{0j}+\beta_1 x_{1ij}+\beta_2 x_{2ij}+\varepsilon_{ij}$
Model 3: Data aggregated to school level; comparisons based on individual residuals; WLS fitting $\overline{y}_i=\alpha+\beta x_{1i}+\gamma x_{2i}+\eta_i$ (η_i=school level error) Suppresses within-school variation Does not use the individual pupil data but aggregates pupils results within the schools to the school means and uses some form of weighted least squares for fitting the model, so grammar school effects can be observed.	$\overline{y}_j=\beta_0+\beta_1 x_{1j}+\beta_2 x_{2j}+u_j$
Model 4: "Contextual effects": individual level model 1 includes schools means of individual level variables; OLS fitting $y_{ij}=\alpha+\beta x_{ij}+\delta x_i+\varepsilon_{ij}$ (δ is the "contextual effect") School context affects the outcome of an individual pupil.	$y_{ij}=\beta_0+\beta_1 x_{1ij}+\beta_2 x_{2j}+\varepsilon_{ij}$
Model 5: Variance components; school effects random variables; maximum likelihood fitting $y_{ij}=\alpha+\beta x_{ij}+\xi_i+\varepsilon_{ij}$ (ξ_i are the school effects) Alternatively, may be written as: $y_{ij}=\alpha_j+\beta x_{ij}+\varepsilon_{ij}$ (where $\alpha_j=\alpha+\xi_i$) *Extension: Random slopes* ($y_{ij}=\alpha+\beta x_{ij}+\xi_i+\zeta_i x_{ij}+\varepsilon_{ij}$) Random intercepts for each school, so almost unaffected by the grammar schools.	$y_{ij}=\beta_0+\beta_1 x_{1ij}+u_j+\varepsilon_{ij}$ $y_{ij}=\beta_{0j}+\beta_1 x_{1ij}+\varepsilon_{ij}$ (where $\beta_{0j}=\beta_0+u_j$)

Aitkin and Longford used each model to compare the relative effectiveness of the schools and draw conclusions about the usefulness and value of the different models. They concluded that the model adopted impacted on the results obtained. For example, they argue that Models 1 and 3 produce "unpredictable, and even meaningless" results when used with the heterogeneous sample of all schools when the information on school identity or within-school variability is suppressed. Of particular interest was the effect of the inclusion within the different models of two opposite-sex selective schools in which the boys outperformed the girls. The lower scores for the girls' school induced effects and interactions in Models 1 and 3 that reflect the suppression of school identity in Model 1 and the suppression of within-school variability in Model 3. In contrast, Models 2 and 5 were almost unaffected by the Grammar schools.

A number of earlier studies are criticised by Aitkin and Longford for failing to use a multilevel approach in their analyses. For example, Steedman (1983)'s study of examination performance relied on differences in mean scores among four different types of schools and therefore risked overstating the differences among the school types because of greater within-school homogeneity relative to that among schools. Similarly, Marks *et al* (1983) had no individual data – they identified large variations in outcome variable means across schools, although they could not relate these to school or pupil level characteristics.

Aitkin and Longford list what they consider to be the minimum requirements for an adequate analysis of school differences as:

1. Pupil-level data on outcome, intake and relevant background variables, together with relevant school- and LEA-level variables
2. Explicit modelling of the multilevel structure through variance components at each sampling level – child, school and LEA
3. A careful analysis of interactions between explanatory variables at different levels, of random variation among schools in the regression coefficients of pupil-level variables, and of random variation among LEAs in the coefficients of school-level variables. (Aitken & Longford 1986, p.25)

Schagen and Hutchison (2003) document a worked example of an analysis of national value-added datasets supplied by the DfES/QCA. 377,583 pupils in 3044 schools in 149 LEAs were tracked from KS2 in 1996 to GCSE in 2002. (While the National Evaluation of Study support used a much smaller sample and tracked pupils from KS3 to GCSE, the research design was similar to that adopted by Schagen and Hutchison.) Background variables were collected at pupil level (including sex and levels achieved in KS2 mathematics, English and science) and school level (such as percentage of pupils in school eligible for free school meals, percentage of pupils in the LEA attending grammar schools and percentage of pupils in the LEA attending faith schools).

Schagen and Hutchison used a multilevel model to produce coefficient values and standard errors for each background variable, along with random variances at each level. The coefficients that express the estimated relationships between GCSE outcomes and each of the background variables were converted into 'normalised coefficients'. These represented the strength of each relationship and allowed the different variables to be compared in terms of their apparent influence on the test outcome, when all other variables were simultaneously taken into account. Schagen and Hutchison concluded that, allowing for pupil factors (including prior attainment), performance was higher in selective (grammar) schools, specialist and faith schools – although only for the first of these was there a substantial effect. The process of converting variables into normalised coefficients is not necessary where, as in the study reported in this thesis, all of the variables of interest were dichotomous and used a 0/1 coding.

A reworking of Schagen and Hutchison's analyses (Schagen and Schagen 2005), which also used multilevel modelling but was based on valued-added data sets, largely confirmed the findings from the previous research. As with the earlier research, the later analyses used numerical equivalents for the GCSE grades (i.e. A*=8 points, A=7 points and B=6 points etc). In reporting the reworked analyses, Schagen and Schagen make the point that this transformation makes the assumption that the transition from Grade A to A* is equivalent in value to that from G to F. This concern is relevant to all analyses that use a numerical scale to represent GCSE grades, including the National Evaluation of Study Support.

Goldstein *et al* (1993) conducted a multilevel analysis of the GCSE examination results of 5,748 pupils in 66 schools in six Inner London Education Authorities. The data were analysed in relation to intake achievement, pupil gender and school type. It was found that the confidence intervals for the school residuals were wide and few schools could be separated reliably. Goldstein and his colleagues discuss the implications of their findings for the publication of school league tables. In a paper which addresses the statistical issues regarding the use of league tables, Goldstein and Spiegelhalter (undated) warn that overinterpretation of a set of rankings with such large uncertainty intervals "can lead to both unfairness and inefficiency and unwarranted conclusions about changes in ranks".

Goldstein and Sammons (1997) explored the influence of secondary and junior schools on GCSE performance. Using a cohort of 758 students in 48 junior schools and 116 secondary schools, they found that the junior schools whose students had high average achievement scores when they left also tended to have high average scores at the age of 16. Furthermore, Goldstein and Sammons concluded that the variation among the junior schools was substantially greater than that among the secondary schools. The authors do, however, acknowledge that their findings were based on a "relatively small sample" and that their conclusions must therefore "remain tentative" (Goldstein & Sammons 1997, p.228). Goldstein and Sammons' study is an interesting example of multilevel modelling because the junior and secondary schools were analysed as two random cross-classified factors. This approach was necessary because the schools were not nested as not all pupils from the same junior school attended the same secondary school. Cross-classification was also a feature of Goldstein *et al* (2007)'s research on the effect of pupil mobility on school differences on educational achievement. Data were collected on 555,671 pupils attending schools in three English local education authorities from their Key Stage 1 exams in 2000 at the end of their second year to their KS2 exams in 2004 at the end of year 6. Using multilevel modelling, comparisons were made with traditional value-added approaches that ignore pupil mobility. The two principal conclusions from the study were that traditional models underestimate the importance of the school as measured by its contribution to the overall variance and that ignoring pupil mobility makes little differences to the value-added ranking of schools.

O'Donoghue *et al* (1997) used multilevel models to analyse the progress between GCSE and GCE A/AS level of all 504,680 students reaching the age of 18 in schools and colleges in England over three academic years (1993-1995). Total and average

GCSE points were used as measures of prior attainment, while total GCE A/AS level points was used as the outcome variable. The findings included:

- girls progressed less than boys (although the relationship varied according to prior attainment)
- students at selective independent schools progressed more than students at other schools (progress was least in FE colleges)
- single sex schooling had no significant effect on progress once the admissions policy of institutions was included.

Yang *et al* (2002) undertook a multilevel analysis of the examination results of 52,587 A/AS level mathematics students from 2,595 institutions in England in 1997. Some of the key findings from their study were similar to those from the research undertaken by O'Donoghue *et al*:

- female students performed worse than male students
- students attending selective, independent and sixth form institutions performed better than students attending other schools
- for Main and Further maths, scores decrease with age.

Ireson *et al* (2005) used multilevel modelling to estimate the effect of setting on GCSE attainment, taking account of prior attainment, social disadvantage, gender and attendance. Data were collected on a cohort of over 6,000 Year 9 students in 45 mixed secondary comprehensive schools. Follow up data were collected on these pupils in Year 11 when they sat GCSE examinations. There are similarities (in terms of the number and ages of pupils and the number of participating schools) between the sample used in this study and that used in the National Evaluation of Study Support. Ireson *et al* found no significant effect of setting on English, maths or science when prior attainment was controlled for and that the effects on higher and lower attaining students were not consistent in the three subject areas. It was also found that, in all three subjects, students of similar ability achieved higher GCSE grades when placed in higher sets. Two other findings were:

- socially disadvantaged students achieved significantly lower grades
- girls achieved higher grades than boys (especially in English)

In a more recent study, Peng *et al* (2006) used multilevel modelling to explore differences between senior secondary schools in value-added measures of school effectiveness. 9,257 18- to 19-year-old pupils who attended 17 out of 105 schools within one local education authority in China participated in the research. Outcome scores in the Entrance Examination for Higher Education (EEHE) in 2003 were linked with prior attainment in the Entrance Examination for Senior High School (EESHS) in 2000 and pupil background data. The EESHS scores comprised Chinese, maths, English, general social science and general natural science/engineering, while the EEHE scores consisted of an overall measure, maths and English. In addition to finding significant differences between schools in value-added scores, it was also found that some schools were differentially effective (i.e. more effective in one academic subject than another).

The final example that will be cited of an educational research project involving school-aged pupils that made use of multilevel modelling was a study undertaken by Blatchford *et al* (2002) to explore class size effects in reception year classes. It was a longitudinal study which followed a large sample of children from school entry through the infant stage, i.e. the first three years of school (Reception year, Year 1 and Year 2), and measured their progress in literacy and mathematics. Two cohorts of children (aged 4 to 7 years) were involved: the first cohort started school in 1996 and the second in 1997. Eight Local Education Authorities, 220 schools, 368 classes and 9330 children comprised Cohort 1. Cohort 2, which was not reported in Blatchford *et al* (2002), involved a further five LEAs. A baseline entry assessment (involving literacy and mathematics) was conducted by the teacher. Pupil background details including: age, sex, free school meal entitlement, English language fluency, previous nursery education, attendance and special educational needs were collected.

Multilevel statistical procedures were used by Blatchford and his colleagues to model the effects of class size differences while controlling for sources of variation that might affect the relationships with academic achievement. Models were fitted to allow for the hierarchical structure of educational data (i.e. between-pupil, between-classroom and between-school variation). A relationship with size of class was found, after various confounding factors had been allowed for. Interactions were reported between class size and initial achievement and between class size and entitlement to free school meals. Generally, the results support the use of small class sizes during the reception year. Small classes appear to work best in literacy for pupils with the lowest school entry scores and for pupils not entitled to free meals.

Multilevel modelling has also been used in educational research projects involving learners outwith school age. Bodovski and Farkas (2007), for example, used multilevel modelling to explore the process and content of mathematics teaching in kindergarten to a nationally representative sample of 17,487 children attending 1,011 schools in America, while Simonite (2005) used multilevel modelling to investigate gender differences in the award of first class honours degrees in mathematical sciences in UK universities between 1994/95 and 1999/2000.

The use of multilevel modelling within other substantive areas and further methodological extensions

In addition to educational research, the literature contains examples of research studies from other substantive areas in which the data have a hierarchically nested structure and can be analysed using multilevel modelling techniques. These include:

- drug prevention research
- clinical therapy
- growth curve analysis
- spatial statistics
- meta analysis
- twin and family studies.

(the above list has been summarised from Kreft & de Leeuw 1998, pp.3-8)

An example of one of these areas, drug prevention research, is discussed below.

Drug prevention research

The aim of drug prevention research is to ascertain the effectiveness of drug prevention programmes for school students. Within drug prevention research, the hierarchy of nesting is usually students nested in schools and schools assigned to programmes or treatments. Measurements are taken at all levels of a hierarchy and these can be analysed simultaneously in multilevel modelling, with students' measurements (such as gender, race, poverty, level of rebelliousness and level of risk) analysed in relation to school level measurements (e.g. rebelliousness level, drug use level and environmental risk factors of the school).

Kreft and de Leeuw (1998) argue that the drug prevention literature assumes an interaction effect between individual risk factors and the type of drug prevention programmes and also between school risk factors and individual risks factors. They refer to "cross-level interactions" where there is a relation between school and student levels.

Kreft (1994) reports on the use of a multilevel model for hierarchically nested data in the evaluation of the effect of Normative Education (NORM) - a drug prevention programme. Data were collected on students nested within schools. Unlike single-level analysis, multi-level modelling takes intraclass correlation into account, handling the clustered and hierarchical structure of the data in an appropriate way.

Kreft considers three traditional models for analysing multilevel data:

1. ANCOVA (an analysis of covariance)
2. A means-to-means regression approach (an aggregate model)
3. A "slopes as outcomes" or separate models for separate schools approach (suggested by Burstein (1980), this approach involves collecting and clustering data at different levels).

Kreft identifies limitations with each of the above models. For example, with ANCOVA there is the possibility of interclass correlation and no opportunity to introduce macro-level characteristics. The aggregate model will answer questions about how schools, rather than students, behave and it is students who are the object of interest in drug education programmes. The separate models for separate schools approach can require the estimation of a number of parameters per school and is therefore not particularly parsimonious.

In the case of drug prevention research, Kreft argues that a random coefficient (RC) model offers the possibility of using within-school differences in parameter estimates by turning it from a within-group error (or nuisance) into a meaningful source of variation. The RC model can help build theories that predict the effect of drug prevention programmes for special groups of students, in the sense that some programmes may work well for some students but not for others. It estimates effects over all schools together, it is parsimonious and it can test macro-effects in combination with micro-effects and their cross-level interactions.

Some Limitations of Multilevel Modelling and Related Techniques

In his critique of multilevel modelling, Gorard (2002 and 2003a) identifies a number of limitations with the technique. These can be summarised as follows:

1. the circumstances in which multilevel modelling should be used are not clear. Multilevel modelling is not required if a good random sample has been used
2. multilevel modelling tends to be used to overcome deficiencies in datasets, in particular the absence of a good cluster-random sample
3. there is a need to consider competing hierarchies, especially when these hierarchies do not nest (e.g. sex and social class)
4. aggregated data may be more accurate because random errors may be cancelled out
5. the order of entry of the variables into the models requires careful consideration
6. only a limited number of people consider themselves adequately informed to comment on the use of multilevel modelling.

Gorard refers to the first of the limitations as the "intrinsic problem" of "the lack of a clear area of application" (2003a, p.51). He suggests that, if measurements are taken from a good random sample, multilevel modelling is not required. He distinguishes between a cluster-random sample, a sample of co-operating schools used as a cluster-opportunity sample and a sample where cases are chosen randomly within such an opportunity cluster. Gorard writes:

> The argument for MLM clearly requires a defined population of clusters from which a sample of *clusters* is selected at random (with no replacement, no non-response, and no dropout)......many examples of MLM in actual use are inappropriate......it now becomes unclear when MLM could ever be appropriate. (Gorard 2003a, p.51)

The second limitation identified by Gorard is a criticism that statistical techniques are often used to overcome deficiencies in datasets. For example, statistical techniques have been used to compensate for the absence of a good cluster-random sample. Such a sample would mimic a true random sample. While Gorard does acknowledge that complex techniques may be the only way to analyse deficient datasets that already exist, he suggests that researchers should in future devote more effort to the collection of better data that can be analysed more simply.

Gorard's third limitation of multilevel modelling is concerned with competing hierarchies. He argues that multilevel modelling allows for nested hierarchies, but the technique does not consider the level to which these hierarchies should be aggregated. He also argues that multilevel modelling does not give guidance on what to do when hierarchies are competing rather than nesting. Gorard asks:

> What is done about the auto-correlation also caused by sex, social class, ethnicity, days of the week for testing, time of day for testing etc? The hierarchies created by these clusters do not nest, so in practice they are ignored. (Gorard 2003a, p.52)

Gorard claims that there is no *a priori* reason why school effectiveness research includes sex as a simple explanatory variable (at one or more levels) and the school as a cluster. He suggests that school effectiveness research often uses multilevel modelling with simple nested hierarchies because of the requirements of multilevel modelling, rather than the subject matter being explored.

Gorard states that, in contrast, a standard regression model (with individual and grouped variables) allows every relevant hierarchy to be assessed in the same model. He cites a hypothetical example of a standard regression model of individual pupil examination outcomes with mean prior attainment of the school attended, individual sex and mean prior attainment of the same sex as explanatory variables. It is possible to include this combination of explanatory variables, even although prior attainment by school and by sex do not nest. The benefits of standard regression models are underlined by Kreft (1996). Kreft compares the usefulness of multilevel models with traditional regression methods which he describes as "more familiar, more readily available and have better known properties". She concludes that it is "in general sound advice" for researchers to explore their data using traditional regression before fitting a multilevel model.

Gorard's fourth limitation of multilevel modelling is concerned with errors. He states that it is generally assumed that it is better to use data relating to individual students rather than aggregated data relating to classes, groups or schools when analysing school outcomes. However, he adds that any measurements may not be totally accurate and some can involve "considerable error" (2003a p.55). In these cases, aggregating the data may result in random errors being cancelled out. Gorard states that further error is introduced in regression-type analyses if there is divergence from a linear relationship between variables. He writes:

> For some problems the introduction of an error component makes a large difference, and for some problems the error makes *all* of the difference.
>
> (Gorard 2003a, p.57)

The fifth limitation identified by Gorard of multilevel modelling is the order of entry of the independent variables into the model. He states that this can make "a very substantial difference" (2003a p.57) to the results obtained and adds "different explanations of social phenomena can be derived using the same technique but with only minor variations in the order in which the variables are entered" (2003a p.57).

Gorard, however, acknowledges that both error measurement and the order in which the variables are entered (i.e. the above two limitations) also have implications for the results derived through other regression techniques. He warns of the danger of multilevel modelling being regarded as "a push button solution to more than the relatively minor problem for which it was devised" (Gorard 2003a, p.57).

A final concern that Gorard expresses in relation to multilevel modelling is that "few people are prepared to critique papers using MLM in their own literature reviews, and even fewer are prepared to referee them for journal or grant-awarding bodies" (2003a p.47). Later in his paper he writes "there are very few people outside what is in danger of becoming a kind of cult who can follow this kind of work, and it sometimes seems writers work to keep it that way" (2003a p.54). Gorard gives the specific example of a group of writers whom he says made their writing unnecessarily complicated to follow by referring to the variables by their names (e.g. FAMSTR), rather than by their descriptions:

> This is not what readers would need to know. This technical mumbo jumbo is usually presented instead of, rather than in addition to, information that I do actually need. (Gorard 2003a, p.54)

Gorard comments on the increasing quality and availability of computer software packages for statistical analysis. These enable the use of complex statistical models which "most consumers of educational research simply cannot, or would not wish to, comprehend" (2003a p.47). He suggests that most readers must "either implicitly accept the findings, or reject them as incomprehensible" (p.48).

Gorard accuses some researchers of being "mono-methodic" (2003a p.60) because they make repeated use of the same technique. Multilevel modelling, he suggests, is one of those techniques.

The Limitations of Multilevel Modelling in Relation to the Present Study

A general comment that can be made about the limitations of multilevel modelling identified by Gorard is that none is peculiar to multilevel modelling. Some are not even restricted to statistical modelling in general. Most are simply general considerations that should be applied to any thorough research study. For example, the need for an appropriate sample with as complete a dataset as possible is merely an indicator of a good research design. Similarly, the importance of researchers communicating their methods such that these can be understood and validated by other readers is not just limited to quantitative research. Gorard himself admits that the decision to use individual or aggregated data and the order in which the variables are entered into the model are not unique to multilevel modelling.

Each of the limitations will now be considered in relation to the present study. Reference will be made to Plewis and Fielding (2003)'s rebuttal to Gorard's critique.

In his first two limitations, Gorard stresses that researchers should always seek to have a good cluster sample. Where such a sample is available, Gorard's view is that multilevel modelling is not required. This suggests that Gorard has missed the point of multilevel modelling. As is outlined earlier in this chapter, the primary purpose of multilevel modelling is to acknowledge the hierarchical nature of the data being analysed. If a hierarchical structure is present within a cluster sample, multilevel modelling is required if that structure is to be recognised within the analyses. Indeed, even the analysis of a simple random sample must recognise the hierarchical structure of the data (if such a structure exists). Given the hierarchical nature of the school population, it is crucial that multilevel modelling be used to take cognisance of the potentially different experiences of pupils attending different schools. Plewis and Fielding offer the following illustration: a simple random sample of Year 9 pupils could be used to estimate the proportion of pupils electing to study geography at GCSE, but the size of the samples within schools is likely to be too small to explore whether the proportion is higher in some schools than in others or whether any variation might be a result of the quality of geography teaching in Year 7 and 8. Plewis and Fielding continue:

> If we are interested in educational processes, many of which are inherently bound up with school, then we need designs that enable us to study those processes. In other words, we need samples that are clustered in a way that reflects the structure of the population we are studying.
>
> (Plewis & Fielding 2003, p.412)

In response to Gorard's suggestion that multilevel modelling is used to overcome deficiencies in datasets, Plewis and Fielding agree with Gorard that statistical analysis can rarely rescue a poorly designed research project. However, they do acknowledge the human element of experiments - people interact with each other and chose whether or not to participate or continue in experiments and this can result in missing data. The result is that complex methods are sometimes required where there is missing data. Furthermore, Plewis and Fielding argue good data are not substitutes for complex analyses, but add that they are in fact complementary:

> ...we are not convinced by the implication that good data are a substitute for complex analyses. Rather we believe that they are complementary; sometimes we need complex research designs to mirror the complexity of the social world and these demand both good data and complex methods of analysis to do them justice. (Plewis & Fielding 2003, p.409)

In a more recent paper, Gorard (2007) lists a number of sources of error in datasets (e.g. measuring error and typographical error) and restates his view that researchers continue to use multilevel modelling in the belief that the approach can be used to overcome the deficiencies in the data. Gorard is correct to argue that multilevel modelling cannot address these sources of error any more than simpler techniques, but adds that "MLM advocates seem to be unaware of this" (Gorard 2007, p.223).

It is regrettable that Gorard's suggestion that multilevel modelling is used by researchers to analyse incomplete datasets belittles the contribution of an approach which has increased the scope of statistical analyses to data that could not be correctly analysed before. He is, however, more positive about this in his response - entitled *In defence of a middle way* (Gorard 2003b) – to Plewis and Fielding's rebuttal in which he writes 'We should all be proud that our field of endeavour has produced a complex analytic technique now taken up by other disciplines..." (Gorard 2003b, p.420).

The decision to use multilevel modelling in the present study was made because the hypotheses required exploring the differences in the study support experience of pupils attending different schools. It was acknowledged at the outset that there were a number of imperfections in the sample of schools that participated in the National Evaluation. These included:

1. the fact that it was an opportunity sample and not a cluster-random sample
2. the sample included some of the most disadvantaged schools in the country and it was not possible to extrapolate the findings to all schools
3. like many longitudinal studies, the inevitable drop out of subjects as the study progressed resulted in missing data.

It must be stressed, however, that multilevel modelling was not used to address these imperfections but because the analysis explored the different experiences of pupils attending different schools.

In concluding this discussion of Gorard's first two limitations, it is worth restating that the need for an appropriate sample with a dataset that is as complete as possible is not peculiar to multilevel modelling. This is merely a feature of a good research design.

Plewis and Fielding are critical of Gorard's third limitation (that multilevel models ignore competing non-nested hierarchies), arguing that Gorard is "just plain wrong" (p.415). They explain that variables such as gender are always treated in multilevel models as fixed effects (this is indeed what happened in the study reported in this thesis – gender and ethnic origin were included as fixed effects), because gender is not sampled from a population of genders. In contrast, participating schools are generally sampled from a population of schools and it is in that population that the researcher is interested. Gorard is therefore wrong to describe these as 'competing' hierarchies. Goldstein and Sammons (1997)'s exploration – referred to earlier in this chapter - of the influence of secondary and junior schools on GCSE performance demonstrated that it is possible to use cross-classified multilevel models. As a development of a previous research study which had involved two types of 2-level analysis, one with students classified by secondary school and one with students classified by junior school, Goldstein and Sammons included junior and secondary school in the same analysis as two random cross-classified factors. It was necessary to use cross-classification because the schools were not nested as not all pupils from the same junior school attended the same secondary school. Goldstein *et al* (2007)'s research on the effect of pupil mobility on school differences in educational achievement also made use of cross-classified models. The analyses took cognisance of the different infant and junior schools attended by the pupils. Other examples of how cross-classified data structures can be recognised within cross-classified multilevel models can be found in Fielding and Goldstein (2006).

Gorard argues that an advantage of using aggregated data is the possibility of cancelling out any random errors occurring at the individual level. This suggests that he has not correctly understood that multilevel modelling takes cognisance of both individual and aggregate data and there is therefore no need for the researcher to choose one or the other. One argument against the use of aggregated data alone is the possibility of replicating the Robinson effect (Robinson 1950). In a comparison between colour and illiteracy in the United States, Robinson found a divisional-level correlation of .946 and an individual-level correlation of .203. This led Robinson to conclude that aggregate-level relationships could not be used as estimates for the corresponding individual-level relationships. While Goldstein (2003) acknowledges that the aggregate level is sometimes the level of interest, he suggests that a multilevel perspective is usually more appropriate. He gives the example of the prediction of the proportion of children socially 'at risk' within a local authority area and suggests that a more accurate prediction can be made if child-level data is used (e.g. whether or not each child's household is overcrowded) as this will permit the use of certain variables that are not recorded at authority-level.

The order of entry of the variables into the model is Gorard's fourth limitation of multilevel modelling. In the present study, the variables included in the models were selected in accordance with a series of nested models that was created to test the hypotheses developed for the research. With MLwiN – the multilevel modelling software package used in the present study - the order of the variables does not affect the coefficients. Gorard's fifth limitation is therefore not relevant to studies using MLwiN.

Gorard's final limitation of multilevel modelling, that only a limited number of people consider themselves adequately informed to comment on the use of multilevel modelling, underlines the necessity for all researchers to communicate in ways that can be understood by their readers and take cognisance of the intended audience (e.g. policymakers are likely to require a different approach from researchers). By communicating effectively with their audiences, researchers should aim to empower their readers so that they are able to evaluate the validity of the findings for themselves. This will include explaining the key concepts associated with multilevel modelling (including, for example, "random effects", "fixed effects" and "school effects"). In the present study non-technical terms were used and the findings were reported in a way that it was hoped would be meaningful to the reader. Rather than reporting values for α, "the coefficient" or "the intercept", values were reported in terms of the differences to GCSE grades. For example:

> The difference in Best 5 GCSE score was just over one point (1.158) for FSM pupils who participated in Year 10 subject study support and almost two points (1.892) – e.g. two additional passes, or perhaps a grade 'A' rather than a grade 'C' - for FSM pupils who participated in Year 11 subject study support.

By presenting the findings in this way it is possible for the reader to consider whether the values have educational significance. The study, therefore, cannot fall foul of the criticism made by Ziliak and McCloskey (2004) that researchers tend to fail to distinguish between statistical significance and policy significance. Ziliak and McCloskey undertook an analysis of the 182 papers published in the *American Economic Review* during the 1980s and concluded that 70% "flatly mistook statistical significance for economic significance" (Ziliak & McCloskey 2004, p.332). Of the 137 papers reviewed in the 1990s, 82% were found by Ziliak and McCloskey to have mistaken statistical significance for economic significance.

Gorard suggests that the use of technical variable names, rather than descriptors, is not helpful in assisting readers to understand multilevel modelling. Care was taken in the present study to ensure that all variable names reported in the main text and appendixes were self-explanatory. The need for researchers to use variable names that can be readily understood by readers is, of course, not peculiar to multilevel modelling.

In summary, a number of the limitations of multilevel modelling discussed by Gorard should be dismissed as they suggest that he has not correctly understood the theory underpinning the technique. This rebuttal has, in fact, underlined the value of multilevel modelling (e.g. multilevel modelling takes cognisance of both individual and aggregate data and there is no need for the researcher to choose one or the other). The other limitations are not peculiar to multilevel modelling. Indeed, some are not even peculiar to quantitative research. These other limitations should not be dismissed, but should be considered within any good research design (whether or not multilevel modelling is involved).

Given that Gorard is critical of "mono-methodic researchers", it is noteworthy that multilevel modelling was not the only technique used in the present analysis. An initial set of analyses was undertaken using SPSS, including frequencies and cross tabulations. Traditional regression analysis - using MLwiN - was used to test some of the models, thus permitting some comparisons with the results from multilevel modelling. The findings from the multilevel modelling analyses will be reported in the following chapter. The present chapter will now discuss the specific software package (MLwiN) used in the multilevel analyses.

MLwiN and Other Multilevel Modelling Software Packages

The MLwiN programme is a development from MLn and its precursor ML3, which provided a system for the specification and analysis of a range of multilevel models. It provides a graphical user interface (GUI) for specifying and fitting a wider range of multilevel models. There are also plotting, diagnostic and data manipulation facilities. The user undertakes tasks by directly manipulating GUI screen objects, such as equations, tables and graphs.

MLwiN is a modified version of the DOS MLn programme. It is driven by a series of commands and operates in the background. Users set about their modelling tasks through direct manipulation of the GUI screen objects. The GUI translates these user actions into MLn commands which are then sent to the computing module. When the computing module has completed the requested action all relevant GUI windows are notified and redraw themselves to reflect the updated system state. Presently there are no GUI structures available for some more of the complex models and tasks. The user must therefore enter the associated commands directly in the command interface window.

A central feature of MLwiN is the equations window. This enables the user to specify and manipulate a model using standard statistical notation.

The data are held within a spreadsheet (or worksheet). The worksheet's columns represent the variables (although columns can be used for other purposes – for example to hold frequency data or parameter estimates), while the rows correspond to the lowest level units in the hierarchy.

A detailed user's guide has been published by the Centre for Multilevel Modelling (2000). Information can also be obtained from the Help system available within MLwiN. This uses the standard Windows 95/NT Help conventions.

The Centre for Multilevel Modelling's website (www.cmm.bristol.ac.uk), located at the University of Bristol, contains details about new developments, courses and workshops in MLwiN. The site also contains information concerning MLwiN software such as upgrades, maintenance downloads and documentation. There is a list of multilevel modelling references and a discussion list.

A newsletter is issued by the Centre for Multilevel Modelling and can be accessed through the website. Each newsletter follows a similar format and includes: details of forthcoming workshops and conferences, conference reports, information about new projects, details of developments in the MLwiN software, book reviews and lists of recent publications using multilevel models. Recent newsletter articles have been concerned with matters such as: the design issues associated with multilevel data (Lewis 2003), the use of bootstrapping procedures to allow for measurement error in multilevel regression (Hutchison *et al* 2003), the use of MLwiN to model ordinal data (Plewis 2002), the effect of ignoring a level in a multilevel model on variance component estimates (Hutchison & Healy 2001) and the use of multilevel models to assess the comparability of examinations (Bell & Dexter 2000).

MLwiN is one of a number of software packages designed for multilevel modelling. Other packages include: BMDP, HLM, LISREL and MIXOR/MIXREG. Goldstein (2003 pp.228-229) provides a table that lists the various software packages available and provides a brief note about each.

THE MODELS

The hypotheses explored in the extension study required the creation of variance components models and random coefficients models.

For each group of hypotheses, six basic models were generated (Models 0, 1, 2, 3, 3a and 4). The models were incremental – for example, Model 1 was Model 0 with pupils assigned to different schools, Model 2 was Model 1 with the addition of a random term for study support and Model 3 was Model 2 with the addition of a fixed term interaction between FSM and study support. The incremental nature of the models permitted the models to be tested against each other. A chi-square test of the difference in loglikelihood between two models was used to assess statistical significance.

Four of the models - Models 2, 3, 3a and 4 – had Year 10 and Year 11 variants. The Year 10 variants included a random term for Year 10 study support, while the Year 11 models included a random term for Year 11 study support. In addition, the Year 10 variant of Model 4 included a random term for the interaction between FSM and Year 10 study support and the Year 11 variant included a random term for the interaction between FSM and Year 11 study support.

In addition to the above models, a variant of Model 0 was created which included school dummy variables. This model was separate from the others as it did not form part of the incremental series. The primary purpose of Model 0 was to permit the comparison of the results from a multiple regression analysis with those from a variance components model.

As was stated earlier in this Chapter (see Table 4.1), each set of models comprised of a baseline measure, an output measure and a study support category which was entered as a dummy variable. The models which explored the benefits of participation in study support for FSM pupils included the interaction between FSM and attendance at study support (either Year 10 or Year 11, as appropriate) as a dummy variable. The values used for these interactions (and the other variables included in the models) are shown in Table 4.4.

Serious consideration was given to the explanatory variables that were included in the models. Free meal entitlement, gender and ethnic background were included as dummy variables in all models. Free meal entitlement was included because of its relevance to the research reported in this study, while gender and ethnic background were included because previous research has shown that these variables influence academic attainment.

Consideration also had to be given to the interaction terms included in the models as the possibilities for including interaction terms were extensive, particularly if three-way interactions were included. It was decided to limit the interactions to those that were most relevant to the study. For example, whether the effect of FSM on outcomes varies by school was not of prime concern – what was important was the value of study support for FSM pupils and whether that varied by school. Moreover, some interactions between gender, ethnic background and study support were included in initial models but were found to be not statistically significant. Therefore only the interaction between FSM and study support was considered in the final models. The FSM*study support interaction was included in Models 3, 3a and 4. It was excluded from Models 0, 1 and 2 as these were concerned with the benefits of attending study support for all pupils and not just FSM pupils.

In each of the models, all interval scale explanatory variables (i.e. NVR, SATS, attitudes and school attendance) were centered. (See page 107 of this thesis for an explanation of centering.)

All models used the Restricted Iterative Generalised Least Square (RIGLS) estimation method. As some of the more complex models could not be created using the Iterative Generalised Least Square (IGLS) method, RIGLS was used in all models to ensure consistency and permit the comparison of the loglikelihood of different models. An advantage of using the RIGLS method is that it produces unbiased estimates. IGLS, in contrast, results in biased estimates of the random parameters because it takes no account of the sampling variation of the fixed parameters and this can be important when analysing small samples (Goldstein 2003).

The six models are summarised below.

<u>**Model 0**</u>

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 10 study support
attendance at Year 11 study support

Explanatory variables with random coefficients

Intercept (individual)

In this model we estimate values and standard errors for:

- the fixed parameters
- the intercept
- the variance of the intercept at individual level only

Model 0 was a single-level model. There was just one random parameter – the intercept at the individual level.

Model 1

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 10 study support
attendance at Year 11 study support

Explanatory variables with random coefficients

Intercept (individual and school)

In this model we estimate values and standard errors for:

- the fixed parameters
- the intercept
- the variance of the intercept at each level

Model 1 added a second random parameter - the school attended (intercept). As a variance components model, it permitted different intercepts but assumed parallel slopes and could be used to test the hypothesis of no variation by school over all values of explanatory variables. It did not allow differential school level variance for different combinations of explanatory variables. A variance components model is an alternative to testing using multiple regression (and dummy school variables).

Model 1 was used to test hypotheses a:

Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE.

The two parameters of interest in relation of hypothesis a are:

- attendance at Year 10 study support
- attendance and Year 11 study support

The coefficients of these two parameters were subjected to a t-test to determine the statistical significance of attendance at study support on the output measure.

As the only difference between Models 0 and 1 was the school attended, a chi-square test of the difference in loglikelihood between the two Models was used to assess the statistical significance of any variance explained by the school.

Model 1 (Null Model)

Explanatory variables with random coefficients

Intercept (individual and school)

In this model we estimate values and standard errors for:

- the intercept
- the variance of the intercept at each level

Model 1 (Null Model) was created to test for the percentage of the total variance explained by the inclusion of the explanatory variables - i.e. baseline measure (centered), male, FSM, white, attendance at Year 10 study support and attendance at Year 11 study support - in the fixed part of Model 1.

The percentage was calculated by adding the sum of the between school variance and the between pupil variance in the Null Model to that of Model 1 and then dividing by the between school variance and between pupil variance in the Null Model.

Model 2(10)

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 11 study support

Explanatory variables with random coefficients

Intercept (individual and school)
attendance at Year 10 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of Year 10 study support
- the covariance of the coefficient of Year 10 study support * intercept (at school level)

Model 2(11)

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 10 study support

Explanatory variables with random coefficients

Intercept (individual and school)
attendance at Year 11 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of Year 11 study support
- the covariance of the coefficient of Year 11 study support
  * intercept (at school level)

Models 2(10) and 2(11) were used to test hypothesis b:

> The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school.

Like Model 1, Model 2 was a multilevel model in which the school was random. As the only difference between Models 1 and 2 was the addition of a random term for study support, a chi-square test of the difference in loglikelihood between Model 1 and Model 2(10) and between Model 1 and 2(11) was used to assess the statistical significance of any variation between schools in the improvement in the output measure from attending Year 10 and Year 11 study support – i.e. chi-square was used to assess if study support was more effective in some schools than others.

As a random coefficients model, Model 2 was an alternative to testing using multiple regression with school level dummy variables for slopes and intercepts.

Model 3(10)

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 11 study support
FSM * attendance at Year 10 study support

Explanatory variables with random coefficients

Intercept (individual and school)
attendance at Year 10 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of Year 10 study support
- the covariance of the coefficient of Year 10 study support * intercept (at school level)

Model 3(11)

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 10 study support
FSM * attendance at Year 11 study support

Explanatory variables with random coefficients

Intercept (individual and school)
attendance at Year 11 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of Year 11 study support
- the covariance of the coefficient of Year 11 study support * intercept (at school level)

Model 3 added a fixed term for the interaction between FSM status and study support, i.e.:

- FSM x attendance at Year 10 study support **Model 3(10) only**
- FSM x attendance and Year 11 study support **Model 3(11) only**

It was used to test hypothesis c:

The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school.

A significant interaction between FSM status and study support indicated that the improvement in the output measure was different for FSM and non-FSM pupils. As the FSM status had been coded 0=Non-FSM and 1=FSM, a significant positive interaction suggested that FSM pupils benefited more than non-FSM pupils. A significant negative value indicated that FSM pupils benefited less than non-FSM pupils. The statistical significance of the coefficients of the two FSM*study support interactions was determined using a T-test.

<u>**Model 3(10)a**</u>

Explanatory variables with fixed coefficients

baseline measure (centered)
male
white
attendance at Year 11 study support
FSM * attendance at Year 10 study support

Explanatory variables with random coefficients

Intercept (individual and school)
FSM
attendance at Year 10 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of FSM
- the variance of the coefficient of Year 10 study support
- the covariance of the coefficient of FSM * intercept (at school level)
- the covariance of the coefficient of Year 10 study support * intercept (at school level)
- the covariance of the coefficient of Year 10 study support * FSM (at school level)

Model 3(11)a

Explanatory variables with fixed coefficients

baseline measure (centered)
male
white
attendance at Year 10 study support
FSM * attendance at Year 11 study support

Explanatory variables with random coefficients

Intercept (individual and school)
FSM
attendance at Year 11 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of FSM
- the variance of the coefficient of Year 11 study support
- the covariance of the coefficient of FSM
  * intercept (at school level)
- the covariance of the coefficient of Year 11 study support
  * intercept (at school level)
- the covariance of the coefficient of Year 11 study support
  * FSM (at school level)

Model 3a added a random term for FSM. This was necessary for comparison with Model 4 (which also included a random parameter for FSM).

Model 4(10)

Explanatory variables with fixed coefficients

baseline measure (centered)
male
white
attendance at Year 11 study support

Explanatory variables with random coefficients

Intercept (individual and school)
FSM
attendance at Year 10 study support
FSM x attendance at Year 10 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of FSM
- the variance of the coefficient of Year 10 study support
- the variance of the coefficient of FSM * Year 10 study support interaction
- the covariance of the coefficient of FSM * intercept (at school level)
- the covariance of the coefficient of Year 10 study support * intercept (at school level)
- the covariance of the coefficient of Year 10 study support * FSM (at school level)
- the covariance of the coefficient of FSM * Year 10 study support interaction * intercept (at school level)
- the covariance of the coefficient of FSM * Year 10 study support interaction * FSM (at school level)
- the covariance of the coefficient of FSM * Year 10 study support interaction * Year 10 study support (at school level)

Model 4(11)

Explanatory variables with fixed coefficients

baseline measure (centered)
male
white
attendance at Year 10 study support

Explanatory variables with random coefficients

Intercept (individual and school)
FSM
attendance at Year 11 study support
FSM * attendance at Year 11 study support

In this model we estimate values and standard errors for:

- the fixed parameters
- the random parameters
- the variance of the intercept at each level
- the variance of the coefficient of FSM
- the variance of the coefficient of Year 11 study support
- the variance of the coefficient of FSM * Year 11 study support interaction
- the covariance of the coefficient of FSM * intercept (at school level)
- the covariance of the coefficient of Year 11 study support * intercept (at school level)
- the covariance of the coefficient of Year 11 study support * FSM (at school level)
- the covariance of the coefficient of FSM * Year 11 study support interaction * intercept (at school level)
- the covariance of the coefficient of FSM * Year 11 study support interaction * FSM (at school level)
- the covariance of the coefficient of FSM * Year 11 study support interaction * Year 11 study support (at school level)

Model 4 added a random term for the FSM*study support interaction. It was therefore used to test Hypothesis d:

> The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level.

Chi-square tests of the difference in loglikelihood between Model 3(10)a and Model 4(10) and between Model 3(11)a and 4(11) were used to assess the statistical significance of any variation between schools in the interaction between FSM and study support - i.e. chi-square was used to assess if there were differences between schools in the effectiveness of study support for FSM pupils compared with non-FSM pupils.

Model 0 with School Dummy Variables

Explanatory variables with fixed coefficients

baseline measure (centered)
male
FSM
white
attendance at Year 10 study support
attendance at Year 11 study support
school dummy variables

Explanatory variables with random coefficients

Intercept (individual)

In this model we estimate values and standard errors for:

- the fixed parameters
- the intercept
- the variance of the intercept at individual level only

Like Model 0, this model estimates the variance at intercept at individual level. Through the addition of school dummy variables, this model also allows for school variation.

The model lies outwith the incremental series and was not used to test any of the hypotheses. Its primary purpose was to explore – through a comparison with Model 1 - the difference in coefficients for the study support variables between using a variance components model (Model 1) and multiple regression. Furthermore, a chi-square test of the difference in loglikelihood between the Model 0 and this model was used to test for a school effect.

All model equations are shown on the following pages in Table 4.3 and 4.5. Table 4.4 lists the variables included in the models and the variable values. A table which summarises the content of each model can be found in Appendix H. The models (with estimated values) are shown in Appendix I.

Table 4.3: **Model equations with Greek notation**

	FIXED COEFFICIENTS	RANDOM COEFFICIENTS
Model 0	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_6x_{6ij}$	$\beta_{oij} = \beta_o + \varepsilon_{oij}$
Model 0 with School Dummies	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_6x_{6ij} + \beta_7x_{7ij} + \beta_8x_{6ij} + \beta_9x_{6ij}$...........	$\beta_{oij} = \beta_o + \varepsilon_{oij}$
Model 1	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_6x_{6ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$
Model 1 (Null Model)	$y_{ij} = \beta_{oij}x_o$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$
Model 2(10) **Model 2(11)**	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_{5j}x_{5ij} + \beta_6x_{6ij}$ $y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_{6j}x_{6ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$
Model 3(10) **Model 3 (11)**	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_{5j}x_{5ij} + \beta_6x_{6ij} + \beta_7x_{7ij}$ $y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_{6j}x_{6ij} + \beta_7x_{7ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$
Model 3(10)a **Model 3(11)a**	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_{3j}x_{3ij} + \beta_4x_{4ij} + \beta_{5j}x_{5ij} + \beta_6x_{6ij} + \beta_7x_{7ij}$ $y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_{3j}x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_{6j}x_{6ij} + \beta_7x_{7ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{3j} = \beta_3 + u_{3j}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$
Model 4(10) **Model 4(11)**	$y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_{3j}x_{3ij} + \beta_4x_{4ij} + \beta_{5j}x_{5ij} + \beta_6x_{6ij} + \beta_{7j}x_{7ij}$ $y_{ij} = \beta_{oij}x_o + \beta_1x_{1ij} + \beta_2x_{2ij} + \beta_{3j}x_{3ij} + \beta_4x_{4ij} + \beta_5x_{5ij} + \beta_{6j}x_{6ij} + \beta_{7j}x_{7ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{3j} = \beta_3 + u_{3j}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{7j} = \beta_7 + u_{7j}$ $\beta_{6j} = \beta_6 + u_{5j}$

Table 4.4: **List of variables and variable values used in models**

ALL MODELS

i = pupil

j = school

y = output

x_0 = constant

x_1 = baseline (centred)

x_2 = male
- 0: not male
- 1: male

x_3 = FSM
- 0: not FSM
- 1: FSM

x_4 = white
- 0: not white
- 1: white

x_5 = Yr10 study support
- 0: not attended
- 1: attended

x_6 = Yr 11 study support
- 0: not attended
- 1: attended

MODEL 0 WITH SCHOOL DUMMIES

x_7 = School Dummy 1
- 0: School 1 not attended
- 1: School 1 attended

x_8 = School Dummy 2
- 0: School 1 not attended
- 1: School 1 attended

x_9 = School Dummy 3
- 0: School 1 not attended
- 1: School 1 attended

NOTE: The number of x's is extended to include the number of school dummies required for the model

MODELS 3(10), 3(11), 3(10)a, 3(11)a, 4(10) and 4(11)

x_7 = FSM*Yr10 study support
- 1: FSM=1 and Yr10 study support=1
- 0: FSM=0 and Yr10 study support=0
- 0: FSM=0 and Yr10 study support=1
- 0: FSM=1 and Yr10 study support=0

<u>or</u>

x_7 = FSM*Yr11 study support
- 1: FSM=1 and Yr11 study support=1
- 0: FSM=0 and Yr11 study support=0
- 0: FSM=0 and Yr11 study support=1
- 0: FSM=1 and Yr11 study support=0

Table 4.5: **Model equations with variable names**

	FIXED COEFFICIENTS	RANDOM COEFFICIENTS
Model 0	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_5 Yr10\ study\ support_{ij} + \beta_6 Yr11\ study\ support_{ij}$	$\beta_{oij} = \beta_o + \varepsilon_{oij}$
Model 0 with School Dummies	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_5 Yr10\ study\ support_{ij} + \beta_6 Yr11\ study\ support_{ij} + \beta_7 School\ Dummy\ 1_{ij} + \beta_8 School\ Dummy\ 2_{ij} + \beta_9 School\ Dummy\ 3_{ij}$............	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$
Model 1	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_5 Yr10\ study\ support_{ij} + \beta_6 Yr11\ study\ support_{ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$
Model 1 (Null Model)	$output_{ij} = \beta_{oij}x_o$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$
Model 2(10) **Model 2(11)**	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_{5j} Yr10\ study\ support_{ij} + \beta_6 Yr11\ study\ support_{ij}$ $output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_5 Yr10\ study\ support_{ij} + \beta_{6j} Yr11\ study\ support_{ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$
Model 3(10) **Model 3 (11)**	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_{5j} Yr10\ study\ support_{ij} + \beta_6 Yr11\ study\ support_{ij} + \beta_7 FSM{*}Yr10\ study\ support_{ij}$ $output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_3 FSM_{ij} + \beta_4 white_{ij} + \beta_5 Yr10\ study\ support_{ij} + \beta_{6j} Yr11\ study\ support_{ij} + \beta_7 FSM{*}Yr11\ study\ support_{ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$
Model 3(10)a **Model 3(11)a**	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_{3j} FSM_{ij} + \beta_4 white_{ij} + \beta_{5j} Yr10\ study\ support_{ij} + \beta_6 Yr11\ study\ support_{ij} + \beta_7 FSM{*}Yr10\ study\ support_{ij}$ $output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_{3j} FSM_{ij} + \beta_4 white_{ij} + \beta_5 Yr10\ study\ support_{ij} + \beta_{6j} Yr11\ study\ support_{ij} + \beta_7 FSM{*}Yr11\ study\ support_{ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{3j} = \beta_3 + u_{3j}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{5j}$

(Continued overleaf)

Table 4.5: **Model equations with variable names (continued)**

Model 4(10) **Model 4(11)**	$output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_{3j}FSM_{ij} + \beta_4 white_{ij} + \beta_{5j}$Yr10 study $support_{ij}$ + β_6Yr11 study $support_{ij}$ + β_{7j}FSM*Yr10 study $support_{ij}$ $output_{ij} = \beta_{oij}x_o + \beta_1 baseline_{ij} + \beta_2 male_{ij} + \beta_{3j}FSM_{ij} + \beta_4 white_{ij} + \beta_5$Yr10 study $support_{ij}$ + β_{6j}Yr11 study $support_{ij}$ + β_{7j}FSM*Yr11 study $support_{ij}$	$\beta_{oij} = \beta_o + u_{oj} + \varepsilon_{oij}$ $\beta_{3j} = \beta_3 + u_{3j}$ $\beta_{5j} = \beta_5 + u_{5j}$ $\beta_{6j} = \beta_6 + u_{6j}$ $\beta_{7j} = \beta_7 + u_{7j}$

CHARACTERISTICS OF PUPILS INCLUDED IN EACH OF THE MULTILEVEL MODELS

Running the models resulted in the creation of ten distinct sub-samples: one for each of the ten groups of analyses. To be included in a sub-sample, the pupils required to have a valid response for each of the variables used in the model. The number of missing cases was therefore the number of pupils with missing data for one or more variables included in the model. The number of pupils included in each sub-sample therefore varied – with some pupils being included in some models but not others, depending on the particular variables included in each model. The number of schools included in each sub-sample also varied as certain data were requested directly from the schools (e.g. school attendance data) and not all schools provided the data, thus resulting in missing data for all pupils attending these schools.

Appendix J provides details of the pupils included in each sub-sample, their attendance at study support and statistics for the baseline and output measures. The samples are summarised in Table 4.6.

The table underlines the extent of missing data from the study. Indeed, even the sub-sample with the least missing data (Group 3) excluded 67.8% of pupils. The highest exclusion was from Groups 6 and 7, from which 85.7% of pupils were excluded because of missing data. Although many pupils were excluded from the analyses, the sample sizes were still in line with those reported in the published literature.

While 45 schools participated in the research, the greatest number included in any group was 38 (Groups 8 and 9). Only 14 schools were included in Groups 6 and 7. This was the result of some schools not providing school attendance data for any of their pupils. Where the number of schools was as few as 14, any reported differences between the schools must be viewed with considerable caution as the extent of the differences may be amplified due to the small number of schools involved.

The percentage of FSM pupils ranged across the sub-samples from 28.1% (Groups 8 and 9) to 33.9% (Group 10). While these percentages were lower than the 40.0% reported for the entire sample, they do indicate that the percentage of pupils entitled to free meals within each sub-sample was greater than in the general population of school pupils (see Chapter 3).

The percentage of male pupils varied across the sub-samples from 44.6% (Group 10) to 48.5% (Group 5). As 49.6% of the entire sample was male, there was less variation in gender between the sub-samples and the entire sample than there was in the percentage of FME pupils.

Across the ten sub-samples the percentage of white pupils ranged from 60.0% (Group 3) to 73.4% (Group 6). As 63.4% of the entire sample was white, some sub-groups had a greater percentage, while others had a lower percentage of white pupils than the entire sample.

Although some of the differences were small, generally speaking a higher percentage of pupils included in the sub-samples attended study support than pupils in the entire sample. The exceptions to this were Group 4 (SATS English/GCSE English and Year 10 and Year 11 English study support), Group 5 (SATS Science/GCSE Science and Year 10 Science study support) and Group 7 (Year 9 School Attendance/Year 11 School Attendance and Year 10 and Year 11 non-subject study support).

The mean baseline and output measures indicate that, on average, the pupils included in each of the sub-samples achieved better NVR scores, SATS and GCSE results, attended school more often and scored higher on the attitude questionnaires than the entire sample.

Table 4.6: **Summary of the ten sub-sample characteristics**[2]

	Number of Pupils	Percentage of Entire Sample excluded from Sub-Sample	Male	FSM	White	Number of Schools	Attend Yr10 Study Support		Attend Yr 11 Study Support		Attend Easter School		Mean Baseline Measure		Mean Output Measure	
Entire Sample	8390		49.6%	40.0%	63.4%	45	**Entire Sample**	**Sub-Group**	**Entire Sample**	**Sub-Group**	**Entire Sample**	**Sub-Group**	**Entire Sample**	**Sub-Group**	**Entire Sample**	**Sub-Group**
Group 1	2312	72.4%	46.9%	32.1%	65.4%	32	48.7%	49.4%	79.6%	84.6%			92.1	93.5	20.4	23.4
Group 2	2310	72.5%	46.9%	32.1%	65.4%	32	81.3%	81.9%	79.6%	83.3%			92.1	93.5	20.4	23.4
Group 3	2699	67.8%	47.9%	32.2%	60.0%	33	13.6%	13.7%	46.0%	50.1%			4.5	4.7	3.6	3.9
Group 4	2485	70.4%	46.1%	30.3%	64.1%	32	6.4%	3.8%	36.2%	36.0%			4.8	5.0	4.0	4.5
Group 5	2488	70.3%	48.5%	31.1%	62.0%	33	12.8%	10.6%	40.3%	44.0%			4.3	4.6	3.8	4.2
Group 6	1201	85.7%	48.0%	30.2%	73.4%	14	48.7%	50.6%	79.6%	83.7%			87.0	91.6	85.4	91.3
Group 7	1200	85.7%	48.0%	30.3%	73.3%	14	81.3%	71.2%	79.6%	76.7%			87.0	91.6	85.4	91.3
Group 8	1256	85.0%	47.5%	28.1%	72.9%	38	48.7%	49.1%	79.6%	84.2%			161.1	163.2	154.6	156.4
Group 9	1255	85.0%	47.5%	28.1%	72.8%	38	81.3%	84.5%	79.6%	80.1%			161.1	163.2	154.6	156.4
Group 10	1689	79.9%	44.6%	33.9%	66.7%	23	48.7%	54.9%	79.6%	87.5%	24.7%	38.7%	92.1	93.5	20.4	23.4

[2] More detailed information on the sub-samples can be found in Appendix J.

THE USE OF THE FSM VARIABLE AS A MEASURE OF SOCIAL DEPRIVATION

A key aspect of the present research was the use of free school meal entitlement as a measure of social deprivation. This final section of this chapter outlines a number of previous research studies that made use of the FSM variable. Consideration, within the context of the present study, is given to the criticisms that have been made of the FSM variable.

Previous Studies Using FSM as a Variable

Many previous studies have made use of the FSM variable. Most of these studies have explored the relationship between FSM (at pupil and/or school level) and academic attainment.

For example, a study (HMI 1998) of the Standard Grade achievement of S4 pupils in 390 Scottish secondary schools from 1995-1997 found correlations between school level FSM and different measures of Standard Grade performance which ranged from -0.72 to -0.82. These are shown in Table 4.7.

Table 4.7: **Correlations between school level FSM and Standard Grade attainment of S4 pupils in 390 Scottish secondary schools**

	Pupil Achieving 5+ Standard Grades at 1-2	Pupil Achieving 5+ Standard Grades at 1-4	Pupil Achieving 5+ Standard Grades at 1-6
r	-0.72	-0.82	-0.77
p	0.0001	0.0001	0.0001
n	390	390	390

Source: HMI (1998), p.4

In their study of 1,784 Year 12 pupils who attended a sample of grammar and secondary schools in Ireland during the academic year 1998-99, Shuttleworth and Daly (2000) explored the differences in the performance of grammar and secondary school pupils and the role of individual and family backgrounds variables in relation to this. In terms of FSM entitlement, it was found that pupils in receipt of free schools meals achieved lower mean GSCE point scores in both grammar schools and secondary schools. Across all schools the difference between FSM and non-FSM pupils was 17.7 points. This equates to approximately two grade A*s or three grade Bs. The mean points scores are summarised in Table 4.8.

Table 4.8: **A comparison of the mean GCSE points scores of 1,782 Year 12 FSM and non-FSM pupils in Ireland**

		Points Score	Number of Pupils
GRAMMAR SCHOOLS	FSM pupils	58.2	51
	Non-FSM pupils	64.9	808
SECONDARY SCHOOLS	FSM pupils	30.4	271
	Non-FSM pupils	35.8	578
ALL SCHOOLS	FSM pupils	34.8	322
	Non-FSM pupils	52.5	1386

Adapted from Shuttleworth & Daly (2000):
p.3, Table 1 Mean GCSE Points Scores by Selected Background Categories
p.5, Table 2 Mean GCSE Scores (A*=8, A=7…) by School Type and Selected Backgound Categories

Cooper *et al* (2003) report on an analysis which sought to test some associations between deprivation and educational underachievement. The study used the GCSE attainment between 1997 and 2001 of pupils attending inner and outer London boroughs. An inverse relationship was found between school level FSM entitlement and GCSE attainment. Cooper *et al* suggest that a one percent increase in FSM entitlement within a school results in a decrease in the percentage of 0.53% of the pupils gaining five GCSEs at A*-C.

A number of longitudinal studies have identified that the attainment gap between FSM and non-FSM pupils widens as the pupils progress through school. One such study was the Improving School Effectiveness Project (MacBeath & Mortimore 2001). The progress of 7000 pupils in 44 primary and 36 secondary schools in Scotland was tracked over a two year period from 1995 to 1997. The study found that pupils eligible for free meals had statistically significant lower attainment in P4, P6, S2 and S4 in reading, maths and Standard Grade results (Thomas *et al* 2001). It was also found that free school meal pupils made less progress across the two year period. The average scores for the different pupil groups are shown in Table 4.9.

Table 4.9: **Average reading, maths and Standard Grade results (with standard deviations) for primary and secondary pupils in the Improving Schools Effectiveness Project**

	PRIMARY		**SECONDARY**	
	P4 Reading 1995	**P6 Reading 1997**	**S2 Reading 1995**	**S4 English Standard Grade 1997**
Free school meals	44.5 (20.0)	44.2 (24.1)	53.8 (21.9)	3.24 (1.31)
Other pupils	59.0 (20.8)	58.2 (23.8)	66.3 (20.5)	4.15 (1.17)
	P4 Maths 1995	**P6 Maths 1997**	**S2 Maths 1995**	**S4 Maths Standard Grade 1997**
Free school meals	55.8 (20.8)	53.5 (17.3)	41.0 (21.9)	2.47 (1.51)
Other pupils	65.5 (19.6)	63.4 (17.7)	54.4 (22.5)	3.68 (1.59)
				S4 Overall Standard Grade Points Score (best 7 grades) 1997
Free school meals				20.1 (9.7)
Other pupils				28.2 (9.1)

Note: All of these results were found to be statistically significant

Source: Thomas *et al* (2001)

p.58, Table 4.3 Socio-economic differences in attainment and progress at the primary level

p.66, Table 4.10 Socio-economic differences in attainment and progress at the secondary level

The Junior School Project (Mortimore *et al* 1988), a study of primary school effectiveness, followed the progress of approximately 2000 pupils from entry to junior school in 1980 to secondary transfer in 1984. The progress of these pupils at secondary transfer was followed up in a subsequent study (Alston 1988). A further study (Sammons *et al* 1993a and Sammons *et al* 1993b), which involved multilevel analysis, tracked the pupils' progress to their GCSEs at the conclusion of their compulsory schooling. Using the complete dataset, Sammons (1995) explored the significance of ethnic, gender and socio-economic differences in pupils' attainment. She also explored progress during secondary education. The conclusions in relation to free school meals pupils were that they:

- attained less in their GCSE exams
- performed less well in reading than maths
- attained less throughout the junior years of education, but the differences increased as the pupils grew older.

In addition, Sammons found that the inclusion of attainment measures had a "pronounced effect" on the explanation of variance in total GCSE performance scores. Another study (Sammons *et al* 1994a and Sammons *et al* 1994b) explored the usefulness of a range of intake variables (including prior attainment and eligibility for free meals) in predicting performance in GCSE exams. The study involved the analysis of two data sets for the 1992 GCSE examination results:

1. a ten percent sample of secondary schools in England for which pupil level GCSE examination results were available
2. a group of 81 Inner-London secondary schools (used for another survey of examination performance) for which pupil level prior attainment and GCSE examination results were available.

The ten per cent national sample was used to calculate predicted examination scores for individual pupils and to test the significance of differences between schools' and pupils' predicted and actual results. Some background information (age and sex) for these pupils was also available. Analyses were undertaken at pupil and school level using multilevel techniques. Pupil level prior attainment was available for the group of 81 schools and this enabled value added estimates of the relative effectiveness of the schools to be calculated. Like Plewis and Goldstein (1997), Sammons *et al* found that it was pupil level data related to intake information which was of most use - particularly as it allowed for the creation of value added models. However, Sammons *et al* add that other indicators of intake (including free school meals) account for "a significant proportion of the variation" in examination results between schools even when prior attainment measures are available. They conclude: "Ideally...multilevel analyses employing prior attainment *and* other intake indicators should be used" (Sammons *et al* 1994a, p.8).

Thomas *et al* (1997) report on a study which explored the differential academic achievement of different groups of pupils, including those eligible for free school meals. The pupils were also classified by gender, ethnic group and prior attainment. (Standardised scores from the London Reading Test and the Verbal Reasoning band assigned to each student at transfer to secondary were used as measures of prior attainment.) A multilevel analyses was undertaken of the GCSE examination results over 3 years of pupils from a sample of 69 (1990), 94 (1991) and 77 (1992) inner London secondary schools drawn from eight LEAs. Differential school and departmental effects were identified for all pupil groups examined (including free school meals), although the strongest evidence of differential effects was found for groups classified by prior attainment and ethnicity. It was found that, generally, the schools that were more or less effective for particular groups were more or less effective for all pupils. For example, more effective schools (for LRT pupils) appeared to boost the GCSE attainment of both advantaged and disadvantaged pupils, although the gap between the two groups did widen as the non-FSM pupils performed especially well.

A recent survey (Ridley *et al* 2006) of the attitudes of Year 7 and Year 10 pupils towards school found that Year 7 FSM pupils tended to be less happy than non-FSM pupils scoring, on average, 0.09 less. This difference was not present amongst the Year 10 cohort. The sample comprised a total of 59,200 pupils attending 283 schools.

Using pupil-level data from over 60,000 Year 7 to Year 10 pupils attending Excellence in Cities schools during the academic years 2000/01 and 2001/02, Morris and Rutt (2004) explored the relationship between attendance at school and FSM. They found a mean attendance rate of 88.6% (SD=11.7) for FSM pupils and a mean attendance of 92.6% (SD=8.7) for pupils not in receipt of free meals.

Each of the studies described above focused on pupils attending mainstream schools. As the following studies indicate, FSM has been used as a variable in research into early years and special educational needs.

For example, Blatchford *et al* (2002) - whose work was referred to earlier in this Chapter - report on a longitudinal study of children in their first years of schooling within English Local Education Authorities. A series of multilevel models was used to explore the relationship between class size, initial achievement and entitlement to free school meals. Their paper focused on the data gathered during the Reception year for the first of two cohorts. The data included two assessments (both of which involved literacy and mathematics): a baseline assessment and an end of reception year assessment. One of the conclusions from the study was that reduced class size had differential effects for different groups of children. For example, in terms of literacy pupils not in receipt of free school meals benefit more than free school meal pupils from smaller classes.

Strand (1997) was also interested in the progress of pupils in their early years at school. He tracked the progress of 1504 pupils from one Local Education Authority as they progressed towards Key Stage 1. Two assessments were used: a baseline assessment (including maths, science and a reading test) and Key Stage 1 results. Background data were gathered for a number of factors, including: age, home language and entitlement to free school meals. Strand found that free school meal pupils:

- achieved lower scores in the baseline assessments
- achieved lower scores in the Key Stage 1 test
- made less progress during the course of Key Stage 1.

A later study by Strand (2002), which explored the association between pupil mobility and attainment in Key Stage 1, included entitlement to free school meals as a variable in the analysis. He tracked the progress of 6,400 pupils (in three cohorts) from 56 primary schools in an inner London LEA. Strand found that the mobile pupils were more likely to be in receipt of free meals than stable pupils. Indeed, 56% of one of the mobile pupil groups was entitled to free meals compared with 37% of the stable group. When Strand included school level factors in his analysis, he found that FSM was the only school level variable which had "a consistent and significant effect" (p.74).

Free school meal entitlement has also been used as a variable in special educational needs research. For example, in a survey concerned with the relationship between social deprivation and special educational needs, Croll (2002 p.43) found a negative relationship between entitlement to free school meals and attainment. The study involved 300 Key Stage 2 teachers in 46 primary schools within 15 English LEAs. The data were aggregated to school level. The overall correlation between the proportion of pupils achieving level 4 and the proportion eligible for free school meals was -0.70. Croll found the correlations between FSM and special education needs and between FSM and discipline problems to be 0.43 and 0.66 respectively. For all three correlations, p was equal to less than 0.01. The correlations are summarised below in Table 4.10.

Table 4.10: **Correlations between free schools meals, achievement levels and discipline problems in 46 English primary schools**

	Correlation	P
KS2 Sats results	-0.70	<0.01
Special educational needs	0.43	<0.01
Discipline problems	0.66	<0.01
N	40	

Adapted from Croll (2002), p.50
Table 2 Correlation between free school meals, achievement levels and special educational needs

On the basis of the research studies outlined above, it can be concluded that:

1. FSM has been used as a variable in a range of studies. Most of these studies have been concerned with the academic attainment of pupils attending mainstream schools, but others have been in the fields of early years and special educational needs
2. pupils entitled to free schools meals achieve lower attainment scores than non-FSM pupils, have poorer attitudes towards school and attend school less often
3. the attainment gap between FSM and non-FSM pupils widens as pupils progress through school
4. like FSM, prior academic attainment is also a predictor of attainment. Taken together, FSM and prior attainment can be a particularly strong predictor.

The link between socio-economic status and academic attainment has also been of interest in countries outwith the United Kingdom. For example, in a study of year seven students in Trinidad and Tobago, Mustapha and Ali-Mustapha (1997) found a significant relationship between socio-economic status and a range of other variables, including attainment in the common entrance exam, levels of self-esteem and educational aspirations.

Issues Associated with the Use of FSM as a Variable

While studies such as those described in the preceding section have included FSM as a variable, numerous researchers have explored the extent to which FSM is a valid measure of social deprivation. These researchers have made use of the extensive datasets collected through the development of the Pupil Level Annual Schools' Census (PLASC)[3] in England and the School and Pupil Census[4] in Scotland.

Two general points that can be made about FSM status are that (1) it is a proxy for, and not a measure of, SES and (2) it is often used because it is the only measure available. It is therefore appropriate to consider the extent to which FSM should be used as a measure of social disadvantage.

Croxford (1999a, 1999b & 2000) reports on an analysis that was undertaken to identify the measures of socio-economic status (SES) associated with FSM. School level FSM was taken from the 1991 and 1992 School Census and linked to data from the 1991-92 and 1992-93 Scottish School Leavers' Survey (SSLS). The Labour Force Survey (LFS) of May 1992 provided the unemployment rates in the local areas of the schools. Additional measures of area socio-economic characteristics were included by linking the SSLS to indices of population density and deprivation from the 1991 national population census through pupil postcodes. Croxford acknowledged that there were some limitations with using the population census data: some indices (e.g. car ownership) were inappropriate for schools, some sections of the population were under-reported, the existence of mobile/transitory populations

[3] See www.teachernet.gov.uk/management/ims/datacollections
[4] See https://www.scotxed.net/jahia/Jahia/cache/offonce/lang/en/pid/447;jsessionid=366243D95542538A0969DF0B73709220

(e.g. "creaming" of school populations through parental choice and private schooling) and changes to the 1991 postcodes.

Croxford found that higher levels of FSM were associated with schools with:

- a high level of area deprivation
- high unemployment
- an intake from areas in the middle range of population density.

Most family background factors were found not to be significantly associated with FSM when area characteristics were included in the model. When area characteristics were excluded, FSM was associated with high percentages of: rented homes, mothers who left school at the earliest opportunity, unemployed fathers and fathers or mothers in skilled manual occupations. Weaker relationships were found between FSM and the percentages of: fathers with post-compulsory schooling, unemployed mothers, lone-parent families and large families.

Croxford used a principal components analysis to reduce the number of SES variables to five:

1. parental unemployment
2. father in non-manual occupation
3. urban deprivation
4. mother in non-manual occupation
5. large family.

Together these five measures explain 63% of the variance in FSM, but this leaves 37% of the variance unexplained. Croxford suggests that the unexplained variance could reflect differences in policy and practice by education authorities and imperfections in the data and adds: "No single indicator, whether FME or the components of SES used in this analysis, can capture the full extent of variation in socio-economic circumstances of Scottish Schools." (Croxford 2000, p.325). Error measurement will also contribute to the unexplained variance.

The unexplained variance will be partly explained by the limitations associated with using School Census data for research purposes. Kounali and Robinson (2006) list these as being:

- the primary use of the Census is for administrative functions relating to LEA funding and related policies. These policies are not always explicitly stated and change over time
- the codes and record layouts change periodically
- data elements are often incomplete and unreliably coded. Information may be inconsistently recorded across LEAs
- the goals (and coding practices) that dictate what data is collected might not coincide with those of researchers
- unique pupil numbers (UPNs) from earlier years might be unreliable.

Croxford introduces her work by explaining that, at the time of writing, government policy in Scotland (and elsewhere in the United Kingdom) was to raise standards of educational achievement. This included setting targets for schools which were used to compare their performance with other schools. Free meal entitlement was used as a proxy for school intake characteristics. She explains that HMI (1998) justified the use of FSM as a proxy for school intake characteristics through a strong correlation between FSM and attainment at school level.

Croxford makes three criticisms of HMI's use of FSM alone for setting targets:

1. the data do not include measures of prior attainment
2. the data are school aggregates, not pupil level
3. the method is based on analysis of school means, and not multilevel analysis of pupils within schools.

In terms of prior attainment (the first criticism), Croxford cites Plewis and Goldstein (1997):

> Socio-economic indicators such as the uptake of free school meals are rather poor indicators of intake achievement. Far and away the best predictor of how well a pupil will do at the end of Key Stage Two is how well they were doing

> when they first entered school, as measured by suitable cognitive assessments. It is just not possible properly to control for intake without data of this kind, and the use of 'free school meals uptake', especially when measured at the school level only, is an inadequate substitute. (Plewis & Goldstein 1997, p.17)

An example of this was the analysis of Higher Grade results reported by Croxford. It was found that, after controlling for Standard Grade attainment, there was no effect of school level FSM on attainment of the Higher Grade targets. FSM would, of course, have influenced the Standard Grade attainment.

With regard to the use of the analysis of school-aggregated data (her second and third criticisms) Croxford warns that, while FSM has been used because it is "better than nothing", the use of inadequate data and methodology can produce misleading results. Kounali and Robinson (2006) also argue that FSM is often used because of the availability of the data and the absence of any other measure of socio-economic disadvantage. A particular criticism of FSM from Kounali and Robinson is that it does not measure cultural capital.

Croxford refers to the work of Sammons *et al* (1994b) whose multilevel analysis of the student-level data for the cohort of pupils from 81 schools produced different results from an ordinary least squares regression. The study found that the estimates of effectiveness produced by each method were very different for one in five schools.

The findings from Croxford's own analysis of the association between FSM and SES include:

- FSM does not have a significant effect on attainment after other SES variables are taken into account.
- FSM is a "relatively good surrogate" for differences between school intakes in predicting attainment at Standard Grades 1-4, but it does not explain all of the difference between schools. Furthermore, it does not predict attainment in terms of 5+ Standard Grades at 1-2 or 1-6.

Croxford advocates that FSM should only be used in analyses where:

1. a measure of prior attainment is available
2. the FSM data is available at the level of the individual pupils
3. appropriate methods, such as multilevel modelling, are used for estimating the variance between pupils and schools.

Like Croxford, Shuttleworth (1995) also questioned the validity of using free school meals as an indicator of social deprivation. Shuttleworth explains that the 1989 Education Reform Order (NI) resulted in the use of formula funding to determine the allocation of resources to post-primary schools. Formula funding is based on an assessment of the need of schools and, like the England and Wales Department of Education and Science, the Department of Education, Northern Ireland used free school meals as an indicator of social deprivation. However, Shuttleworth continues:

> ...little is known about the effectiveness of free school meals, either at the pupil or school levels, as an indicator of social deprivation, the links between social deprivation and academic achievement in the social conditions specific to Northern Ireland and whether free school meal-based variables are the most suitable indicator of deprivation. (Shuttleworth 1995, p.488)

Using data from the Northern Ireland Pilot Secondary Education Leavers Survey (SELS) of 1480 students who left school during the academic year 1990-91, Shuttleworth explored a number of issues including the impact of free school meal eligibility on GCSE attainment at the individual and school levels. He found that free school meal entitlement was highest amongst: large families, students whose parents were unemployed, Catholic families and those attending secondary schools (i.e. rather than grammar schools).

Shuttleworth found a strong correlation between school level FSM and examination attainment. Indeed, FSM explains 46% of the variance. He also found that an increase of 1% in the percentage of pupils receiving free school meals resulted in a decrease of approximately 1% in the proportion of pupils achieving at least one GCSE at grade C or higher. While pupil level FSM was also significant, it was school level FSM that had most effect. Shuttleworth commented on the lack of a measure of prior attainment – "...a variable which is usually highly important in explaining attainment at age 16" (p.498).

Shuttleworth suggests that, given the association between qualifications and employment, the differential between the attainment of FSM and non-FSM pupils "might have a large effect in moulding future life-chances" (p.499).

Having begun his article by questioning the validity of FSM as a measure of social deprivation, Shuttleworth concludes that pupil and school level FSM data have a greater predictive power than a model including only individual SES indicators "suggesting that free school meal data are valuable" (p.500). This would suggest that it is legitimate to use FSM as a variable within research studies.

In contrast to the findings of Shuttleworth, the conclusions from other researchers are much less positive about the value of using FSM as a measure of deprivation. For example, in a comparison of the proportions of non-FSM and FSM pupils achieveing 5+ at A*-C at GCSE in 2003 by socio-economic group, Ray (2006) found much larger confidence intervals for FSM pupils.

While school level FSM eligibility can remain relatively stable over time, Kounali and Robinson (2006) demonstrated that FSM eligibility at pupil level changes through time. Their data indicate that almost 15% of a sample of 11,702 pupils received free meals over the four year period from 2002 to 2005, but the percentage entitled at any one time during the four years never exceeded 9.7%. Only 4.1% were entitled during all four years. They suggest that FSM entitlement can be underestimated by as much as 70%.

Kounali and Robinson developed a Multiple-Indicator-Multiple-Cause (MIMIC) model for the derivation of a scale representing economic disadvantage. This included working tax credit, FSM eligibility and home renting. They also developed a structural model, including working status, SES assessed from occupation records and level of education for the latent economic disadvantage, for the latent economic disadvantage.

When Kounali and Robinson assessed the effect of deprivation on Key Stage 1 test results, they concluded that FSM does not work. While concurrent FSM eligibility resulted in a mean effect of 0.013 (SE = 0.118), eligibility for FSM over a three-year period produced a mean effect of -0.029 (SE = 0.101). Using the economic deprivation index creates a mean effect of 0.035 (SE = 0.015) or 0.027 (SE = 0.017) when accounting for measurement error. They found that FSM tends to underestimate school performance because FSM underestimates the prevalence of economic deprivation. Given that this underestimation appears to be proportional to the level of FSM, more disadvantaged schools will be more affected than those less disadvantaged.

Hobbs and Vignoles (2006 and 2007) argue that there has been little in the way of formal evaluation of FSM. Croxford (2000) is one exception. Hobbs and Vignoles cite the Centre for the Economics of Education's FSM Project which used the merged data from the Avon Longitudinal Study of Parents and Children (this includes a range of SES variables) and the NPD (including the FSM variables) to explore the relationship between FSM eligibility criteria and what FSM is actually measuring.

The sample used in the ALSPAC study comprised mothers resident in Avon with an expected delivery date between April 1991 and December 1992. 14,049 children were included in the study. Data collected included: family income, presence of partner, mother and partner employment, mother and partner education, mother and partner social class. The data from the NPD were: FSM, age, gender, ethnicity, EFL, SEN and KS2 and KS1 attainment. Only 11,131 of the 14,049 children successfully matched to NPD. Only 5,924 of the 14,049 responded to all SES variables. Potential reasons for the discrepancies between FSM status and family status include: FSM not claimed, misreporting of income etc in ALSPAC and timing of data collection (family SES variables were collected in pregnancy or when the children were 4-4.5

years old, but FSM data were collected when the children were between 9 and 11 years old).

A proxy framework was created for family SES, as was a value-added model for Key Stage 2 attainment (English, maths and science). In the context of this specific value-added model of KS2 attainment, Hobbs and Vignoles conclude that FSM is an “imperfect proxy” for family SES variables. The estimates of parameters on some variables are biased as a result of using FSM. There are large biases on SEN and, in some subjects, ethnicity (but the small number of minority ethnic group children in the estimation sample prevents strong inferences for other studies).

Around half of the conditional and unconditional FSM differences in KS2 attainment are accounted for by the eight family SES variables (with the exception of conditional FSM differences in KS2 maths). Conditional FSM differences in KS2 attainment are principally accounted for by mother’s education and family income.

Hobbs and Vignoles warn that researchers should be ‘cautious’ in drawing inferences from research that relies on the FSM measure. They call for further evaluation of the FSM measure ‘in other contexts and datasets’.

Eligibility for Free School Meals

The 1980 Education Act restricted eligibility for free school meals to families in receipt of family income supplement or supplementary benefit. Previously children were eligible if their families met a national low income criterion, but the 1980 Act left eligibility on the grounds of low income to the discretion of the individual LEAs. By 1981, 27% of LEAs had decided to go no further than their statutory minimum obligations (Bissett & Coussins 1982).

Funding for free meals is distributed to LEAs through the system of Standard Spending Assessments (SSAs). The SSAs include a component which reflects the variation between LEAs in the proportion of school-age pupils in households in receipt of Income Support or income based Job Seeker's Allowance benefits. The decision of how to distribute the funding that the LEAs receive through the SSAs is made by the LEAs.

In addition to children of parents who receive Income Support or income-based Jobseeker's Allowance (and children who receive either of these benefits in their own right), the present eligibility criteria for free meals[5] includes children whose parents receive: support under Part VI of the Immigration and Asylum Act 1999, Child Tax Credit (provided that they are not entitled to Working Tax Credit and have an annual income that does not exceed £14,495) and the Guarantee element of State Pension Credit.

A history of the school meal service, beginning with the introduction of free meals in Manchester in 1879 for "destitute and badly nourished children" (McMahon & Marsh 1999, p.8), is provided by McMahon and Marsh (1999) and Riley (2004).

The DfES Annual School Census records the numbers of pupils at each school who are registered for free school meals and receive a free meal on the day of the Census. However, these figures should be read with "considerable caution" since "little is known of how accurately these figures reflect the true level of eligibility within each LEA, or within each individual school" (Storey and Chamberlin 2001b). For example, a school may record a 100% take up rate by registered pupils, but this does not necessarily indicate a 100% take up rate by eligible pupils since the registered figure may not reflect eligibility.

Drawing on a range of data sources, McMahon and Marsh (1999) reported that approximately 2.8 million of the young people in the UK aged between 5 and 16 years live in poverty. As only 1.8 million children are eligible for a free meal, around one million children go without. In addition, it is estimated that 300,000 (20%) of the 1.8 million young people entitled to free meals do not take up their entitlement.

[5] See www.direct.gov.uk

Writing almost 20 years earlier, Bissett and Cousins (1982) reported a higher percentage non-take-up of 39%. Bissett and Coussins (1982) argued that the rising prices and falling standards that followed the 1980 Education Act resulted in a reduction in the number of paying children eating school meals such that "in some schools free school meal children are the only children left eating school dinners" (p.22).

A recent study by Granville *et al* (2006) of local authority procedures for identifying and registering pupils eligible for free school meals in Scotland found that 10 authorities reported 100% registration of eligible secondary pupils. In the other 22 authorities, registration ranged from 58% upwards. Granville *et al* make the point that, as local authorities have no formal means to identify pupils entitled to free meals, the annual figures reported to the Scottish Government are only 'indicative' (2006 p.14).

While it is acknowledged that the percentage of pupils registered for free school meals underestimates the percentage entitled to free meals, it is often used as an indicator of social deprivation within a school population. It is included as an indicator within the DfEE's Autumn Package benchmark of school performance information for Ofsted inspections.

Reasons for Non Take-Up of Free School Meals

Croxford (2000) points out that there is a considerable degree of uncertainty about the uptake of free school meals. While there is concern that FSM might not accurately record the number of pupils that are entitled to free meals, Croxford argued that there was a dearth of research evidence concerning the extent to which stigma, dietary requirements and the enthusiasm with which schools and local authorities encourage parents to claim free meals influence parents' decisions to apply for free meals for their children.

Storey and Chamberlain (2001a and 2001b) report on a study commissioned by The Child Poverty Action Group and undertaken by the Thomas Coram Research Unit to investigate some of the reasons for the non-take up of free meal entitlement and to explore how the nature of the school and its meal provision, its management and administration, influence the take up of free meals. The research also sought to identify good models of practice and successful strategies to maximise take up.

A total of seven secondary, two middle and four primary schools from seven LEAs in England were selected as case studies for the study. The schools represented low and high registered eligibility for free meals. Questionnaires were completed by pupils and parents. Pupils were interviewed in groups and as individuals. Interviews were held with school, catering and LEA staff.

A number of reasons were identified by Storey and Chamberlain (2001a and 2001b) for non-take up of entitlement to free meals:

- embarrassment or fear of being teased (parents held onto memories of their own school days and these influenced their perceptions of how free meals operate today)
- some schools continue to operate systems which make pupils receiving free meals readily identifiable
- the payment systems and the storage and presentation of free packed lunches give rise to discrimination
- the quality of the meals
- the choice of food (for example: a lack of choice compared with a packed lunch prepared at home)
- long queues and overcrowded dining rooms
- in some schools pupils are not allowed to eat free meals with their friends who have brought packed lunches
- in some schools hot meals are not offered to free meal pupils (i.e. only packed lunches are available)
- parents are unaware of their entitlement or how to apply (this applies to 11% of the sample).

Other reasons for the non-take up of free meals include stigma, truancy and school exclusions (McMahon & Marsh 1999) and the administrative practices – such as issuing different coloured meal tickets and segregating free meal children at meal time - followed in schools that enable children who are paying for their meals to identify those who are receiving free meals (Bissett & Coussins 1982). McMahon and Marsh and Bissett and Coussins suggest a number of good practice strategies to address these issues. Hurley and Riley's edited book (2004) also describes initiatives that have been undertaken to increase the up-take of free meals.

Eliminating the stigma attached to taking free meals was included within the remit of the Scottish Executive's Expert Panel on School Meals which was established in 2002. Indeed, the Panel's report states:

> We believe any child entitled to free school meals should be able to take them without any fear of stigmatisation. There is no place in a fair and equal society for stigmatisation of children because of their life circumstances.
>
> (SEED 2002, p.58)

To support the work of the Panel and to complement models of good practice emerging from education authorities in Scotland, SCRE was commissioned (Lowden & Schlapp 2002) by the Scottish Executive to provide a brief summary of published information, recent research and other evidence, and (as yet) unpublished work on: (1) ways to encourage children to select healthier school lunch choices (2) ways to increase the up-take of school meals. The literature review drew on authors such as Armstrong *et al* 2001, MacGregor *et al* 2001 and Wrieden *et al* 2000.

A recommendation from Storey and Chamberlain's research was the replacement of cash-based cafeterias with cashless smart card systems. A study of a representative sample of 79 maintained secondary schools by Nelson *et al* (2004) found that 76% of schools operated a cash cafeteria, while 18% used a cashless card system and 5% used a combination of cash and smart card systems.

Storey and Chamberlain (2001b) argue "...beyond altruism, there are no incentives for schools to increase the take up of the free meal" adding that, for some schools, there are "strong disincentives". They suggest that, as most LEAs set their budgets annually (based on the School Census from the previous year), "a school making a determined effort to increase numbers taking the free meal and encouraging all children to take their meal everyday, can find itself with a budget deficit".

While Storey and Chamberlain's research involved case studies in 13 schools, a later study by Nelson *et al* (2004) used a representative sample of 79 maintained secondary schools. The aim of this later study, which was commissioned by the Department for Education and Skills and the Food Standard Agency, was to assess compliance with the National Nutritional Standards (introduced in 2001) and measure food consumption in secondary schools. Although the uptake of free meals was not a specific area of interest to the researchers, one of their findings was that in over three-quarters of the schools other pupils could identify the pupils in receipt of free meals. One of the reasons for this was that 76% of schools operated a cash cafeteria. Only 18% of the schools used a cashless smart card system (a recommendation from Storey and Chamberlain's research). The remaining 5% used a combination of cash and smart card systems.

In their discussion of a (1981) survey of English and Scottish parents about their attitudes towards school meals for primary school children, Rona and Chinn (1984) reported that poorer sections of the community and mothers working outside the home valued school meals more than others. They warned that the stigma associated with school meals might increase and the quality of meals deteriorate if paying families withdrew and school meals were perceived as a service for poor children.

Rona and Chinn argue that the 1980 Act resulted in a selective approach to school meals, with a move away from the situation in the 1970s when children from all social classes made similar use of the school meal system.

While the percentage of non-take-up of free school meals varied across the different studies, the research cited above suggests that any study which uses FSM as a variable must accept that it is likely that at least some pupils who are entitled to free meals will not be recorded as such. Despite the possible under-reporting of free meal entitlement, the research studies cited earlier in this section demonstrated that there were associations between FSM and attainment.

Alternatives to the Use of the FSM Variable

One alternative measure of deprivation is the Index of Multiple Deprivation (IMD). The IMD (see Office of the Deputy Prime Minister 2004) is a composite index based on indices grouped within seven domains: income; employment; health deprivation and disability; education, skills and training; barriers to housing and services; living environment; crime. The Index does not relate directly to an individual, but to the small geographical area (the Super Output Area or SOA) in which s/he lives. Each SOA contains about 1500 people. It is possible to assign a deprivation index to a school using IMD information from the SOAs from which the school draws its pupils, thus creating a school-level indicator of deprivation. The limitation of using the IMD is that an individual may, or not, share the fortunes for an average neighbour living in the SOA – i.e. it is not possible to use the IMD as an indicator of deprivation at pupil-level. Kounali and Robinson (2006) make the point that the education component of the IMD contains achievement data on performance at Key Stages 2, 3, and 4 which may well preclude it as independent information used as input to an analysis of such performance. The Scottish Index of Multiple Deprivation 2006 (Scottish Executive 2006a and 2006b) has been developed for use North of the Border. Maps which show the spread of relative deprivation across each local authority in Scotland are available through an interactive website[6]. It was not possible to use the IMD in the present study for two fundamental reasons: the hypotheses required a pupil-level measure of deprivation and the data collection period predated the development of the IMD.

6 www.scotland.gov.uk/Topics/Statistics/SIMD/map.asp

A second alternative to the use of the FSM variable is principal components analysis (PCA). This approach has been used in Scotland by HMIe (HMIe 2007), as an alternative to the percentage of FSM pupils, to identify groups of similar schools for the analysis of SQA examination results. Six measures were included in the analysis:

1. the percentage of pupils' mothers with a degree level qualification (source: 2001 Census)
2. the percentage of pupils' households where the main householder has never worked (source: 2001 Census)
3. the percentage of pupils within the school entitled to free meals (source: School Meals Survey)
4. the percentage of pupils with additional support needs (source: School and Pupil Census)
5. the percentage of pupils living in the 15% most deprived data zones (source: School and Pupil Census and SIMD)
6. the percentage of pupils living in the two most urban areas (source: School and Pupil Census)

PCA reduces the number of variables to two factors (or components) that account for 77.7% of the variance in the six original measures. The first component is strongly influenced by the factors most associated with deprivation, while the second component is influenced by ASN. The procedure calculates a value for each school for each of the two components and the Euclidean distance is calculated to get the distance between the schools. Concern has been expressed at the inclusion of ASN data because of differences between authorities in the recording of the data. This indicates that FSM is not the only variable with which there is possibly a recording issue between local authorities. As with the Index of Deprivation, a principal components analysis could not be used in the present study because the hypotheses require data at pupil level, rather than school level.

A third alternative measure of social disadvantage which has been used by researchers is the approximate number of books in the pupil's house. Two criticisms can be made of this approach:

1. it makes the assumption that the number of books in the house is an indicator of disadvantage. As with FSM it is a proxy measure for SES
2. with the increasing reliance on internet-based media, it is likely to become less valid as a proxy for SES
3. it relies on the respondents being able to answer the question accurately
4. it requires asking respondents for an additional piece of data, rather than data that can be sourced from the school.

As the number of books in the house was not collected in the study, it was not possible to use this information as a measure of deprivation.

<u>Using FSM in the Present Study</u>

The preceding discussion has highlighted a number of issues in relation to the use of the FSM variable as a measure of deprivation. These can be summarised as follows:

1. FSM can be used more effectively to predict attainment when a measure of prior attainment is also available
2. there would appear to be contradictory messages emerging from different research studies as to whether school or pupil level FSM data is the most appropriate to use. Of the seven cited research studies which explored FSM and attainment, two used school level data, four used pupil level data and one used both school and pupil level data. While Sammons *et al* (1994a) and Sammons *et al* (1994b) concluded that it was pupil level data that was most useful (a multilevel analysis of the pupil level data produced different results from an ordinary least squares regression), HMI (1998) found correlations between school level FSM and Standard Grade attainment of -0.72 to -0.82. Cooper *et al* (2003) also found a relationship between school

level FSM and GCSE attainment. One solution would be to have the data available at both pupil and school levels and to include both in the analysis

3. appropriate methods, such as multilevel modelling, should be used for estimating the variance between pupils and schools
4. school-level FSM tends to remain stable over time, but individual FSM eligibility changes
5. FSM is at best an "imperfect proxy" for SES which generally underestimates deprivation. Researchers are advised to be cautious when relying on the FSM measure
6. for a variety of reasons, it is likely that some pupils who are eligible for free meals will not be recorded as such
7. alternative measures of social deprivation include the Index of Multiple Deprivation and principal component analyses.

The first three issues are unproblematic for the present study for the following reasons:

1. measures of prior academic attainment were available in the form or SATS Maths, SATS English and SATS Science. These were included in the multilevel models that were created for the analysis
2. the particular hypotheses explored in the research required pupil level FSM data and this was available
3. multilevel modelling was used in the analyis.

Despite the limitations of FSM as a proxy for SES, it was decided to proceed with its usage in the analyses. It was accepted that FSM tends to underestimate social deprivation and that the FSM status of pupils changes over time, but the hypotheses required a pupil level measure and alternative indicators (such as the Index of Multiple Deprivation and principal components analysis) do not produce pupil level indicators. Futhermore, the Index of Multiple Deprivation did not exist when the data were collected.

SUMMARY

This chapter has outlined the aims and methods used in the study. It has explained the importance of acknowledging the existence of hierarchical structures within data and how multilevel modelling techniques, in particular the MLwiN programme, can be used to analyse data whilst taking cognisance of these hierarchical structures. The use of multilevel modelling within a range of studies, including some concerned with educational research (and school effectiveness research in particular), was described. Some critiques of the technique were explored in relation to the present research. The models used in the research were described in detail and it was explained how these would be used to explore each of the hypotheses. The findings from these explorations will be reported in Chapter 5. Consideration was given to the criticisms that have been made of the use of FSM as a measure of social deprivation and the implications of these for the research.

Chapter 5: RESULTS

This chapter will present the research findings. It comprises two main sections: the first considers the four hypotheses within each study support/outcome group and reports on the results from the specific models that relate to each of these, while the second is a synthesis of the findings which draws together the results from the ten groups under each of the four hypotheses and summarises the key messages from the study's findings.

The hypothesis and groups were outlined in Chapter 4. They are summarised below:

Hypothesis a:	Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE.
Hypothesis b:	The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school.
Hypothesis c:	The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school.
Hypothesis d:	The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level.

Group 1:	NVR/Best 5 and Subject Based Study Support
Group 2:	NVR/Best 5 and Non-Subject Based Study Support
Group 3:	SATS Maths/GCSE Maths and Maths Study Support

Group 4:	SATS English/GCSE English and English Study Support
Group 5:	SATS Science/GCSE Science and Science Study Support
Group 6:	Year 9 School Attendance/Year 11 School Attendance and Subject Based Study Support
Group 7:	Year 9 School Attendance/Year 11 School Attendance and Non-Subject Based Study Support
Group 8:	Year 9 Attitudes/Year 11 Attitudes and Subject Based Study Support
Group 9:	Year 9 Attitudes/Year 11 Attitudes and Non-Subject Based Study Support
Group 10:	NVR/Best 5 and Easter School

The multilevel models used in the analyses are described fully in Chapter 4. The rationale for the selection of these models is provided in Chapter 4, along with an explanation of how they were used to explore each of the hypotheses.

Unless otherwise stated, p values of less than .05 are considered to be statistically significant.

The two main sections of this chapter are preceded with two introductory sections. The first section examines the residuals to check that the two assumptions of using multilevel modelling (normal distribution and homoscedasticity) are true of the data analysed in the study. The second introductory section considers the value of the school effect within the basic study support models. This includes the use of multilevel modelling and standard regression analysis and demonstrates the superiority of multilevel modelling.

EXAMINING THE RESIDUALS

As was explained in Chapter 4, the use of multilevel modelling includes two assumptions:

1. the residuals (or errors) are normally distributed
2. homoscedasticity - the variance of the residual is constant at each value of the predictor variable (i.e. there is no evidence of heteroscedasticity)

These assumptions were tested, at each of the levels of the model separately, for all models within Group 1 and for Model 1 within all ten groups.

Figure 5.1 is a plot of standardised level 1 (i.e. pupil) residuals against their equivalent normal scores for Model 1.1 (NVR/Predicted Best 5 and Subject Study Support). As the points lie close to a straight line it can be concluded that the residuals follow a normal distribution.

Figure 5.1: Standardised level 1 residuals by normal equivalent scores for Model 1.1

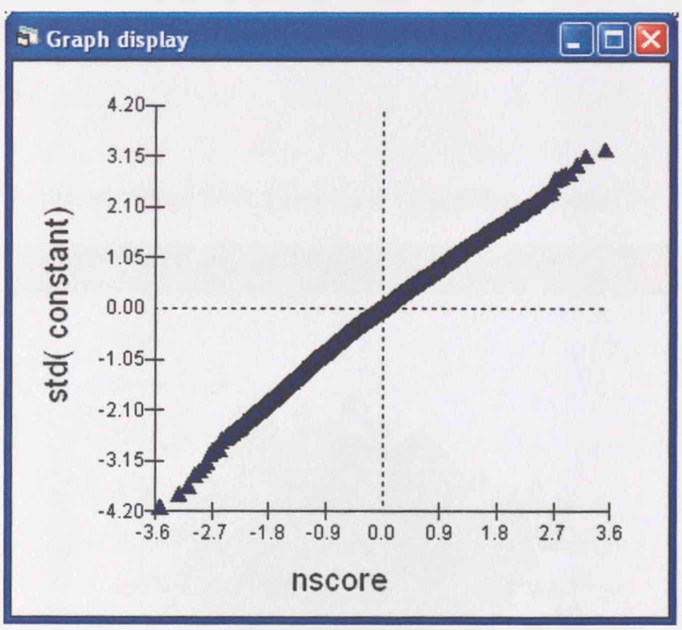
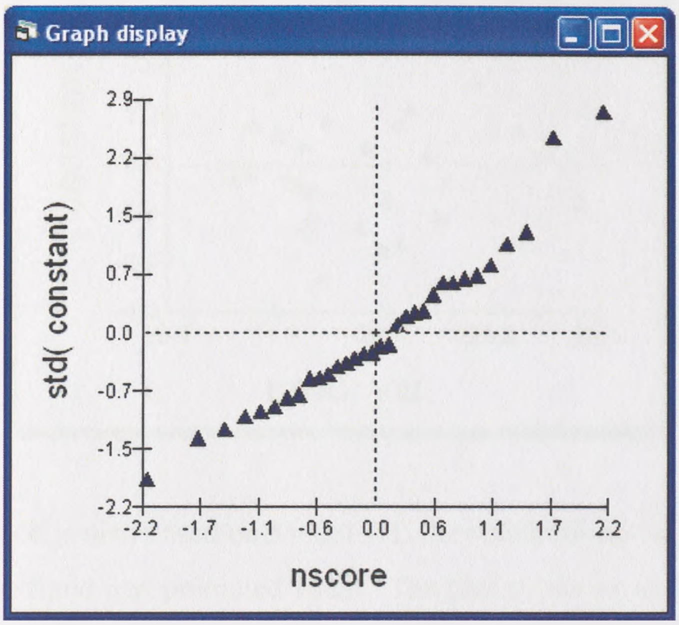


Figure 5.2 plots the standardised level 2 (i.e. school) residuals against their equivalent Normal scores for Model 1.1. While the two schools with the largest

residuals are outliers, all other schools lie on an almost straight line. This indicates that, like the level 1 residuals, the level 2 residuals are normally distributed.

Figure 5.2: **Standardised level 2 residuals by normal equivalent scores for Model 1.1**



In Figure 5.3, which is also based on Model 1.1, the standardised level 1 residuals are plotted against the fixed part predicted value. The plot shows no evidence of heteroscedasticity.

Figure 5.3: **Standardised level 1 residuals by predicted values for Model 1.1**

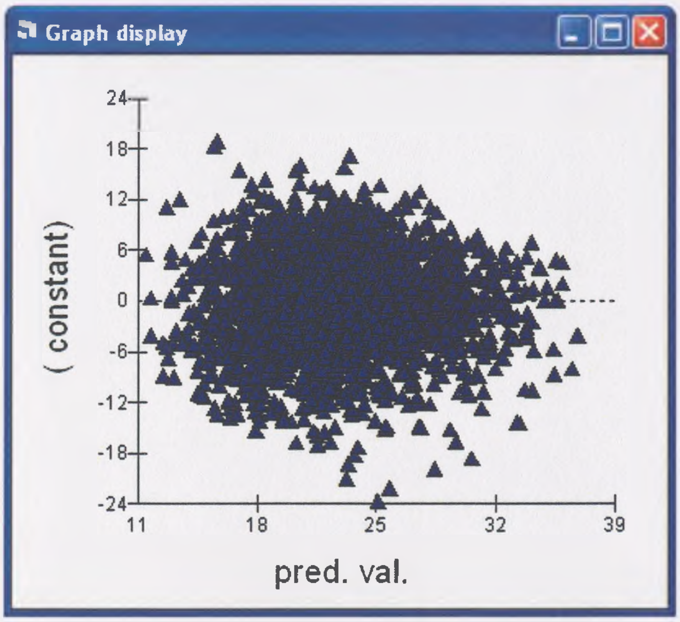
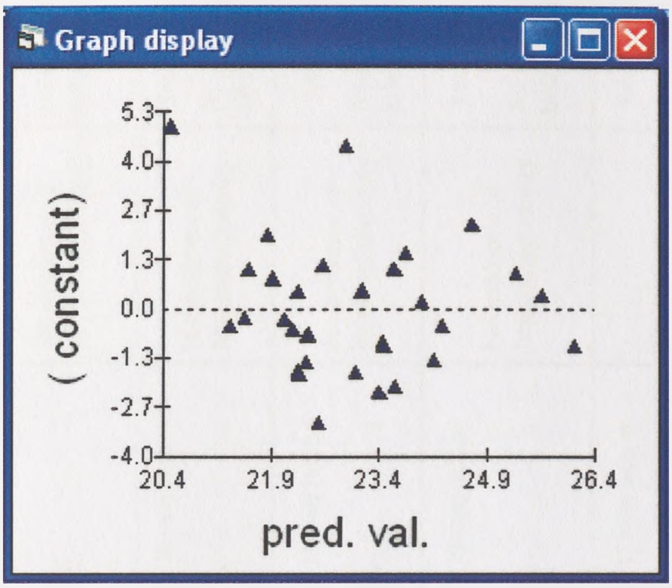


Figure 5.4: **Standardised level 2 residuals by predicted values for Model 1.1**



In Figure 5.4, which is also based on Model 1.1, the standardised level 1 residuals are plotted against the fixed part predicted value. The plot shows no evidence of heteroscedasticity.

The plots for the other tested models can be found in Appendix K. The findings are summarised in Tables 5.1 and 5.2. These tables show that there is normal distribution for standardised level 1 and level 2 residuals for all models. While there are a small number of level 2 outliers in some models, overall the data show homoscedasticity.

Table 5.1: **Standardised level 1 and 2 residuals by normal equivalent scores and standardised level 1 and 2 residuals by predicted values for all Group 1 (NVR Standardised/Subject Study Support/Best 5 GCSE) models**

Model	Explanatory Variables		Standardised Level 1 Residuals by Normal Equivalent Scores		Standardised Level 2 Residuals by Normal Equivalent Scores		Standardised Level 1 Residuals by Predicted Values	Standardised Level 2 Residuals by Predicted Values
	with fixed coefficients	with random coefficients	Normality Demonstrated	Number of Outliers	Normality Demonstrated	Number of Outliers		
1.1	baseline measure (centered) male FSM white attendance at Year 10 study support attendance at Year 11 study support	intercept	Yes	0	Yes	2	No evidence of heteroscedasticity	No evidence of heteroscedasticity
1.2(10)	baseline measure (centered) male FSM white attendance at Year 11 study support	intercept attendance at Year 10 study support	Yes	0	Year 10 study support Yes	 0	No evidence of heteroscedasticity	Year 10 study support No evidence of heteroscedasticity
1.2(11)	baseline measure (centered) male FSM white attendance at Year 10 study support	intercept attendance at Year 11 study support	Yes	0	Year 11 study support Yes	 0	No evidence of heteroscedasticity	Year 11 study support No evidence of heteroscedasticity
1.3(10)	baseline measure (centered) male FSM white attendance at Year 11 study support FSM * attendance at Year 10 study support	intercept attendance at Year 10 study support	Yes	0	Year 10 study support Yes	 3	No evidence of heteroscedasticity	Year 10 study support No evidence of heteroscedasticity
1.3(11)	baseline measure (centered) male FSM white attendance at Year 10 study support FSM * attendance at Year 11 study support	intercept attendance at Year 11 study support	Yes	0	Year 11 study support Yes	 1	No evidence of heteroscedasticity	Year 11 study support No evidence of heteroscedasticity
1.3a(10)	baseline measure (centered) male white attendance at Year 11 study support FSM * attendance at Year 10 study support	intercept FSM attendance at Year 10 study support	Yes	0	FSM Yes	 3	No evidence of heteroscedasticity	FSM No evidence of heteroscedasticity

(Continued overleaf)

Table 5.1 (continued): **Standardised level 1 and 2 residuals by normal equivalent scores and standardised level 1 and 2 residuals by predicted values for all Group 1 (NVR Standardised/Subject Study Support/Best 5 GCSE) models**

Model	Explanatory Variables		Standardised Level 1 Residuals by Normal Equivalent Scores		Standardised Level 2 Residuals by Normal Equivalent Scores		Standardised Level 1 Residuals By Predicted Values	Standardised Level 2 Residuals by Predicted Values
	with fixed coefficients	with random coefficients	Normality Demonstrated	Number of Outliers	Normality Demonstrated	Number of Outliers		
1.3a(11)	baseline measure (centered) male white attendance at Year 10 study support FSM * attendance at Year 11 study support	intercept FSM attendance at Year 11 study support	Yes	0	FSM Yes	 5	No evidence of heteroscedasticity	FSM No evidence of heteroscedasticity
1.4(10)	baseline measure (centered) male white attendance at Year 11 study support	intercept FSM attendance at Year 10 study support FSM * attendance at Year 10 study support	Yes	0	FSM*Year10 study support 2 error messages generated: *Not enough data (NCSO)* then *Not enough data (sum)*		No evidence of heteroscedasticity	FSM*Year10 study support 2 error messages generated: *Not enough data (NCSO)* then *Not enough data (sum)*
1.4(11)	baseline measure (centered) male white attendance at Year 10 study support	intercept FSM attendance at Year 11 study support FSM * attendance at Year 11 study support	Error message generated: V gone –ve definite for block 0 iteration(random pass) (moni)					

Table 5.2: **Standardised level 1 and 2 residuals by normal equivalent scores and standardised level 1 and 2 residuals by predicted values for Model 1 in all groups**

Model	Baseline Measure	Output Measure	Study Support Category	Standardised Level 1 Residuals by Normal Equivalent Scores		Standardised Level 2 Residuals by Normal Equivalent Scores		Standardised Level 1 Residuals by Predicted Values	Standardised Level 2 Residuals by Predicted Values
				Normality Demonstrated	Number of Outliers	Normality Demonstrated	Number of Outliers		
1.1	NVR Score	GCSE Best 5	Subject	Yes	0	Yes	2	No evidence of heteroscedasticity	No evidence of heteroscedasticity
2.1	NVR Score	GCSE Best 5	Non-Subject	Yes	0	Yes	2	No evidence of heteroscedasticity	No evidence of heteroscedasticity
3.1	SATS Maths	GCSE Maths	Maths	Yes	1	Yes	1	No evidence of heteroscedasticity	No evidence of heteroscedasticity
4.1	SATS English	GCSE English	English	Yes	3	Yes	1	No evidence of heteroscedasticity	No evidence of heteroscedasticity
5.1	SATS Science	GCSE Science	Science	Yes	0	Yes	0	No evidence of heteroscedasticity	No evidence of heteroscedasticity
6.1	Year 9 School Attendance	Year 11 School Attendance	Subject	Yes	1	Yes	4	No evidence of heteroscedasticity	No evidence of heteroscedasticity
7.1	Year 9 School Attendance	Year 11 School Attendance	Non-Subject	Yes	1	Yes	4	No evidence of heteroscedasticity	No evidence of heteroscedasticity
8.1	Year 9 Attitudes	Year 11 Attitudes	Subject	Yes	0	Yes	3	No evidence of heteroscedasticity	No evidence of heteroscedasticity
9.1	Year 9 Attitudes	Year 11 Attitudes	Non-Subject	Yes	0	Yes	1	No evidence of heteroscedasticity	No evidence of heteroscedasticity
10.1	NVR Score	GCSE Best 5	Easter School (with Subject)	Yes	0	Yes	1	No evidence of heteroscedasticity	No evidence of heteroscedasticity

The effect of the level 2 outliers was explored through the creation of dummy variables for the outlying schools in each model. By re-running the models with these dummy variables, it was possible to investigate the effect of these schools on the coefficients. The conclusion was that the outliers had little effect. This is shown in Appendix L.

TESTING FOR SCHOOL VARIANCE

For each group of models a 'Model 0' was created. The composition of Model 0 was identical to that of Model 1, but all pupils were assigned to the same school. Any differences between the two models were therefore due to the fact that the pupils attended different schools. Chi-square was used to test if the differences were statistically significant.

Table 5.3 summarises the differences in loglikelihood between Model 0 and Model 1 for all ten groups. In each case the difference was found to be statistically significant at the 0.001 level. The conclusion must therefore be that schools do make a difference – i.e. the relationship between a pupil's baseline and output measure is partly dependent on the school attended.

Table 5.3: **Comparison of loglikelihoods for Model 0 and Model 1 for each of the ten groups**

Group	**Baseline**	**Output**	**Study Support**	**Loglikelihood Model 0**	**Loglikelihood Model 1**	**Difference in Loglikelihood (Chi-square)**	**Additional degrees of freedom**	**P value**
1	NVR	GCSE Best 5	Subject	14920.0	14740.9	179.1	1	0.000
2	NVR	GCSE Best 5	Non-Subject	14936.4	14809.9	126.5	1	0.000
3	SATS Maths	GCSE Maths	Maths	7122.4	6943.3	179.1	1	0.000
4	SATS English	GCSE English	English	6932.6	6614.3	318.3	1	0.000
5	SATS Science	GCSE Science	Science	7028.2	6835.8	192.4	1	0.000
6	Yr 9 School Attendance	Yr 11 School Attendance	Subject	8311.9	8150.8	161.1	1	0.000
7	Yr 9 School Attendance	Yr 11 School Attendance	Non-Subject	8229.2	8142.7	86.5	1	0.000
8	Yr 9 Attitudes	Yr 11 Attitudes	Subject	10030.2	9999.9	30.3	1	0.000
9	Yr 9 Attitudes	Yr 11 Attitudes	Non-Subject	10019.0	9995.7	23.3	1	0.000
10	NVR	GCSE Best 5	Easter School (with Subject)	10828.8	10653.7	175.1	1	0.000

Model 1 is an alternative to inserting school dummy variables into Model 0 and using standard regression. Just as Model 0 and Model 1 can be compared to test for a school effect, the school effect can also be tested by comparing Model 0 with Model 0 with school dummies.

Table 5.4 shows the differences in loglikelihood between Model 0 and Model 0 with school dummies for all ten groups. The ten differences were found to be statistically significant, thus providing further proof of the school effect.

Table 5.4: **Comparison of loglikelihoods for Model 0 and Model 0 including school dummies for each of the ten groups**

Group	Baseline	Output	Study Support	Loglikelihood Model 0	Loglikelihood Model 0 with School Dummies	Difference in Loglikelihood (Chi-square)	Additional degrees of freedom	P value
1	NVR	GCSE Best 5	Subject	14920.0	14643.1	276.9	31	0.000
2	NVR	GCSE Best 5	Non-Subject	14936.4	14718.3	218.1	31	0.000
3	SATS Maths	GCSE Maths	Maths	7122.4	6837.6	284.8	32	0.000
4	SATS English	GCSE English	English	6932.6	6504.5	428.1	31	0.000
5	SATS Science	GCSE Science	Science	7028.2	6730.0	298.2	32	0.000
6	Yr 9 School Attendance	Yr 11 School Attendance	Subject	8311.9	8097.2	214.7	13	0.000
7	Yr 9 School Attendance	Yr 11 School Attendance	Non-Subject	8229.2	8091.9	137.3	13	0.000
8	Yr 9 Attitudes	Yr 11 Attitudes	Subject	10030.2	9920.4	109.8	37	0.000
9	Yr 9 Attitudes	Yr 11 Attitudes	Non-Subject	10019.0	9918.6	100.4	37	0.000
10	NVR	GCSE Best 5	Easter School (with Subject)	10828.8	10578.7	250.1	22	0.000

Table 5.5 compares the coefficients (and their standard errors) for the study support variables in Model 1 with Model 0 with school dummies. The table shows that for 16 of the 19 models, the standard errors are greater with the school dummy model. School dummies use up additional degrees of freedom, reducing the power of the model to distinguish study support variable categories.

Table 5.5: **Comparison of study support coefficients for Model 1 and Model 0 including school dummies for each of the ten groups**

					MODEL 1				MODEL 0 INCLUDING SCHOOL DUMMIES			
	Baseline	**Output**	**Study Support**		**Estimate**	**S.E.**	**T value**	**P value**	**Estimate**	**S.E.**	**T value m**	**P value**
1	NVR	GCSE Best 5	Subject	Yr 10	1.246	0.303	4.112	0.000	1.282	0.314	4.083	0.000
				Yr 11	3.333	0.379	8.794	0.000	3.440	0.383	8.982	0.000
2	NVR	GCSE Best 5	Non-Subject	Yr 10	1.116	0.401	2.783	0.005	1.037	0.419	2.475	0.013
				Yr 11	1.216	0.360	3.378	0.001	1.215	0.363	3.347	0.001
3	SATS Maths	GCSE Maths	Maths	Yr 10	0.218	0.061	3.574	0.000	0.199	0.063	3.159	0.002
				Yr 11	0.266	0.039	6.821	0.000	0.265	0.039	6.795	0.000
4	SATS English	GCSE English	English	Yr 10	0.218	0.111	1.964	0.050	0.253	0.113	2.239	0.025
				Yr 11	0.026	0.043	0.605	0.545	0.036	0.043	0.837	0.403
5	SATS Science	GCSE Science	Science	Yr 10	0.028	0.078	0.359	0.720	0.024	0.080	0.300	0.764
				Yr 11	0.320	0.043	7.442	0.000	0.315	0.043	7.326	0.000
6	Yr 9 School Attendance	Yr 11 School Attendance	Subject	Yr 10	0.227	0.494	0.460	0.646	0.179	0.501	0.357	0.721
				Yr 11	3.007	0.591	5.088	0.000	2.955	0.593	4.983	0.000
7	Yr 9 School Attendance	Yr 11 School Attendance	Non-Subject	Yr 10	1.323	0.605	2.187	0.029	0.929	0.621	1.496	0.135
				Yr 11	2.413	0.537	4.493	0.000	2.401	0.539	4.455	0.000
8	Yr 9 Attitudes	Yr 11 Attitudes	Subject	Yr 10	1.534	0.880	1.743	0.082	1.462	0.965	1.515	0.130
				Yr 11	6.900	1.141	6.047	0.000	7.526	1.183	6.362	0.000
9	Yr 9 Attitudes	Yr 11 Attitudes	Non-Subject	Yr 10	2.593	1.179	2.199	0.028	3.210	1.306	2.458	0.014
				Yr 11	5.509	0.993	5.548	0.000	5.652	1.022	5.530	0.000
10	NVR	GCSE Best 5	Easter School (with Subject)		3.846	0.317	12.132	0.000	3.968	0.320	12.400	0.000

TESTING THE HYPOTHESES

Group 1: NVR/Best 5 and Subject Based Study Support

The intra-school correlation in the null model is 0.076. This indicates that almost 8% of the total variance is accounted for at school level.

Hypothesis 1a: Controlling for NVR, attendance at subject study support will result in improved Best 5 GCSE attainment.

Model 1.1:

- attending Year 10 subject study support improves Best 5 GCSE attainment by an average of 1.246 points. This is statistically significant ($t=1.246/0.303=4.112$, d.f.=2304, $p=0.000$).
- attending Year 11 subject study support improves Best 5 GCSE attainment by an average of 3.333 points. This is also statistically significant ($t=3.333/0.379=8.794$, d.f.=2304, $p=0.000$).
- the explanatory variables account for 31.5% of the total variance.

These findings support Hypothesis 1a in respect of both Year 10 and Year 11 subject study support.

Hypothesis 1b: The extent of the improvement in Best 5 GCSE attainment from attending subject study support will vary by school.

Model 1.2(10):

- The difference in loglikelihood between Model 1.1 and 1.2(10) is not statistically significant ($\chi^2=2.2$, d.f.=2, $p=0.333$), indicating that there is no

variation between schools in the improvement in Best 5 GCSE attainment from attending Year 10 subject study support.

Model 1.2(11)

- The difference in loglikelihood between Model 1.1 and 1.2(11) is statistically significant (χ^2=15.6, d.f.=2, p=0.000). This indicates that the extent of the improvement in Best 5 GCSE attainment from attending Year 11 subject study support varies by school.

These findings support Hypothesis 1b for Year 11, but not Year 10, subject study support.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 11 subject study support on promoting students' progress over and above the average progress across all schools, it is necessary to examine the school-level residuals. Figure 5.5 shows the residual plots for the two random terms - i.e. the terms that are permitted to vary by school - in Model 1.2(11): the 'constant' (or intercept) and the coefficient for Year 11 subject study support. The residual plots demonstrate the extent to which schools vary from the overall average values with respect to these two terms. A school whose line sits either exclusively above or below the dotted line is statistically different from the average. Although the dotted line is shown in the plot to have the value y=0, the line in fact takes the average value. As the average value for the intercept in Model 1.2(11) is 20.670, all values in the y-axis are relative to 20.670.

In Model 1.2(11) the intercept is the average Best 5 GCSE score for pupils in the reference group. The reference group comprises pupils who are not male, not white, not in receipt of free meals and do not attend Year 10 or Year 11 subject study support. The first plot in Figure 5.5 shows the spread of Best 5 GCSE scores in each school for these pupils. It shows that four schools are significantly different from the average: the green and royal blue lines indicates that Schools 23 and 15 score 4 and 3 Best 5 GCSE points less than 20.670, while the light blue and red lines indicate that

Schools 8 and 5 both score 6 points better than 20.670. The intercept therefore varies from 16.670 (i.e. 20.670 – 4) to 26.670 (i.e. 20.670 + 6).

In Model 1.2(11) the overall coefficient for Year 11 subject study support is 3.572. This is the overall increase in the Best 5 GCSE scores compared with the reference group who do not receive subject study support. However the effect of subject study support on GCSE performance varies from one school to another. The second plot in Figure 5.5 shows that two schools are significantly different from the average: the red and light blue lines indicate that Schools 5 and 8 score 4.5 and 2.3 Best 5 GCSE points less than 3.572. No schools are significantly better than the average. The effect of attending Year 11 subject study support therefore varies from -0.928 (i.e. 3.572 – 4.5) to the average of 3.572.

Read together, the two plots in Figure 5.5 show that the schools in which the reference group pupils score less in Best 5 GCSE points in comparison with reference group pupils in other schools gain most from attendance at Year 11 subject study support, while schools in which the reference group pupils score better in Best 5 GCSE points in comparison with reference group pupils in other schools gain less from attendance at Year 11 subject study support. The strongly negative correlation between the intercept and 'slope'[1] of -0.830 supports this. The implication of this finding is that Year 11 subject study support is more effective in lower-attaining schools. One explanation for this is that schools whose pupils already achieve higher scores have less to gain from study support because they are already close to the maximum number of Best 5 GCSE points.

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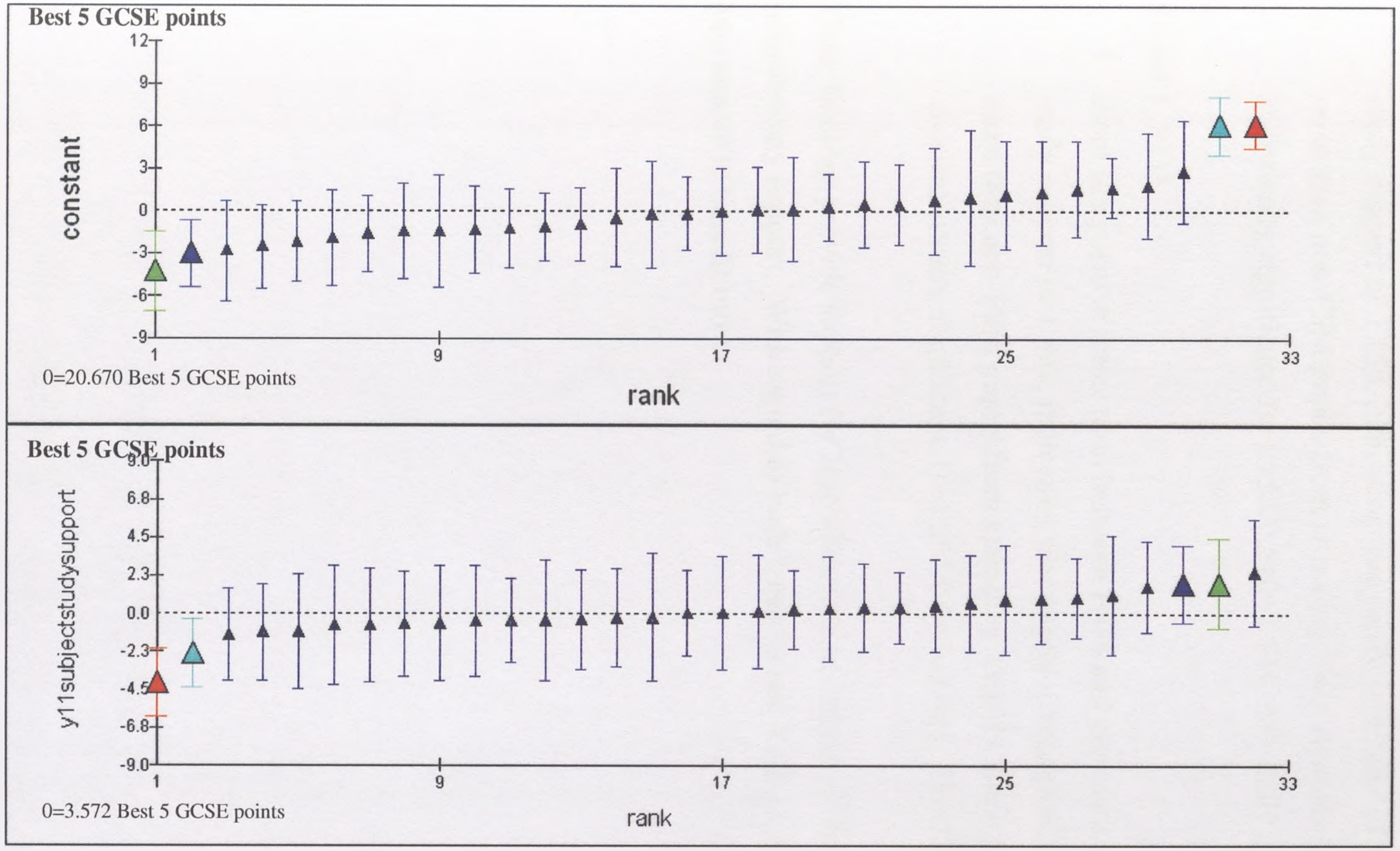
[1] Throughout this chapter, inverted commas are printed around the term 'slope'. All of these 'slopes' relate to attendance at study support. In the present study attendance at study support is represented as a binary variable (defined by a dummy variable, taking the values 0, 1). The regression line is simply the line joining the two means (i.e. pupils who attend and those who do not attend study support), there being no capacity to detect any relationships of higher degree.

Figure 5.5: **Plots of school residuals for intercept and attendance at Year 11 subject study support for Model 1.2(11), Best 5 GCSE points**



Red=School 5, Light Blue=School 8

Hypothesis 1c: The extent of the improvement in Best 5 GCSE attainment from attending subject study support will be different for FSM and non-FSM pupils within a school.

Model 1.3(10):

- there is a positive interaction between FSM and attendance at Year 10 subject study support of 1.158, indicating that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support This is statistically significant. ($t=1.158/0.540=2.144$, d.f.=2301, $p=0.032$).

Model 1.3(11)

- there is a positive interaction between FSM and attendance at Year 11 subject study support of 1.892, indicating that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 study support This is also statistically significant. ($t=1.892/0.762=2.483$, d.f.=2301, $p=0.013$).

These findings provide support for Hypothesis 1c in respect of Year 10 and Year 11 subject study support. With regard to both Year 10 and Year 11, it is the FSM pupils who appear to benefit most.

Hypothesis 1d: The difference in the improvement in Best 5 GCSE attainment from attending subject study support for FSM and non-FSM pupils will vary at school level.

Model 1.4(10):

- The difference in loglikelihood between Models 1.3(10)a and 1.4(10) is not statistically significant as the loglikelihood for Model 1.4(10) is greater than that for 1.3(10)a. This indicates that there is no variation across schools in the difference in improvement in Best 5 GCSE attainment from attending Year 10 subject study support for FSM pupils in contrast to non-FSM pupils.

Model 1.4(11):

- As Model 1.4(11) resulted in an error message ('V has gone negative definite'), it is not possible to use multilevel modelling to test if there is a variation across schools in the improvement in Best 5 GCSE attainment from attending Year 11 subject study support for FSM pupils in contrast to non-FSM pupils. 'V has gone negative definite' indicates that the V matrix - which is constructed from the random parameters, i.e. the variances and covariances of the random effects - has become negative definite at school level because the variance function for a particular combination of explanatory variable values has become negative.[2] It is not possible to eliminate the problem by removing the relevant parameter from the model as the model has been designed to address the hypothesis.

These findings do not support Hypothesis 1d with regard to Year 10 subject study support. Hypothesis 1d cannot be tested in MLwiN in respect of Year 11 subject study support.

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[2]Source: www.cmm.bristol.ac.uk/MLwiN/tech-support/support-faqs/index.shtml#num

Group 2: <u>NVR/Best 5 and Non-Subject Based Study Support</u>

The intra-school correlation in the null model is 0.076. This indicates that almost 8% of the total variance is accounted for at school level.

Hypothesis 2a: Controlling for NVR, attendance at non-subject study support will result in improved Best 5 GCSE attainment.

Model 2.1:

- attending Year 10 non-subject study support improves Best 5 GCSE attainment by an average of 1.116 points. This is statistically significant ($t=1.116/0.401=2.783$, d.f.=2302, $p=0.005$).
- attending Year 11 non-subject study support improves Best 5 GCSE attainment by an average of 1.216 points. This is statistically significant ($t=1.216/0.360=3.378$, d.f.=2302, $p=0.001$).
- the explanatory variables account for 30.5% of the total variance.

These findings support Hypothesis 2a in respect of both Year 10 and Year 11 non-subject study support.

Hypothesis 2b: The extent of the improvement in Best 5 GCSE attainment from attending non-subject study support will vary by school.

Model 2.2(10):

- The difference in loglikelihood between Model 2.1 and 2.2(10) is not statistically significant ($\chi^2=3$, d.f.=2, $p=0.223$), indicating that there is no variation between schools in the improvement in Best 5 GCSE attainment from attending Year 10 non-subject study support.

Model 2.2(11)

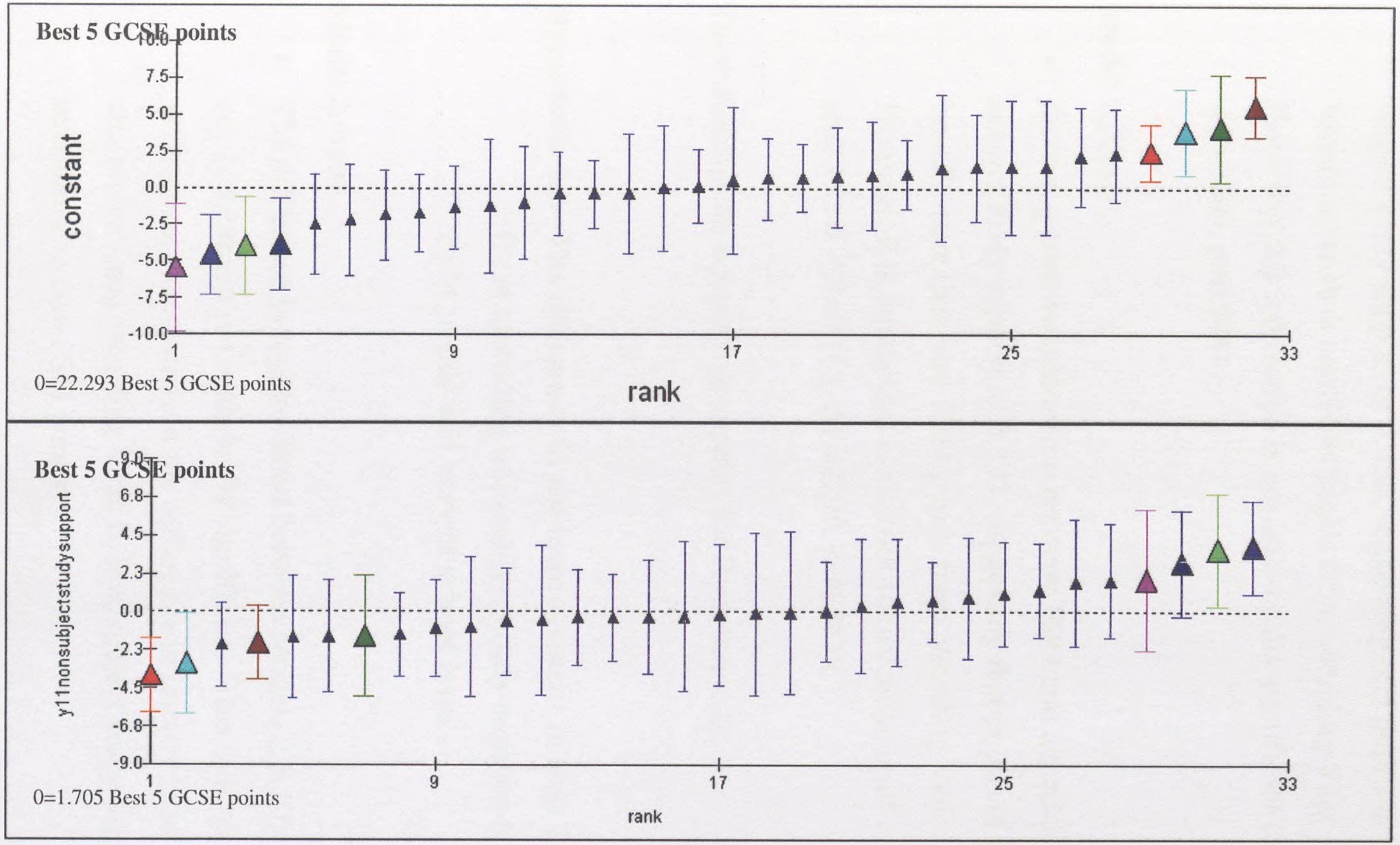
- The difference in loglikelihood between Model 2.1 and 2.2(11) is statistically significant (χ^2=22.9, d.f.=2, p=0.000). This indicates that the extent of the improvement in Best 5 GCSE attainment from attending Year 11 non-subject study support varies by school.

These findings support Hypothesis 2b for Year 11, but not Year 10, non-subject study support.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 11 non-subject study support on promoting students' progress over and above the average progress across all schools, it is necessary to examine the school-level residuals. Figure 5.6 shows the residual plots for the two random terms - i.e. the terms that are permitted to vary by school - in Model 2.2(11): the 'constant' (or intercept) and the coefficient for Year 11 non-subject study support. The overall message from the plots shown in Figure 5.6 is very similar to the message that emerges from Figure 5.5 - the schools in which the reference group pupils score less in Best 5 GCSE points in comparison with reference group pupils in other schools gain most from attendance at Year 11 non-subject study support, while schools in which the reference group pupils score better in Best 5 GCSE points in comparison with reference group pupils in other schools gain less from attendance at Year 11 non-subject study support. The strongly negative correlation between the intercept and 'slope' of -0.834 supports this.

In Model 2.2(11) the overall coefficient for Year 11 non-subject study support is 1.705. The second plot in Figure 5.6 shows that four schools are significantly different from the average: the red and light blue lines indicate that Schools 27 and 25 score 4.0 and 3.2 Best 5 GCSE points less than 1.705, while the light green and blue lines indicate that Schools 33 and 15 score 3.3. and 3.4 Best 5 GCSE points better than the average. The effect of attending Year 11 non-subject study support varies from -2.295 (i.e. 1.705 -4.0) to 5.105 (i.e. 1.705 + 3.4).

Figure 5.6: **Plots of school residuals for intercept and attendance at Year 11 non-subject study support for Model 2.2(11), Best 5 GCSE points**



Red=School 27, Light Blue=School 25, Light Green=School 33, Blue=School 15

Hypothesis 2c: The extent of the improvement in Best 5 GCSE attainment from attending non-subject study support will be different for FSM and non-FSM pupils within a school.

Model 2.3(10):

- there is a positive interaction between FSM and attendance at Year 10 non-subject study support of 0.456, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 non-study support However, this interaction is not statistically significant (t=0.456/0.752=0.606, d.f.=2299, p=0.544).

Model 2.3(11)

- there is a positive interaction between FSM and attendance at Year 11 non-subject study support of 0.122, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 non-study support However, this interaction is also not statistically significant (t=0.122/0.755=0.162, d.f.=2299, p=0.872).

These findings do not provide support for Hypothesis 2c.

Hypothesis 2d: The difference in the improvement in Best 5 GCSE attainment from attending non-subject study support for FSM and non-FSM pupils will vary at school level.

Model 2.4(10):

- The difference in loglikelihood between Models 2.3(10)a and 2.4(10) is zero and is therefore not statistically significant. This indicates that there is no variation across schools in the difference in improvement in Best 5 GCSE attainment from attending Year 10 non-subject study support for FSM pupils in contrast to non-FSM pupils.

Model 2.4(11):

- The difference in loglikelihood between Models 2.3(11)a and 2.4(11) is not statistically significant (χ^2=3.8, d.f.=4, p=0.434). This indicates that there is no variation across schools in the difference in improvement in Best 5 GCSE attainment from attending Year 11 non-subject study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 2d with regard to either Year 10 or Year 11 non-subject study support.

Group 3: <u>SATS Maths/GCSE Maths and Maths Study Support</u>

The intra-school correlation in the null model is 0.047. This indicates that almost 5% of the total variance is accounted for at school level.

Hypothesis 3a: Controlling for SATS maths, attendance at maths study support will result in improved Maths GCSE attainment.

Model 3.1:

- attending Year 10 maths study support improves maths GCSE attainment by an average of 0.218 points. This is statistically significant (t=0.218/0.061=3.574, d.f.=2691, p=0.000).
- attending Year 11 maths study support improves maths GCSE attainment by an average of 0.266 points. This is also statistically significant (t=0.266/0.039=6.821, d.f.=2691, p=0.000).
- the explanatory variables account for 68.1% of the total variance.

These findings support Hypothesis 3a in respect of both Year 10 and Year 11 maths study support.

Hypothesis 3b: The extent of the improvement in maths GCSE attainment from attending maths study support will vary by school.

Model 3.2(10):

- The difference in loglikelihood between Model 3.1 and 3.2(10) is statistically significant (χ^2=8, d.f.=2, p=0.018). This indicates that the extent of the improvement in maths GCSE attainment from attending Year 10 maths study support varies by school.

Model 3.2(11)

- The difference in loglikelihood between Model 3.1 and 3.2(11) is statistically significant (χ^2=26.8, d.f.=2, p=0.000). This indicates that the extent of the improvement in maths GCSE attainment from attending Year 11 maths study support also varies by school.

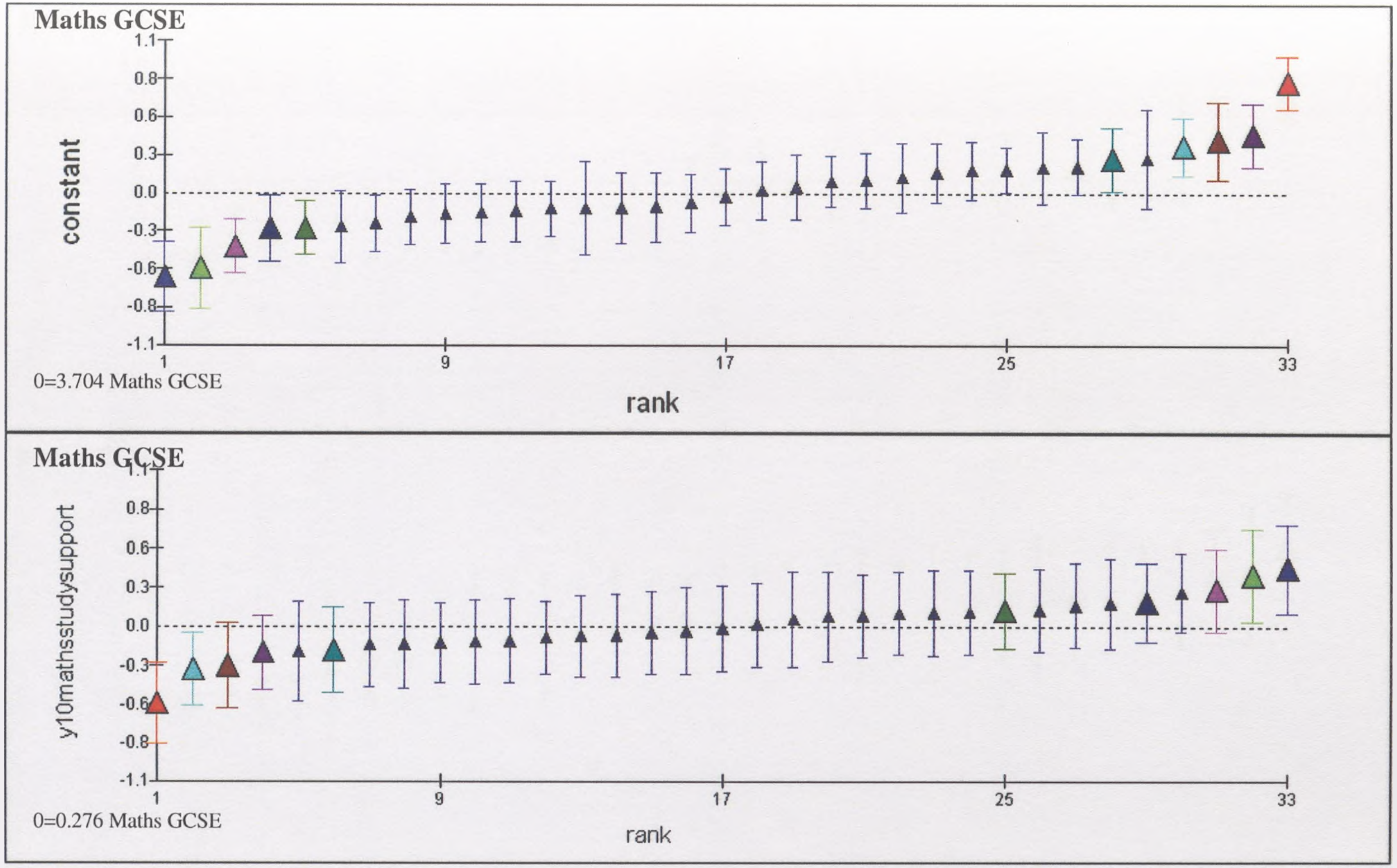
These findings support Hypothesis 3b for both Year 10 and Year 11 maths study support.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 10 and Year 11 maths study support on promoting students' progress over and above the average progress across all schools, it is necessary to examine the school-level residuals for Models 3.2(10) and 3.2(11). Figures 5.7 and 5.8 show the residual plots for the two random terms in both models. The plots show that, with regard to both Year 10 and Year 11, the schools in which the reference group pupils achieve lower GCSE maths grades in comparison with reference group pupils in other schools gain most from attendance at maths study support, while schools in which the reference group pupils score higher GCSE maths grades in comparison with reference group pupils in other schools gain less from attendance at maths study support. The strongly negative correlations between the intercept and 'slope' of -0.834 and -0.733 support this.

In Model 3.2(10) the overall coefficient for Year 10 maths study support is 0.276. The second plot in Figure 5.7 shows that four schools are significantly different from the average: the red and light blue lines indicate that Schools 5 and 4 score 0.6 and 0.36 of a maths grade less than 0.218, while the light green and blue lines indicate that Schools 33 and 20 score 0.35 and 0.4 of a maths grade better than the average. The effect of attending Year 10 maths study support varies from -0.324 (i.e. 0.276 - 0.6) to 0.676 (i.e. 0.276 + 0.4).

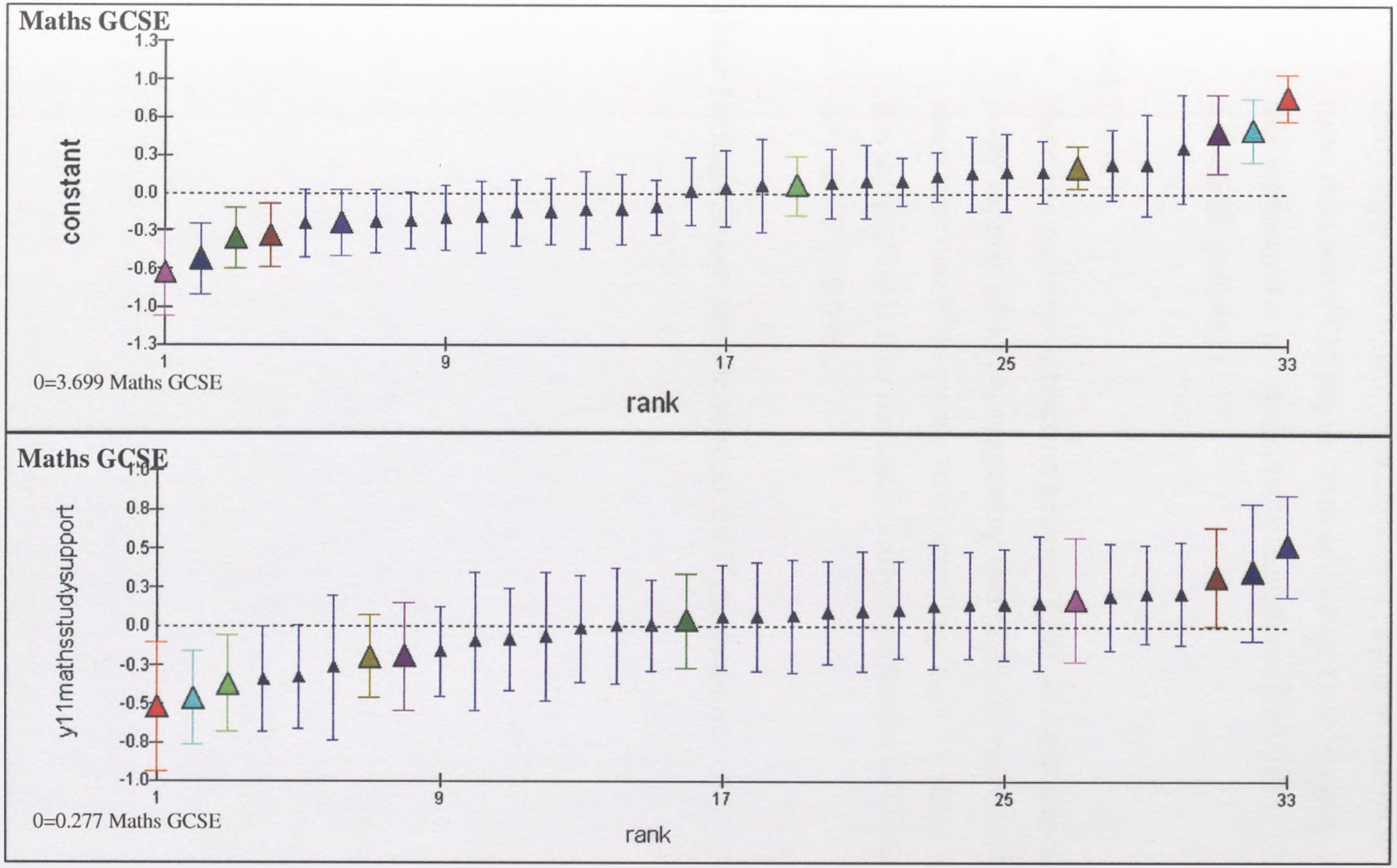
In Model 3.2(11) the overall coefficient for Year 11 maths study support is 0.277. The second plot in Figure 5.8 shows that five schools are significantly different from the average: the red, light blue and light green lines indicate that Schools 5, 4and 39 score 0.55, 0.5 and 0.45 of a maths grade less than 0.277, while the brown and blue lines indicate that Schools 6 and 26 score 0.25 and 0.45 of a maths grade better than the average. The effect of attending maths study support varies from -0.273 (i.e. 0.277 - 0.55) to 0.727 (i.e. 0.277 + 0.45).

Figure 5.7: **Plots of school residuals for intercept and attendance at Year 10 maths study support for Model 3.2(10), maths GCSE**



Red=School 5, Light Blue=School 4, Light Green=School 33, Blue=School 20

Figure 5.8: **Plots of school residuals for intercept and attendance at Year 11 maths study support for Model 3.2(11), maths GCSE**



Red=School 5, Light Blue=School 4, Light Green=School 39, Brown=School 6, Blue=School 26

Hypothesis 3c: The extent of the improvement in maths GCSE attainment from attending maths study support will be different for FSM and non-FSM pupils within a school.

Model 3.3(10):

- there is a positive interaction between FSM and attendance at Year 10 maths study support of 0.015, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support However, this interaction is not statistically significant ($t=0.015/0.101=0.149$, d.f.=2688, $p=0.882$).

Model 3.3(11)

- there is a positive interaction between FSM and attendance at Year 11 maths study support of 0.124, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 study support However, this interaction is also not statistically significant ($t=0.124/0.075=1.653$, d.f.=2688, $p=0.098$).

These findings do not provide support for Hypothesis 3c.

Hypothesis 3d: The difference in the improvement in maths GCSE attainment from attending maths study support for FSM and non-FSM pupils will vary at school level.

Model 3.4(10):

- The difference in loglikelihood between Models 3.3(10)a and 3.4(10) is zero and is therefore not statistically significant. This indicates that there is no variation across schools in the difference in improvement in maths GCSE attainment from attending Year 10 maths study support for FSM pupils in contrast to non-FSM pupils.

Model 3.4(11):

- The difference in loglikelihood between Models 3.3(11)a and 3.4(11) is not statistically significant (χ^2=2.7, d.f.=4, p=0.609). This indicates that there is no variation across schools in the difference in improvement in maths GCSE attainment from attending Year 11 maths study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 3d with regard to either Year 10 or Year 11 maths study support.

Group 4: <u>SATS English/GCSE English and English Study Support</u>

The intra-school correlation in the null model is 0.072. This indicates that 7% of the total variance is accounted for at school level.

Hypothesis 4a: Controlling for SATS English, attendance at English study support will result in improved GCSE English GCSE attainment.

Model 4.1:

- attending Year 10 English study support improves English GCSE attainment by an average of 0.218 points. This is statistically significant ($t=0.218/0.111=1.964$, d.f.=2477, $p=0.050$).
- attending Year 11 English study support improves English GCSE attainment by an average of 0.026 points. This is not statistically significant ($t=0.026/0.043=0.605$, d.f.=2477, $p=0.545$).
- the explanatory variables account for 50.7% of the total variance.

These findings support Hypothesis 4a in respect of Year 10, but not Year 11, English study support.

Hypothesis 4b: The extent of the improvement in English GCSE attainment from attending English study support will vary by school.

Model 4.2(10):

- The difference in loglikelihood between Model 4.1 and 4.2(10) is not statistically significant ($\chi^2=1.9$, d.f.=2, $p=0.387$), indicating that there is no

variation between schools in the improvement in English GCSE attainment from attending Year 10 English study support.

Model 4.2(11)

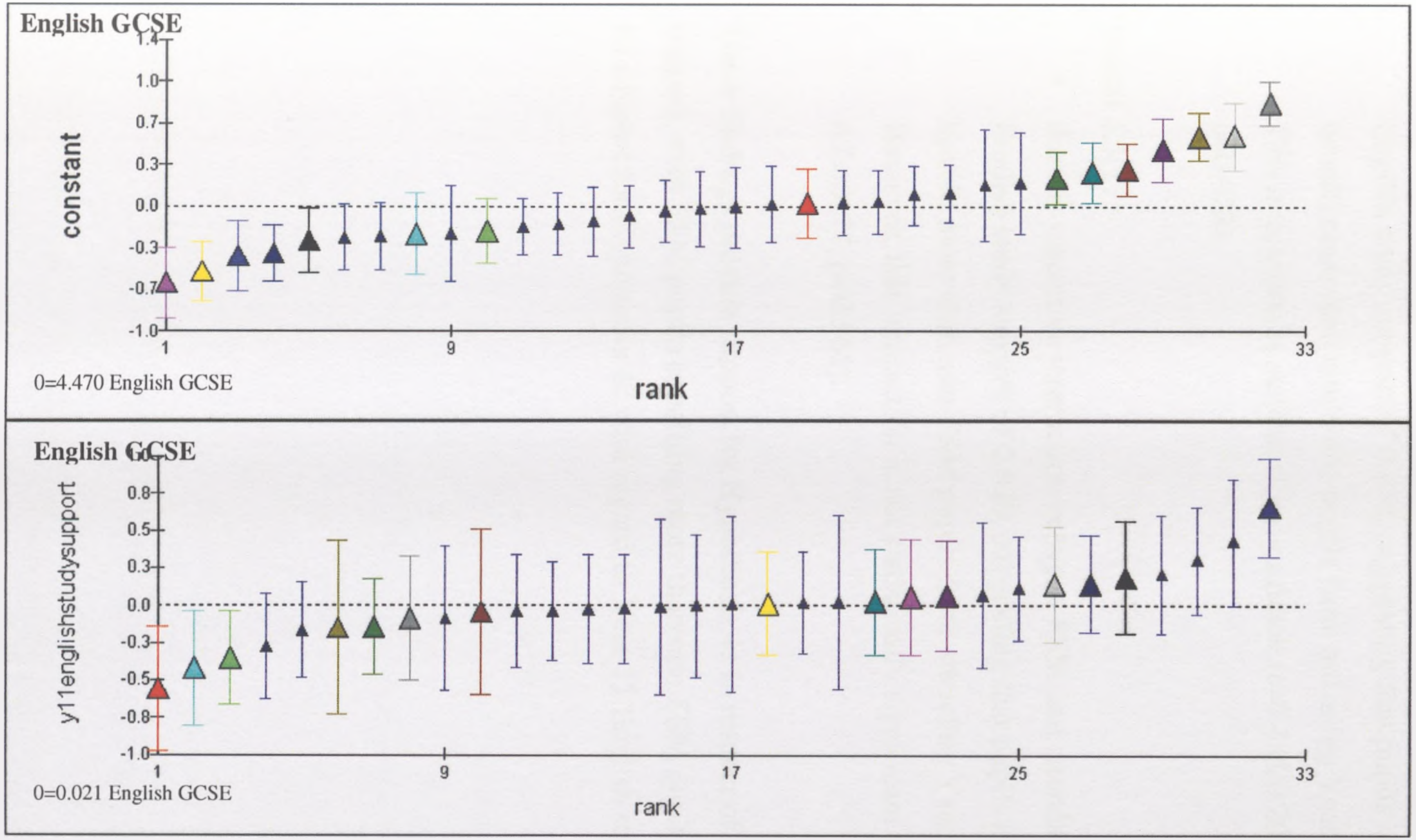
- The difference in loglikelihood between Model 4.1 and 4.2(11) is statistically significant (χ^2=21.3, d.f.=2, p=0.000). This indicates that the extent of the improvement in English GCSE attainment from attending Year 11 English study support varies by school.

These findings support Hypothesis 4b for Year 11, but not Year 10, English study support.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 11 English study support on promoting students' progress over and above the average progress across all schools, it is necessary to examine the school-level residuals for Models 4.2(11). Figure 5.9 shows the residual plots for the two random terms in the models. The plots show that there are some schools in which the reference group pupils achieve lower GCSE English grades in comparison with reference groups pupils in other schools but gain most from attendance at Year 11 English study support and there are some schools in which the reference group pupils score higher GCSE English grades in comparison with reference group pupils in other schools but gain less from attendance at Year 11 English study support. The negative correlation between the intercept and 'slope' of -0.296 supports this.

In Model 4.2(11) the overall coefficient for Year 11 English study support is 0.021, but this is not statistically significant. The second plot in Figure 5.9 shows that four schools are significantly different from the average: the red, light blue and light green lines indicate that Schools 20, 37 and 34 score 0.55, 0.45 and 0.4 of a English grade less than 0.021, while School 6 scores 0.65 better than the average. The effect of attending English study support varies from -0.529 (i.e. 0.021 - 0.55) to 0.671 (i.e. 0.021 + 0.65).

Figure 5.9: **Plots of school residuals for intercept and attendance at Year 11 English study support for Model 4.2(11), English GCSE**



Red=School 20, Light Blue=School 37, Light Green=School 34, Blue=School 6

Hypothesis 4c: The extent of the improvement in English GCSE attainment from attending English study support will be different for FSM and non-FSM pupils within a school.

Model 4.3(10):

- there is a positive interaction between FSM and attendance at Year 10 English study support of 0.458, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support. This interaction is statistically significant (t=0.458/0.202=2.267, d.f.=2474, p=0.023).

Model 4.3(11)

- there is a positive interaction between FSM and attendance at Year 11 English study support of 0.050, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 study support. However, this interaction is not statistically significant (t=0.050/0.086=0.581, d.f.=2474, p=0.561).

These findings provide support for Hypothesis 4c in respect of Year 10 English study support, with FSM pupils benefiting more than non-FSM pupils. There is, however, no support for Hypothesis 4c with regard to Year 11 English study support.

Hypothesis 4d: The difference in the improvement in English GCSE attainment from attending English study support for FSM and non-FSM pupils will vary at school level.

Model 4.4(10):

- As Model 4.4(10) resulted in a numeric warning ('V has gone negative definite'), it is not possible to use multilevel modelling to test if there is a variation across schools in the improvement in English GCSE attainment from attending Year 10 English study support for FSM pupils in contrast to non-FSM pupils. (For an explanation of the 'V has gone negative definite' message, see page 199.)

Model 4.4(11):

- The difference in loglikelihood between Models 4.3(11)a and 4.4(11) is not statistically significant (χ^2=2.2, d.f.=4, p=0.699). This indicates that there is no variation across schools in the difference in improvement in English GCSE attainment from attending Year 11 English study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 4d with regard to Year 11 English study support. Hypothesis 4d cannot be tested in MLwiN in respect of Year 10 English study support.

Group 5: SATS Science/GCSE Science and Science Study Support

The intra-school correlation in the null model is 0.095. This indicates that almost 10% of the total variance is accounted for at school level.

Hypothesis 5a: Controlling for SATS science, attendance at science study support will result in improved science GCSE attainment.

Model 5.1:

- attending Year 10 science study support improves science GCSE attainment by an average of 0.028 points. This is not statistically significant (t=0.028/0.078=0.359, d.f.=2480, p=0.720).
- attending Year 11 science study support improves science GCSE attainment by an average of 0.320 points. This is statistically significant (t=0.320/0.043=7.442, d.f.=2480, p=0.000).
- the explanatory variables account for 58.3% of the total variance.

These findings support Hypothesis 5a in respect of Year 11, but not Year 10, science study support.

Hypothesis 5b: The extent of the improvement in science GCSE attainment from attending science study support will vary by school.

Model 5.2(10):

- The difference in loglikelihood between Model 5.1 and 5.2(10) is not statistically significant (χ^2=0.5, d.f.=2, p=0.779), indicating that there is no variation between schools in the improvement in science GCSE attainment from attending Year 10 science study support.

Model 5.2(11)

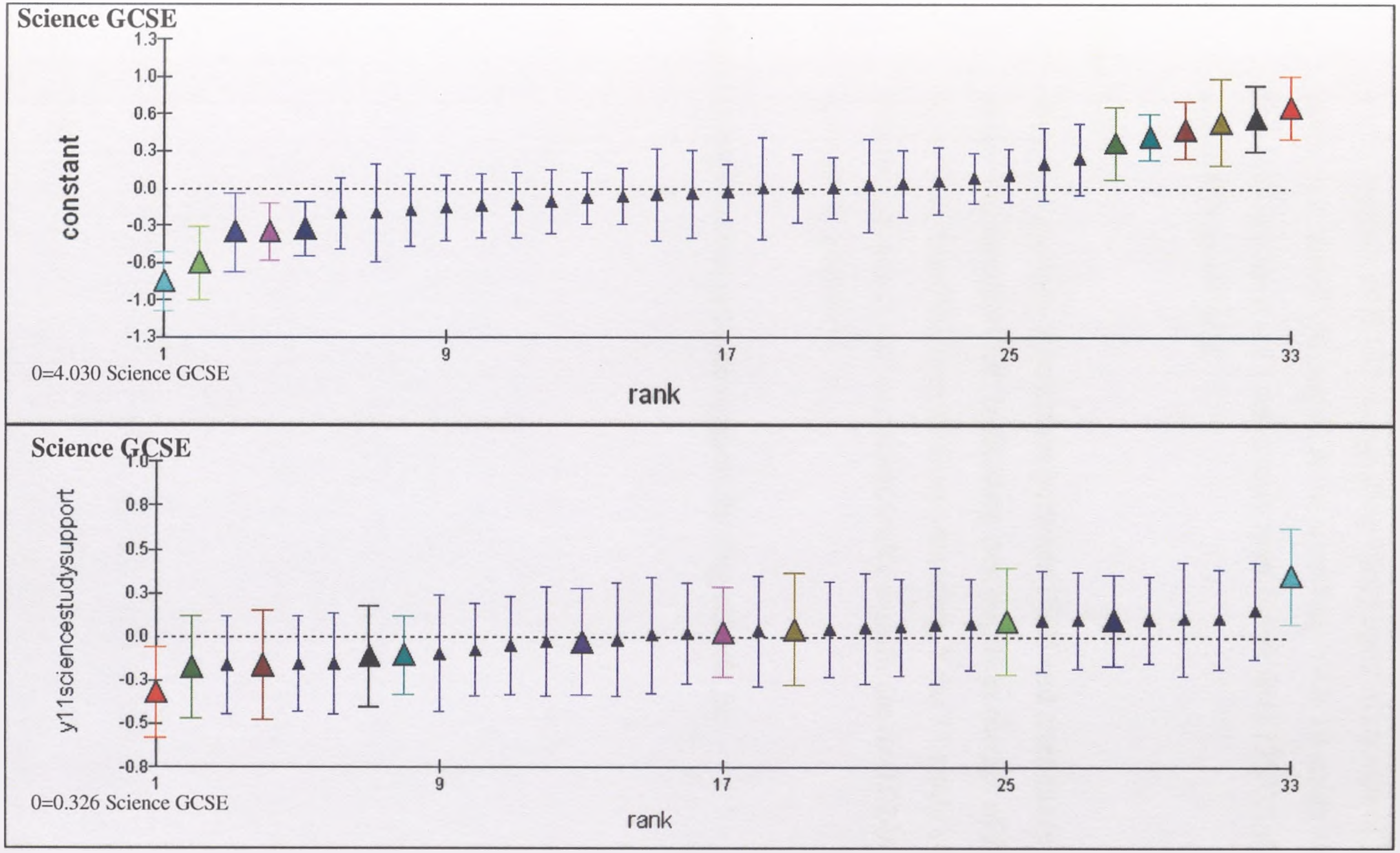
- The difference in loglikelihood between Model 5.1 and 5.2(11) is statistically significant (χ^2=7.2, d.f.=2, p=0.027). This indicates that the extent of the improvement in science GCSE attainment from attending Year 11 science study support varies by school.

These findings support Hypothesis 5b for Year 11, but not Year 10, science study support.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 11 science study support on promoting students' progress over and above the average progress across all schools, it is necessary to examine the school-level residuals for Model 5.2(11). Figure 5.10 shows the residual plots for the two random terms. The plots show that the schools in which the reference group pupils achieve lower GCSE science grades in comparison with reference group pupils in other schools gain most from attendance at science study support, while schools in which the reference group pupils score higher GCSE science grades in comparison with reference group pupils in other schools gain less from attendance at science study support. The negative correlation between the intercept and 'slope' of -0.596 supports this.

In Model 5.2(11) the overall coefficient for Year 11 science study support is 0.326. The second plot in Figure 5.10 shows that two schools are significantly different from the average: the red line indicate that Schools 4 scores 0.35 a science grade less than 0.326, while the light blue line indicates that School 35 scores 0.3 better than the average. The effect of attending science study support varies from -0.024 (i.e. 0.326 - 0.35) to 0.626 (i.e. 0.326 + 0.3).

Figure 5.10: **Plots of school residuals for intercept and attendance at Year 11 science study support for Model 5.2(11), science GCSE**



Red=School 4, Light Blue=School 35

Hypothesis 5c: The extent of the improvement in science GCSE attainment from attending science study support will be different for FSM and non-FSM pupils within a school.

Model 5.3(10):

- there is a positive interaction between FSM and attendance at Year 10 science study support of 0.135, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support. However, this interaction is not statistically significant ($t=0.135/0.148=0.912$, d.f.=2477, $p=0.362$).

Model 5.3(11)

- there is a positive interaction between FSM and attendance at Year 11 science study support of 0.024, indicating that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 study support. However, this interaction is also not statistically significant ($t=0.024/0.087=0.276$, d.f.=2477, $p=0.783$).

These findings do not provide support for Hypothesis 5c.

Hypothesis 5d: The difference in the improvement in science GCSE attainment from attending science study support for FSM and non-FSM pupils will vary at school level.

Model 5.4(10):

- The difference in loglikelihood between Models 5.3(10)a and 5.4(10) is not statistically significant (χ^2=7.5, d.f.=4, p=0.112). This indicates that there is no variation across schools in the difference in improvement in science GCSE attainment from attending Year 10 science study support for FSM pupils in contrast to non-FSM pupils.

Model 5.4(11):

- The difference in loglikelihood between Models 5.3(11)a and 5.4(11) is not statistically significant (χ^2=4.2, d.f.=4, p=0.380). This indicates that there is no variation across schools in the difference in improvement in science GCSE attainment from attending Year 11 science study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 5d with regard to either Year 10 or Year 11 science study support.

Group 6: <u>Year 9 School Attendance/Year 11 School Attendance and Subject Based Study Support</u>

The intra-school correlation in the null model is 0.149. This indicates that almost 15% of the total variance is accounted for at school level.

Hypothesis 6a: Controlling for Year 9 school attendance, attendance at subject study support will result in improved Year 11 school attendance.

Model 6.1:

- attending Year 10 subject study support improves Year 11 school attendance by an average of 0.227 percent. This is not statistically significant ($t=0.227/0.494=0.460$, d.f.=1193, $p=0.646$).
- attending Year 11 subject study support improves Year 11 school attendance by an average of 3.007 percent. This is statistically significant ($t=3.007/0.591=5.088$, d.f.=1193, $p=0.000$).
- the explanatory variables account for 22.3% of the total variance.

These findings support Hypothesis 6a in respect of Year 11, but not Year 10, subject study support.

Hypothesis 6b: The extent of the improvement in Year 11 school attendance from attending subject study support will vary by school.

Model 6.2(10):

- The difference in loglikelihood between Model 6.1 and 6.2(10) is not statistically significant ($\chi^2=0.4$, d.f.=2, $p=0.819$), indicating that there is no

variation between schools in the improvement in Year 11 school attendance from attending Year 10 subject study support.

Model 6.2(11)

- The difference in loglikelihood between Model 6.1 and 6.2(11) is not statistically significant (χ^2=4.4, d.f.=2, p=0.111). This indicates that there is also no variation between schools in the improvement in Year 11 school attendance from attending Year 11 subject study support.

These findings do not support Hypothesis 6b in respect of either Year 10 or Year 11 subject study support.

Hypothesis 6c: The extent of the improvement in Year 11 school attendance from attending subject study support will be different for FSM and non-FSM pupils within a school.

Model 6.3(10):

- there is a positive interaction between FSM and attendance at Year 10 subject study support of 0.938, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support. However, this interaction is not statistically significant (t=0.938/0.915=1.025, d.f.=1190, p=0.306).

Model 6.3(11)

- there is a negative interaction between FSM and attendance at Year 11 subject study support of -0.785, suggesting that pupils in receipt of free meals benefit less than non-FSM pupils from attending Year 11 study support. This interaction is also not statistically significant (t=-0.785/1.224=0.641, d.f.=1190, p=0.521).

These findings do not provide support for Hypothesis 6c.

Hypothesis 6d: The difference in the improvement in Year 11 school attendance from attending subject study support for FSM and non-FSM pupils will vary at school level.

Model 6.4(10):

- The difference in loglikelihood between Models 6.3(10)a and 6.4(10) is not statistically significant (χ^2=4.4, d.f.=4, p=0.355). This indicates that there is no variation across schools in the difference in improvement in Year 11 school attendance from attending Year 10 subject study support for FSM pupils in contrast to non-FSM pupils.

Model 6.4(11):

- The difference in loglikelihood between Models 6.3(11)a and 6.4(11) is not statistically significant as the loglikelihood for Model 6.4(11) is greater than that for 6.3(11)a. This indicates that there is no variation across schools in the difference in improvement in Year 11 school attendance from attending Year 10 subject study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 6d with regard to either Year 10 or Year 11 subject study support.

Group 7: Year 9 School Attendance/Year 11 School Attendance and Non-Subject Based Study Support

The intra-school correlation in the null model is 0.149. This indicates that almost 15% of the total variance is accounted for at school level.

Hypothesis 7a: Controlling for Year 9 school attendance, attendance at non-subject study support will result in improved Year 11 school attendance.

Model 7.1:

- attending Year 10 non-subject study support improves Year 11 school attendance by an average of 1.323 percent. This is statistically significant ($t=1.323/0.605=2.187$, d.f.=1192, $p=0.029$).
- attending Year 11 non-subject study support improves Year 11 school attendance by an average of 2.413 percent. This is also statistically significant ($t=2.413/0.537=4.493$, d.f.=1192, $p=0.000$).
- the explanatory variables account for 25.3% of the total variance.

These findings support Hypothesis 7a in respect of both Year 10 and Year 11 non-subject study support.

Hypothesis 7b: The extent of the improvement in Year 11 school attendance from attending non-subject study support will vary by school.

Model 7.2(10):

- The difference in loglikelihood between Model 7.1 and 7.2(10) is statistically significant ($\chi^2=12.3$, d.f.=2, $p=0.002$). This indicates that the extent of the improvement in Year 11 school attendance from attending Year 10 non-subject study support varies by school.

Model 7.2(11)

- The difference in loglikelihood between Model 7.1 and 7.2(11) is statistically significant (χ^2=17.6, d.f.=2, p=0.000). This indicates that the extent of the improvement in Year 11 school attendance from attending Year 11 non-subject study support also varies by school.

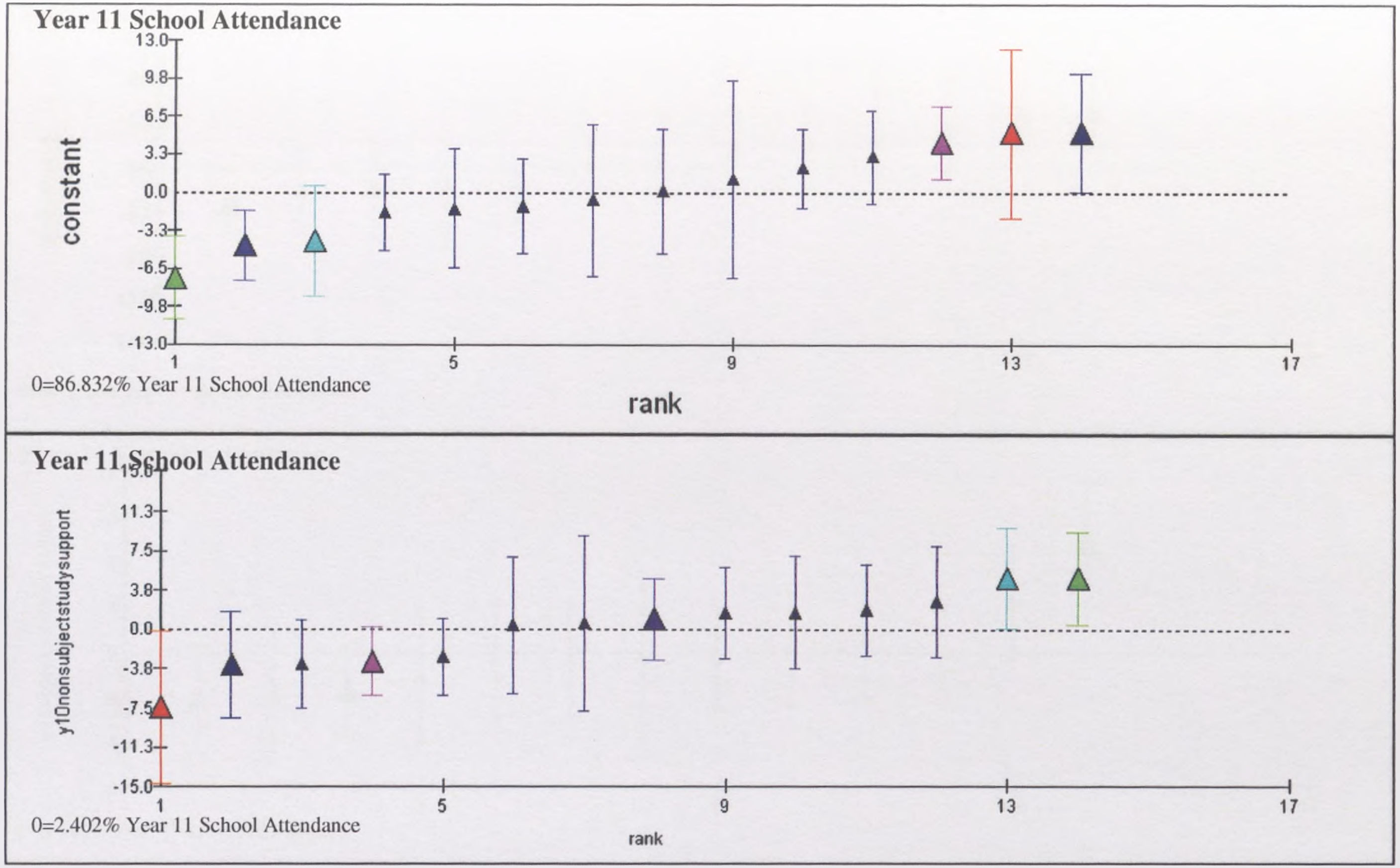
These findings support Hypothesis 7b in respect of both Year 10 and Year 11 non-subject study support.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 10 and Year 11 subject study support on students' Year 11 school attendance over and above the average change across all schools, it is necessary to examine the school-level residuals for Models 7.2(10) and 7.2(11). Figures 5.11 and 5.12 show the residual plots for the two random terms in both models. The plots show that, with regard to both Year 10 and Year 11, the schools in which the reference group pupils have lower Year 11 school attendance in comparison with reference group pupils in other schools gain most from attendance at subject study support, while schools in which the reference group pupils have higher Year 11 school attendance in comparison with reference group pupils in other schools gain less from attendance at subject study support. The strongly negative correlations between the intercept and 'slope' of -0.897 and -0.828 support this.

In Model 7.2(10) the overall coefficient for Year 10 subject study support is 2.402. The second plot in Figure 5.11 shows that three schools are significantly different from the average: the red line indicates that School 22 has 7.5 percent less attendance than 2.402, while the light blue and green lines indicate that Schools 31 and 33 both have 3.8 percent better attendance than the average. The effect of attending Year 10 subject study support varies from -5.098 percent (i.e. 2.402 – 7.5) to 6.202 percent (i.e. 2.402 + 3.8).

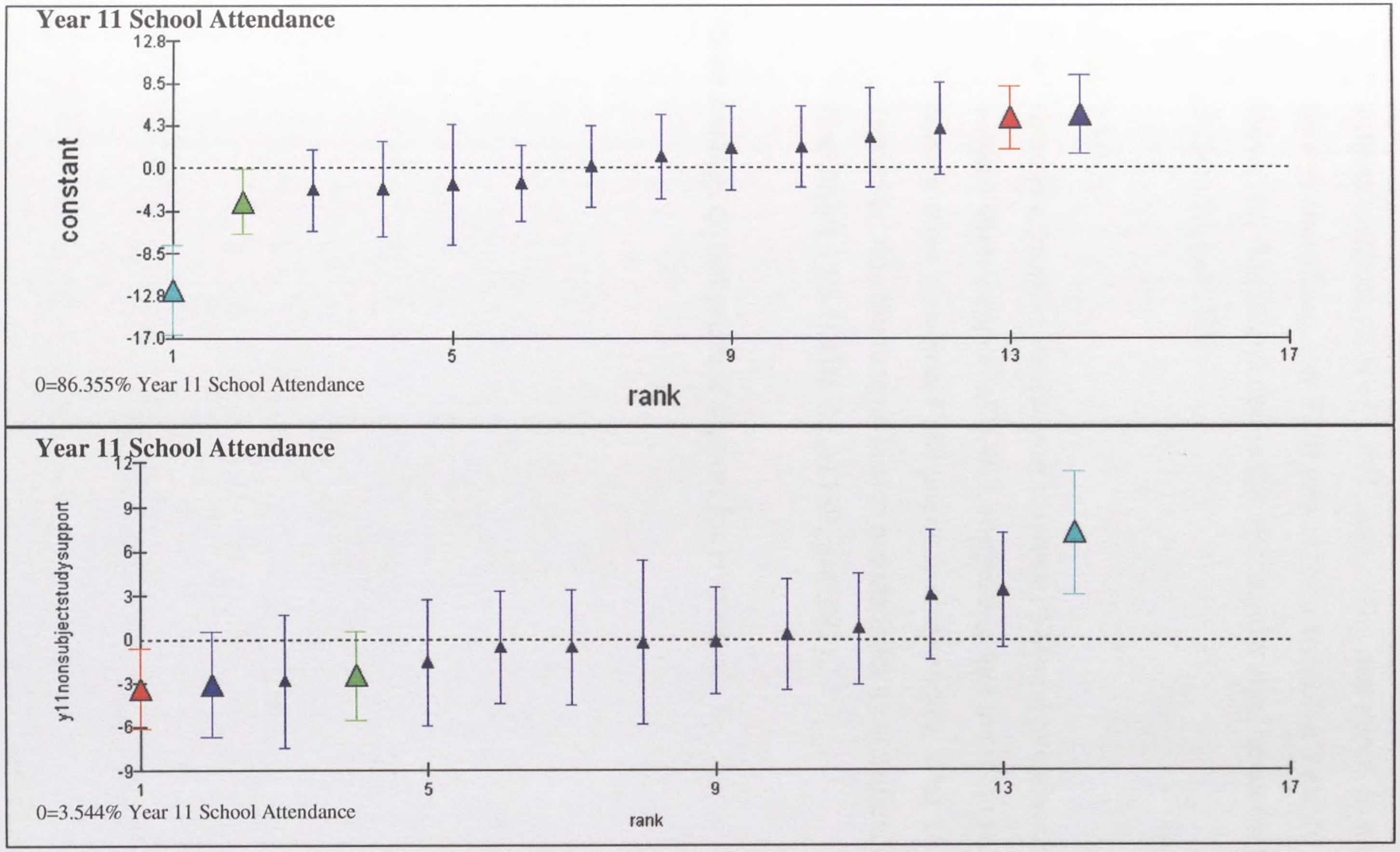
In Model 7.2(11) the overall coefficient for Year 11 subject study support is 3.544. The second plot in Figure 5.12 shows that two schools are significantly different from the average: the red line indicates that School 8 has 3.5 percent less attendance than 3.544, while the light blue line indicates that School 33 has 7.0 percent better attendance than the average. The effect of attending Year 11 subject study support varies from 0.044 percent (i.e. 3.544 – 3.5) to 10.544 percent (i.e. 3.544 + 7.0).

Figure 5.11: **Plots of school residuals for intercept and attendance at Year 10 subject study support for Model 7.2(10), Year 11 school attendance**



Red=School 22, Light Blue=School 31, Green=School 33

Figure 5.12: **Plots of school residuals for intercept and attendance at Year 11 subject study support for Model 7.2(11), Year 11 school attendance**



Red=School 8, Light Blue=School 33

Hypothesis 7c: The extent of the improvement in Year 11 school attendance from attending non-subject study support will be different for FSM and non-FSM pupils within a school.

Model 7.3(10):

- there is a positive interaction between FSM and attendance at Year 10 non-subject study support of 1.491, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support. However, this interaction is not statistically significant ($t=1.491/1.087=1.372$, $d.f.=1189$, $p=0.170$).

Model 7.3(11)

- there is a positive interaction between FSM and attendance at Year 11 non-subject study support of 0.463, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 study support. However, this interaction is also not statistically significant ($t=0.463/1.130=0.410$, $d.f.=1189$, $p=0.682$).

These findings do not provide support for Hypothesis 7c.

Hypothesis 7d: The difference in the improvement in Year 11 school attendance from attending non-subject study support for FSM and non-FSM pupils will vary at school level.

Model 7.4(10):

- The difference in loglikelihood between Models 7.3(10)a and 7.4(10) is not statistically significant (χ^2=3.5, d.f.=4, p=0.478). This indicates that there is no variation across schools in the difference in improvement in Year 11 school attendance from attending Year 10 non-subject study support for FSM pupils in contrast to non-FSM pupils.

Model 7.4(11):

- The difference in loglikelihood between Models 7.3(11)a and 7.4(11) is zero and is therefore not statistically significant. This indicates that there is no variation across schools in the difference in improvement in Year 11 school attendance from attending Year 11 non-subject study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 7d with regard to either Year 10 or Year 11 non-subject study support.

Group 8: <u>Year 9 Attitudes/Year 11 Attitudes and Subject Based Study Support</u>

The intra-school correlation in the null model is 0.071. This indicates that 7% of the total variance is accounted for at school level.

Hypothesis 8a: Controlling for Year 9 attitudes, attendance at subject study support will result in improved Year 11 attitudes.

Model 8.1:

- attending Year 10 subject study support improves Year 11 attitudes by an average of 1.534 points. This is not statistically significant (t=1.534/0.880=1.743, d.f.=1248, p=0.082).
- attending Year 11 subject study support improves Year 11 attitudes by an average of 6.900 points. This is statistically significant (t=6.900/1.141=6.047, d.f.=1248, p=0.000).
- the explanatory variables account for 29.1% of the total variance.

These findings support Hypothesis 8a in respect of Year 11, but not Year 10, subject study support.

Hypothesis 8b: The extent of the improvement in Year 11 attitudes from attending subject study support will vary by school.

Model 8.2(10):

- The difference in loglikelihood between Model 8.1 and 8.2(10) is zero and is therefore not statistically significant. This indicates that there is no variation between schools in the improvement in Year 11 attitudes from attending Year 10 subject study support.

Model 8.2(11)

- The difference in loglikelihood between Model 1.1 and 1.2(11) is also not statistically significant (χ^2=3.5, d.f.=2, p=0.174). This indicates that there is no variation between schools in the improvement in Year 11 attitudes from attending Year 11 subject study support.

These findings do not support Hypothesis 8b with regard to either Year 10 or Year 11 subject study support.

Hypothesis 8c: The extent of the improvement in Year 11 attitudes from attending subject study support will be different for FSM and non-FSM pupils within a school.

Model 8.3(10):

- there is a positive interaction between FSM and attendance at Year 10 subject study support of 0.604, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support. However, this interaction is not statistically significant (t=0.604/1.679=0.360, d.f.=1245, p=0.719).

Model 8.3(11)

- there is a negative interaction between FSM and attendance at Year 11 subject study support of -4.132, indicating that pupils in receipt of free meals benefit less than non-FSM pupils from attending Year 11 study support. However, this interaction is also not statistically significant (t=-4.132/2.491=1.659, d.f.=1245, p=0.097).

These findings do not provide support for Hypothesis 8c.

Hypothesis 8d: The difference in the improvement in Year 11 attitudes from attending subject study support for FSM and non-FSM pupils will vary at school level.

Model 8.4(10):

- The difference in loglikelihood between Models 8.3(10)a and 8.4(10) is not statistically significant (χ^2=2.4, d.f.=4, p=0.663). This indicates that there is no variation across schools in the difference in improvement in Year 11 attitudes from attending Year 10 subject study support for FSM pupils in contrast to non-FSM pupils.

Model 8.4(11):

- As Model 8.4(11) resulted in a numeric warning ('SSP matrix for fixed (random) part has gone negative definite'), it is not possible to use multilevel modelling to test if there is a variation across schools in the improvement in Year 11 attitudes from attending Year 11 subject study support for FSM pupils in contrast to non-FSM pupils. As the warning message 'SSP matrix for fixed (random) part has gone negative definite' suggests, this occurs when the matrix has become negative. This will be the result of the variance function for a particular combination of explanatory variable values becoming negative.[3] It is not possible to eliminate the problem by removing the relevant parameter from the model as the model has been designed to address the hypothesis.

These findings do not support Hypothesis 8d with regard to Year 10 subject study support. Hypothesis 8d cannot be tested in MLwiN in respect of Year 11 subject study support.

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[3] Source: www.cmm.bristol.ac.uk/MLwiN/tech-support/support-faqs/index.shtml#num

Group 9: Year 9 Attitudes/Year 11 Attitudes and Non-Subject Based Study Support

The intra-school correlation in the null model is 0.071. This indicates that 7% of the total variance is accounted for at school level.

Hypothesis 9a: Controlling for Year 9 attitudes, attendance at non-subject study support will result in improved Year 11 attitudes.

Model 9.1:

- attending Year 10 non-subject study support improves Year 11 attitudes by an average of 2.593 points. This is statistically significant ($t=2.593/1.179=2.199$, d.f.=1247, $p=0.028$).
- attending Year 11 non-subject study support improves Year 11 attitudes by an average of 5.509 points. This is also statistically significant ($t=5.509/0.993=5.548$, d.f.=1247, $p=0.000$).
- the explanatory variables account for 29.4% of the total variance.

These findings support Hypothesis 9a in respect of both Year 10 and Year 11 non-subject study support.

Hypothesis 9b: The extent of the improvement in Year 11 attitudes from attending non-subject study support will vary by school.

Model 9.2(10):

- The difference in loglikelihood between Model 9.1 and 9.2(10) is not statistically significant ($\chi^2=1$, d.f.=2, $p=0.607$), indicating that there is no variation between schools in the improvement in Year 11 attitudes from attending Year 10 non-subject study support.

Model 9.2(11)

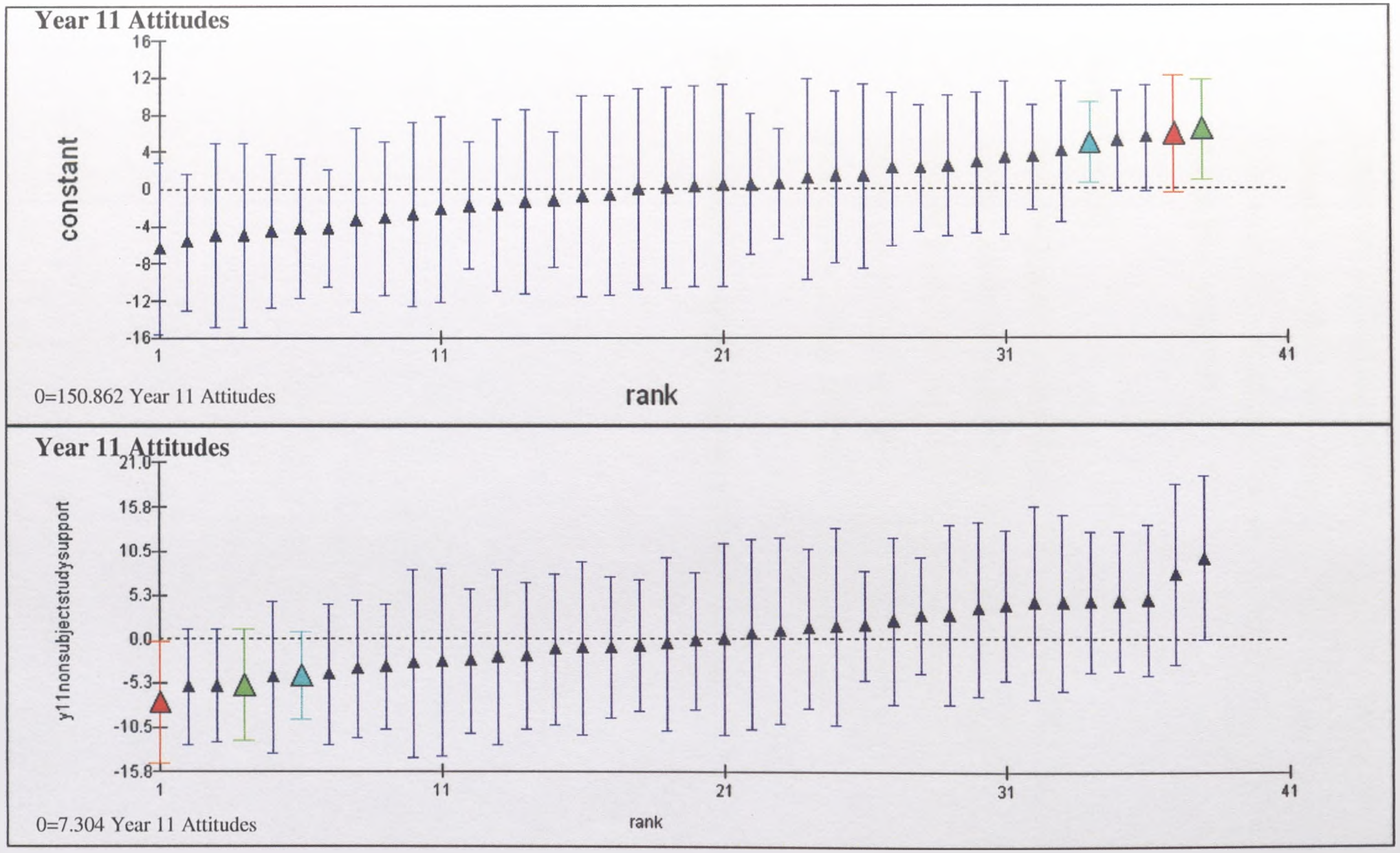
- The difference in loglikelihood between Model 9.1 and 9.2(11) is statistically significant (χ^2=7.5, d.f.=2, p=0.024). This indicates that the extent of the improvement in Year 11 attitudes from attending Year 11 non-subject study support varies by school.

These findings support Hypothesis 9b for Year 11, but not Year 10, non-subject study support only.

To assess the extent of the statistical differences between schools with regard to the impact of attending Year 11 non-subject study support on students' Year 11 attitudes over and above the average change across all schools, it is necessary to examine the school-level residuals for Models 9.2(11). Figure 5.13 shows the residual plots for the two random terms in the model. The plots show that the schools in which the reference group pupils have lower Year 11 attitudes in comparison with reference group pupils in other schools gain most from attendance at non-subject study support, while schools in which the reference group pupils have higher Year 11 attitudes in comparison with reference group pupils in other schools gain less from attendance at non-subject study support. The strongly negative correlation between the intercept and 'slope' of -0.834 supports this.

In Model 9.2(11) the overall coefficient for Year 11 non-subject study support is 7.304. The second plot in Figure 5.13 shows that one school is significantly different from the average: the red line indicates that School 7 has 8.0 points less than 7.304. No schools are significantly better than the average. The effect of attending Year 11 non-subject study support varies from -0.696 points (i.e. 7.304 – 8.0) to the average of 7.304 points.

Figure 5.13: **Plots of school residuals for intercept and attendance at Year 11 non-subject study support for Model 7.2(11), Year 11 attitudes**



Red=School 7

Hypothesis 9c: The extent of the improvement in Year 11 attitudes from attending non-subject study support will be different for FSM and non-FSM pupils within a school.

Model 9.3(10):

- there is a positive interaction between FSM and attendance at Year 10 non-subject study support of 3.157, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 10 study support. However, this interaction is not statistically significant ($t=3.157/2.564=1.231$, d.f.=1244, $p=0.218$).

Model 9.3(11)

- there is a positive interaction between FSM and attendance at Year 11 non-subject study support of 0.676, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending Year 11 study support. However, this interaction is also not statistically significant ($t=0.676/2.213=0.305$, d.f.=1244, $p=0.760$).

These findings do not provide support for Hypothesis 9c.

Hypothesis 9d: The difference in the improvement in Year 11 attitudes from attending non-subject study support for FSM and non-FSM pupils will vary at school level.

Model 9.4(10):

- The difference in loglikelihood between Models 9.3(10)a and 9.4(10) is zero and therefore not statistically significant. This indicates that there is no variation across schools in the difference in improvement in Year 11 attitudes from attending Year 10 non-subject study support for FSM pupils in contrast to non-FSM pupils.

Model 9.4(11):

- As Model 9.3(11)a would not converge, it is not possible to use multilevel modelling to test if there is a variation across schools in the improvement in Year 11 attitudes from attending Year 11 non-subject study support for FSM pupils in contrast to non-FSM pupils.

These findings do not support Hypothesis 9d with regard to Year 10 non-subject study support. Hypothesis 9d cannot be tested in MLwiN in respect of Year 11 non-subject study support.

Group 10: <u>NVR/Best 5 and Easter School</u>

The intra-school correlation in the null model is 0.072. This indicates that 7% of the total variance is accounted for at school level.

Hypothesis 10a: Controlling for NVR, attendance at Easter School will result in improved Best 5 GCSE attainment.

Model 10.1:

- attending an Easter School improves Best 5 GCSE attainment by an average of 3.846 points. This is statistically significant (t=3.846/0.317=12.132, d.f.=1681, p=0.000). The 3.846 points are <u>in addition</u> to the improvements from attending Year 10 and Year 11 subject study support.
- the explanatory variables account for 35.4% of the total variance.

This finding supports Hypothesis 10a.

Hypothesis 10b: The extent of the improvement in Best 5 GCSE attainment from attending Easter School will vary by school.

Model 10.2

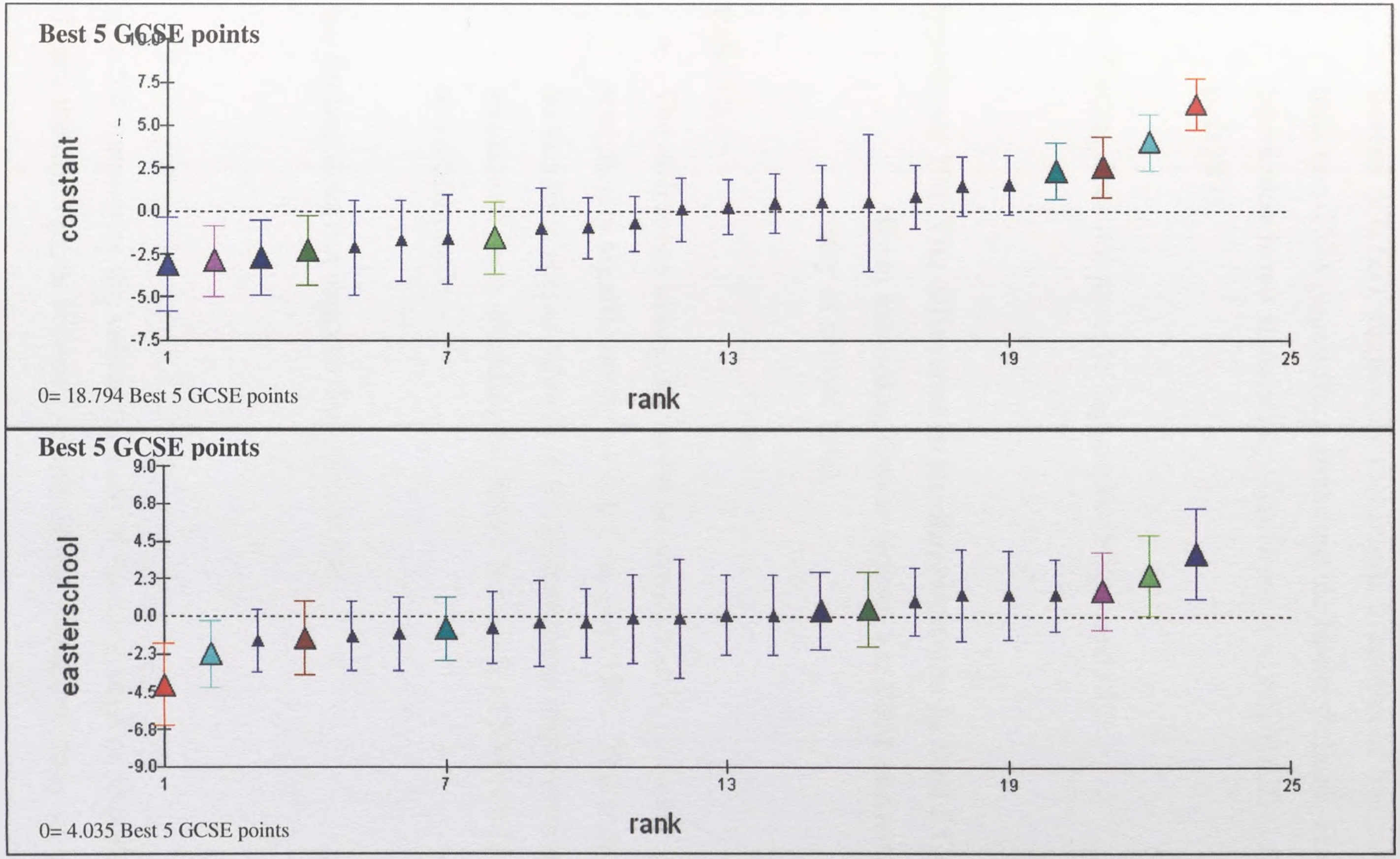
- The difference in loglikelihood between Model 10.1 and 10.2 is statistically significant (χ^2=13.8, d.f.=2, p=0.001). This indicates that the extent of the improvement in Best 5 GCSE attainment from attending an Easter School varies by school.

This finding supports Hypothesis 10b.

To assess the extent of the statistical differences between schools with regard to the impact of attending and Easter School on promoting students' progress over and above the average progress across all schools, it is necessary to examine the school-level residuals for Models 10.2. Figure 5.14 shows the residual plots for the two random terms in the models. The plots show that the schools in which the reference group pupils achieve lower Best 5 GCSE scores in comparison with reference group pupils in other schools gain most from attendance at an Easter School, while schools in which the reference group pupils achieve higher Best 5 GCSE scores in comparison with reference group pupils in other schools gain less from attendance at an Easter School. The strong negative correlation between the intercept and 'slope' of -0.782 supports this.

In Model 10.2 the overall coefficient for attendance at an Easter School is 4.035. The second plot in Figure 5.14 shows that four schools are significantly different from the average: the red and light blue lines indicate that Schools 8 and 4 score 4.3 and 2.3 less Best 5 GCSE points, while the light green and blue lines indicate that Schools 29 and 25 score 2.3 and 3.4 Best 5 GCSE points better than the average. The effect of attending an Easter School varies from -0.265 (i.e. 4.035 – 4.3) to 7.435 (i.e. 4.035 + 3.4).

Figure 5.14: **Plots of school residuals for intercept and attendance at an Easter School for Model 10.2, Best 5 GCSE points**



Red=School 8, Light Blue=School 4, Light Green=29, Blue=School 25

Hypothesis 10c: The extent of the improvement in Best 5 GCSE attainment from attending Easter School will be different for FSM and non-FSM pupils within a school.

Model 10.3:

- there is a positive interaction between FSM and attendance at an Easter School of 0.660, suggesting that pupils in receipt of free meals benefit more than non-FSM pupils from attending the Easter School. However, this interaction is not statistically significant (t=0.660/0.620=1.065, d.f.=1678, p=0.287).

This finding does not provide support for Hypothesis 10c.

Hypothesis 10d: The difference in the improvement in Best 5 GCSE attainment from attending Easter School for FSM and non-FSM pupils will vary at school level.

Model 10.4:

- The difference in loglikelihood between Models 10.3a and 10.4 is not statistically significant (χ^2=4.4, d.f.=4, p=0.355). This indicates that there is no variation across schools in the difference in improvement in Best 5 GCSE attainment from attending an Easter School for FSM pupils in contrast to non-FSM pupils.

This finding does not support Hypothesis 10d.

Table 5.6 summarise the values for each of the 10 groups of hypotheses, while Table 5.7 lists the differences between schools in the impact of study support.

Table 5.6: **Summary of values from hypotheses testing**

Group	**Baseline**	**Output**	**Study Support**		**Hypothesis a** Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE **Uses Model 1**	**Hypothesis b** The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school **Uses Model 2**	**Hypothesis c** The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school **Uses Model 3**	**Hypothesis d** The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level **Uses Model 4:**
1	NVR	GCSE Best 5	Subject	Yr 10	1.246 (p=0.000)	n.s.	1.158 (p=0.032)	n.s.
				Yr11	3.333 (p=0.000)	p=0.000	1.892 (p=0.013)	Cannot test using MLwiN
2	NVR	GCSE Best 5	Non-Subject	Yr 10	1.116 (p=0.005)	n.s.	n.s	n.s.
				Yr11	1.216 (p=0.001)	p=0.000	n.s.	n.s.
3	SATS Maths	GCSE Maths	Maths	Yr 10	0.218 (p=0.000)	p=0.018	n.s.	n.s.
				Yr11	0.266 (p=0.000)	p=0.000	n.s.	n.s.
4	SATS English	GCSE English	English	Yr 10	0.218 (p<0.050)	n.s.	0.458 (p=0.023)	Cannot test using MLwiN
				Yr11	n.s.	p=0.000	n.s.	n.s.
5	SATS Science	GCSE Science	Science	Yr 10	n.s.	n.s	n.s.	n.s.
				Yr11	0.320 (p=0.000)	p=0.027	n.s.	n.s.

n.s.= not significant

(Continued overleaf)

Table 5.6 (continued): **Summary of values from hypotheses testing**

Group	**Baseline**	**Output**	**Study Support**		**Hypothesis a** Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE **Uses Model 1**	**Hypothesis b** The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school **Uses Model 2**	**Hypothesis c** The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school **Uses Model 3**	**Hypothesis d** The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level **Uses Model 4:**
6	Yr 9 School Attendance	Yr 11 School Attendance	Subject	Yr 10 Yr11	n.s. 3.007 (p=0.000)	n.s. n.s.	n.s. n.s.	n.s. n.a.
7	Yr 9 School Attendance	Yr 11 School Attendance	Non-Subject	Yr 10 Yr11	1.323 (p=0.029) 2.413 (p=0.000)	p=0.002 p=0.000	n.s. n.s.	n.s. n.s.
8	Yr 9 Attitudes	Yr 11 Attitudes	Subject	Yr 10 Yr11	n.s. 6.900 (p=0.000)	n.s. n.s.	n.s. n.s.	n.s. Cannot test using MLwiN
9	Yr 9 Attitudes	Yr 11 Attitudes	Non-Subject	Yr 10 Yr11	2.593 (p=0.028) 5.509 (p=0.000)	n.s. p=0.024	n.s. n.s.	n.s. Cannot test using MLwiN.
10	NVR	GCSE Best 5	Easter School (with Subject)		3.846 (p=0.000)	p=0.001	n.s.	n.s.

n.s.= not significant

Table 5.7: **Summary of differences between schools in the impact of study support**

Group	Baseline	Output	Study Support		Number of Schools included in Model	Correlation between intercept and 'slope'	School Residuals Departure of school midpoints from zero for schools whose 95% confidence intervals do not overlap zero	School-level Impact of Study Support Average	 Maximum and minimum values for impact of study support
1	NVR	GCSE Best 5	Subject	Yr11	32	-0.830	School 8 -2.3 School 5 -4.5	3.572	Max: 3.572 Min: -0.928 Diff: 4.5
2	NVR	GCSE Best 5	Non-Subject	Yr11	32	-0.834	School 15 +3.4 School 33 +3.3 School 25 -3.2 School 27 -4.0	1.705	Max: 5.105 Min: -2.295 Diff: 7.4
3	SATS Maths	GCSE Maths	Maths	Yr 10	33	-0.834	School 20 +0.4 School 33 +0.35 School 4 -0.36 School 5 -.0.6	0.276	Max: 0.676 Min: -0.324 Diff: 1.0
				Yr11	33	-0.733	School 26 +0.45 School 6 +0.25 School 39 -0.45 School 4 -0.5 School 5 -0.55	0.277	Max: 0.727 Min: -0.273 Diff: 1.0
4	SATS English	GCSE English	English	Yr11	32	-0.296	School 6 +0.65 School 34 -0.4 School 37 -0.45 School 20 -0.55	0.021	Max: 0.671 Min: -0.529 Diff: 1.2

Note: Where the maximum value is reported to be the same as the average, this indicates that no school had a residual that was significantly higher than the average.

(Continued overleaf)

Table 5.7 (continued): **Summary of differences between schools in the impact of study support**

Group	Baseline	Output	Study Support	Number of Schools included in Model	Correlation between intercept and 'slope'	School Residuals	School-level Impact of Study Support	
						Departure of school midpoints from zero for schools whose 95% confidence intervals do not overlap zero	Average	Maximum and minimum values for impact of study support
5	SATS Science	GCSE Science	Science Yr11	33	-0.596	School 35 +0.3 School 4 -0.35	0.326	Max: 0.626 Min: -0.024 Diff: 0.65
7	Yr 9 School Attendance	Yr 11 School Attendance	Non-Subject Yr 10	14	-0.897	School 31 +3.8 School 33 +3.8 School 22 -7.5	2.402	Max: 6.202 Min: -5.098 Diff: 11.3
			Yr11	14	-0.828	School 33 +7.0 School 8 -3.5	3.544	Max: 10.544 Min: 0.044 Diff: 10.588
9	Yr 9 Attitudes	Yr 11 Attitudes	Non Subject Yr11	38	-0.834	School 7 -8.0	7.304	Max: 7.304 Min: -0.696 Diff: 8.0
10	NVR	GCSE Best 5	Easter School (with Subject)	23	-0.782	School 25 +3.4 School 29 +2.3 School 4 -2.3 School 8 -4.3	4.035	Max: 7.435 Min: -0.265 Diff: 7.7

Note: Where the maximum value is reported to be the same as the average, this indicates that no school had a residual that was significantly higher than the average.

SYNTHESIS OF FINDINGS

The intra-school correlations for the null models ranged from 0.047 to 0.149, indicating that approximately 5% to 15% of the total variance in each model was accounted for at school level. The two models in which the school accounted for the highest percentage were Models 6.1 and 7.1. These models explored the impact of participation at subject and non-subject study support on school attendance.

The explanatory variables (male, FSM, white, Year 10 study support and Year 11 study support account) accounted for between 22.3% and 68.1% of the total variance. The lowest percentage (22.3%) was in Model 6 and the highest (68.1%) was in Model 3. Model 6 was concerned with the impact of participation at subject study support on school attendance, while Model 3 was concerned with the impact of participation at maths study support on maths GSCE.

<u>**Hypothesis a**</u>**:**
Controlling for BASELINE MEASURE, attendance at STUDY SUPPORT CATEGORY will result in improved OUTPUT MEASURE.

Attainment

In general the findings suggest that participation in study support does result in improved attainment. Indeed, support for this hypothesis was found with respect to all attainment combinations with the exception of:

- SATS English/GCSE English and English Study Support (Year 11)
- SATS Science/GCSE Science and Science Study Support (Year 10).

In all but one of the attainment combinations (English), Year 11 study support is more effective than Year 10.

Of the specific curriculum subjects (i.e. maths, English and science), the greatest improvement was for Year 11 Science (0.320, equating to an average improvement of one third of a grade).

Attending Year 11 subject study support increased the Best 5 score by an average of 3.333 points. This could mean the difference of an additional three passes or of one 'A' grade, rather than a 'D' grade.

The benefit of attending non-subject study support appears to be less than that from attending subject study support. It is, none-the-less, statistically significant (both in Year 10 and Year 11) and suggests that the benefits of non-subject study support are not limited to attitudes and/or school attendance (although it may be that the improved attitudes and attendance contribute towards improved attainment).

Attending an Easter School improves GCSE Best 5 by an average of 3.846 points (i.e. almost four grades). This could mean the difference of four additional passes or perhaps two 'A' grades, rather than two 'C' grades. The 3.846 points was in addition to the 1.395 and 3.112 points from attending Year 10 and Year 11 subject-focused study support (see Model 10.1). The Easter School analysis suggests that a pupil who wishes to participate in only one form of study support should attend an Easter School. It also shows that a pupil who attends a combination of Year 10 and Year 11 subject study support and an Easter School could raise his/her Best 5 score by a total of 8.353 points (i.e. 1.395 + 3.112 + 3.846).

School Attendance

In general the findings suggest that participation in study support does result in improved school attendance. The greatest impact is from Year 11 subject study support (an increase of 3%) and Year 11 non-subject study support (almost 2.5%). It is interesting that participation in Year 10 subject study support does not make a significant difference to school attendance, while participating in Year 10 non-subject study support does. This suggests that non-subject study support can sometimes have an impact where subject study support does not.

The association between participation in non-subject study support and increased school attendance would suggest that non-subject study support offers pupils an experience which encourages them to attend school. Curiously, however, Year 11 subject study support does have a statistically significant effect on school attendance and this effect is greater than that from attending Year 11 non-subject study support.

Attitudes

In general, the findings support the hypothesis that participation in study support does result in improved attitudes. There are a number of important similarities between the findings in relation to school attendance and attitudes. These are:

- Year 10 non-subject study support makes a statistically significant difference while Year 10 subject study support does not
- Year 11 subject study support has a larger effect than Year 11 non-subject study support.

This is therefore another example of Year 10 non-subject study support having an impact where Year 10 subject support does not.

Hypothesis b:

The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will vary by school.

Support for this hypothesis was found with regard to the following combinations:

- NVR/Best 5 and Subject Based Study Support (Year 11)
- NVR/Best 5 and Non-Subject Based Study Support (Year 11)
- SATS Maths/GCSE Maths and Maths Study Support (Year 10)
- SATS Maths/GCSE Maths and Maths Study Support (Year 11)
- SATS English/GCSE English and English Study Support (Year 11)
- SATS Science/GCSE Science and Science Study Support (Year 11)
- Year 9 School Attendance/Year 11 School Attendance and Non-Subject Based Study Support (Year 10)
- Year 9 School Attendance/Year 11 School Attendance and Non-Subject Based Study Support (Year 11)
- Year 9 Attitudes/Year 11 Attitudes and Non-Subject Based Study Support (Year 11)
- NVR/Best 5 and Easter School.

Attainment

All five of the Year 11 attainment combinations were found to be statistically significant between schools, while only one (science) of the Year 10 attainment combination was found to be so. This suggests that there is greater variety between schools in the impact of study support offered in Year 11.

School Attendance

There is a statistically significant difference between schools in the impact on school attendance of both Year 10 and Year 11 non-subject study support. As this is not evident in subject study support, it would appear that there is greater variety between schools in terms of the impact of non-subject support than subject study support.

Attitudes

Of the four combinations involving attitudes, only Year 11 non-subject study support was found to be statistically different between schools. This suggests that there was a variation between schools in the impact on attitudes of Year 11 non-subject study support that did not exist in Year 10 non-subject study support or Year 10 or Year 11 subject study support.

Interestingly, while some of the attainment, school attendance and attitude combinations that were identified in hypothesis a as being significant across schools were found in hypothesis b to vary by school, others were found not to vary by school. One combination - SATS English/GCSE English and English Study Support (Year 11) – was not identified as being statistically significant across all schools (hypothesis a), but it was found to vary by school (hypothesis b) - i.e. overall, attending Year 11 English study support does not result in improved GSCE English, but in some schools it does.

An exploration of the school-level residuals (i.e. the intercept and the coefficient for attendance at study support) in the ten models in which statistically significant differences were found between schools in the impact of attendance at study support revealed that there was a negative correlation between the intercept and 'slope' in each case. Indeed, in seven of the models the correlation was -0.8 or greater. The implication of this finding is that study support is more effective in schools with lower attainment, lower school attendance and lower attitudes. Correlations of less than -0.8 were found in the three subject-specific study support groups: Year 11 maths -0.733, Year 11 Science -0.596 and Year 11 English -0.296.

The extent of the differences between schools is summarised in Table 5.8.

Table 5.8: **Summary of the extent of differences between schools in the impact of attendance at study support**

<table>
<tr><th rowspan="2">Group</th><th rowspan="2">Baseline</th><th rowspan="2">Output</th><th rowspan="2" colspan="2">Study Support</th><th colspan="2">Extent of Difference between Schools</th></tr>
<tr><th>Size of Differ-ence</th><th>Possible Implication of Difference for GSCE Results/Attendance/Attitude</th></tr>
<tr><td>1</td><td>NVR</td><td>GCSE Best 5</td><td>Subject</td><td>Yr11</td><td>4.5</td><td>4 additional passes
2 'A's rather than 2 'C's</td></tr>
<tr><td>2</td><td>NVR</td><td>GCSE Best 5</td><td>Non-Subject</td><td>Yr11</td><td>7.4</td><td>7 additional passes
3 'A's and 1 'B' rather than 4 'C's</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">SATS Maths</td><td rowspan="2">GCSE Maths</td><td rowspan="2">Maths</td><td>Yr 10</td><td>1.0</td><td>An 'A' rather than a 'B'
A 'B' rather than a 'C'</td></tr>
<tr><td>Yr11</td><td>1.0</td><td>An 'A' rather than a 'B'
A 'B' rather than a 'C'</td></tr>
<tr><td>4</td><td>SATS English</td><td>GCSE English</td><td>English</td><td>Yr11</td><td>1.2</td><td>An 'A' rather than a 'B'
A 'B' rather than a 'C'</td></tr>
<tr><td>5</td><td>SATS Science</td><td>GCSE Science</td><td>Science</td><td>Yr11</td><td>0.65</td><td>Improvement by half a grade</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Yr 9 School Attendance</td><td rowspan="2">Yr 11 School Attendance</td><td rowspan="2">Non-Subject</td><td>Yr 10</td><td>11.3</td><td>11.3% attendance</td></tr>
<tr><td>Yr11</td><td>10.588</td><td>10.6% attendance</td></tr>
<tr><td>9</td><td>Yr 9 Attitudes</td><td>Yr 11 Attitudes</td><td>Non Subject</td><td>Yr11</td><td>8.0</td><td>8.0 points on attitude scale</td></tr>
<tr><td>10</td><td>NVR</td><td>GCSE Best 5</td><td>Easter School (with Subject)</td><td></td><td>7.7</td><td>7 additional passes
3 'A's and 1 'B' rather than 4 'C's</td></tr>
</table>

Hypothesis c:

The extent of the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY will be different for FSM and non-FSM pupils within a school.

Support for this hypothesis was found in respect of only three attainment-related combinations:

- NVR/Best 5 and Subject Based Study Support (Year 10)
- NVR/Best 5 and Subject Based Study Support (Year 11)
- SATS English/GCSE English and English Study Support (Year 10)

In each case the interaction between FSM and study support was positive, indicating that FSM pupils benefit more than non-FSM pupils from participating in these activities. The difference in Best 5 GCSE score was just over one point (1.158) for FSM pupils who participated in Year 10 subject study support and almost two points (1.892) – e.g. two additional passes, or perhaps a grade 'A' rather than a grade 'C' - for FSM pupils who participated in Year 11 subject study support.

For all other attainment combinations, there were no significant differences between the impact of participation in study support for FSM and non-FSM pupils. This indicates that the benefits of participating in study support are not greater or less for FSM pupils in comparison with non-FSM pupils – i.e. participation in study support has the same impact on FSM and non-FSM pupils.

No support for hypothesis c was found with regard to any of the school attendance or attitude combinations.

<u>Hypothesis d</u>:

The difference in the improvement in OUTPUT MEASURE from attending STUDY SUPPORT CATEGORY for FSM and non-FSM pupils will vary at school level.

This hypothesis could not be tested with regard to four particular combinations, including two of the attainment combinations in which FSM pupils were found to benefit more than non-FSM pupils (i.e. Year 11 subject study support and NVR/GCSE Best 5 and Year 10 English and GCSE English/SATS English).

For all other combinations, however, hypothesis d was tested and no support was found. This indicates that there were no statistically significant differences between schools in the improvement in the output measure from participation in study support for FSM pupils relative to non-FSM pupils.

SUMMARY

The findings reported in this chapter suggest that:

1. By and large, participation in study support has a positive impact on attainment, school attendance and attitudes.
2. The impact of participation in Year 11 study support is, generally speaking, greater than the impact of participation in Year 10 study support. This applies to attainment, school attendance and attitudes.
3. In terms of attainment, attending an Easter School is more beneficial than participation in Year 10 and Year 11 subject study support. Pupils striving for maximum impact should attend Year 10 study support, Year 11 study support and an Easter School.
4. In ten of the combinations, there are statistically significant differences between schools in the impact of participation in study support. These combinations include attainment, school attendance and attitudes. Study support appears to be most effective in schools with lower attainment, lower school attendance and lower attitudes.
5. FSM pupils benefit more than non-FSM pupils from participation in study support in three combinations. (Two of these combinations are Year 10 and Year 11 subject study support and NVR/GCSE Best 5.) There are no combinations in which FSM pupils benefit less than non-FSM pupils. In other words, there are no combinations in which participation in study support widens the gap between FSM and non-FSM pupils.
6. The benefit for FSM pupils, relative to non-FSM pupils, does not vary between schools. However, it should be noted that it was not possible to test this using MLwiN for four of the combinations. These include two of the combinations in which FSM pupils were found to benefit more than non-FSM pupils (i.e. Year 11 subject study support and NVR/GCSE Best 5 and Year 10 English and GCSE English/SATS English).

Chapter 6: DISCUSSION

This Chapter will discuss the results reported in Chapter 5 in relation to the theoretical model outlined in Chapter 2 and consideration will be given to what the results suggest about the impact of study support. The strengths and limitations of the research will be discussed in depth later in this Chapter, but it is worth restating in this opening paragraph that the word 'impact' has to be used with considerable caution in a study such as the present one. There are two key reasons for this:

1. the study was based on correlational data and any apparent improvements in attainment/attendance/attitudes may not necessarily be the result of participation in study support. Other variables may be responsible for, or at least contribute to, the improved outcomes
2. there was a considerable amount of missing data. This reduced the number of pupils who could be included in the analyses. It also reduced the number of schools that could be included in the multilevel models. Indeed, only 14 schools were included in some analyses and this may have amplified any differences identified between schools.

The Chapter concludes with a discussion of the implications of the study for future research into study support and study support policy.

The theoretical model presented in Chapter 2 acknowledges that there is no simple relationship between the type of study support activity attended (i.e. subject based or non-subject based) and the improved outcome (or outcomes). Previous research has found that subject based provision generally results in improved attainment, while non-subject based provision generally results in improved attitudes and school attendance. However, some researchers have reported that subject based activities can increase attitudes and attendance and non-subject based study support can result in improved attainment. The model was presented in an attempt to conceptually map and subsequently test participation in study support activities with improved attainment, attitudes and school attendance. In addition to the general category of subject based provision, the study included maths, English and science separately (although these were included in the general 'subject based' category). Easter School was the only intensive form of study support included in the research. It included subject based provision only. The model suggests that the impact of participation in study support will be influenced by the overall 'school experience' which is influenced by the characteristics of the pupils (e.g. gender and ethnicity), their home experience and the school attended.

Table 6.1 summarises the coefficients for each study support variable within the key groups explored in the hypotheses. The table suggests that subject based study support does indeed impact on attainment. However, non-subject based study support also appears to impact on attainment, although to a lesser extent. Some of the previous research summarised in Chapter 2 also found an association between participation in subject based study support and improved attainment, e.g. Pocklington (1996) and Mason, Pye and Easton (2004). The present study has therefore replicated these findings from other research, but with a much larger sample size.

An interesting finding summarised in Table 6.1 is that, with the exception of English, it seems that in all of the attainment combinations Year 11 study support is more effective than Year 10 study support. For subjects other than English, it is likely to be recency effects that result in Year 11 study support being more effective. The fact this is not seen in the case of English reinforces the belief that English is effected by environmental factors, is more diffuse in its content and may be considered to be more complex to teach as it is more difficult to rehearse and review than other subjects (such as maths and science).

Table 6.1: **Study support activities and outcomes: comparison of coefficient for study support variables**

Output Measure	Study Support Category	Coefficients for Study Support Variable Year 10	Year 11	Hypotheses Group (Baseline & output measures)
Attainment	Subject	1.246 (p=0.000)	3.333 (p=0.000)	1 NVR/Best 5
	Non-Subject	1.116 (p=0.005)	1.216 (p=0.001)	2 NVR/Best 5
	Easter School	Provided in Year 11 only	3.846 (p=0.000)	10 NVR/Best 5
	Maths	0.218 (p=0.000)	0.266 (p=0.000)	3 SATS Maths/GCSE Maths
	English	0.218 (p<0.050)	n.s.	4 SATS English/GCSE English
	Science	n.s.	0.320 (p=0.000)	5 SATS Science/GCSE Science
Attendance	Subject	n.s.	3.007 (p=0.000)	6 Yr9/Yr11 School Attendance
	Non-Subject	1.323 (p=0.029)	2.413 (p=0.000)	7 Yr9/Yr11 School Attendance
Attitudes	Subject	n.s.	6.900 (p=0.000)	8 Yr9/Yr11 Attitudes
	Non-Subject	2.593 (p=0.028)	5.509 (p=0.000)	9 Yr9/Yr11 Attitudes

n.s. = not significant

Table 6.1 implies that Easter School participation also has an impact on attainment. It is, in fact, Easter School participation that impacts most on attainment. This suggests that, in the event of limited funding, it would make sense for a school (or local authority) to concentrate on the provision of intensive subject based study support, rather than extensive subject based or non-subject based support. It also suggests that a pupil who wants to make the most effective use of his/her study support time should attend intensive subject based study support provision. In the present study, the apparent impact of attendance at Easter School is in addition to the impact of attending Year 10 and Year 11 subject based study support. Pocklington (1996) also reported that participation at an Easter School impacts positively on attainment. However, his research was limited to pupils attending the same London Borough. The present study has therefore replicated Pocklington's finding, but with a broader (albeit not representative) sample involving schools drawn from a number of local education authorities.

The table also indicates that non-subject based study support impacts on school attendance and attitudes. Again this replicates the findings from previous research (e.g. Mason, Bhabra & Rees 2002, Miller 1998, and Tierney, Grossman & Resch 1995), but with a much larger sample size. In Year 10 non-subject based study support appears to impact on school attendance and attitudes, while Year 10 subject based study support does not. One possible explanation for this is that pupils find non-subject based provision to be more enjoyable than subject based provision and participation in such provision therefore results in improved school attendance and attitudes. An unexpected finding in this study is that Year 11 subject based study support seems to impact on school attendance and attitudes to a greater extent than Year 11 non-subject based study support. This finding has not been recorded in other studies. Chapter 3 reported that participation in subject based study support by the overall sample was 48.7% in Year 10 and 79.6% in Year 11. It may be that the group of pupils who attended such provision in Year 11 but not in Year 10 included those who would have attended school often and scored highly on the attitude questionnaire regardless of their participation in study support. In other words, the apparent change in impact between Year 10 and Year 11 may not reflect a change in the quality of provision but a change in the pupils accessing that provision.

There was no value in exploring the impact of Easter School participation on attitudes and school attendance as the post-test attitudinal and attendance data were collected before the Easter Schools took place. There was therefore no opportunity for the Easter School to impact on these outcome measures.

In summary, the above findings suggest that:

- attending extensive Year 11 subject based study support leads to improved attainment, attitudes and school attendance
- attending extensive Year 10 non-subject based study support raises attitudes and school attendance while Year 10 subject study support raises attainment
- attending intensive subject based provision is particularly effective at improving attainment.

Table 6.2: **Study support activities and outcomes: comparison of p values for chi-square tests of the difference in loglikelihood for model when study support variable is random**

Output Measure	Study Support Category	P Value for Chi-square Test of the Difference in Loglikelihood for Model when Study Support Variable is Random		Hypotheses Group (Baseline & output measures)
		Year 10	Year 11	
Attainment	Subject	n.s.	p=0.000	1 NVR/Best 5
	Non-Subject	n.s.	p=0.000	2 NVR/Best 5
	Easter School	Provided in Year 11 only	p=0.001	10 NVR/Best 5
	Maths	p=0.018	p=0.000	3 SATS Maths/GCSE Maths
	English	n.s.	p=0.000	4 SATS English/GCSE English
	Science	n.s.	p=0.027	5 SATS Science/GCSE Science
Attendance	Subject	n.s.	n.s.	6 Yr9/Yr11 School Attendance
	Non-Subject	p=0.002	p=0.000	7 Yr9/Yr11 School Attendance
Attitudes	Subject	n.s.	n.s.	8 Yr9/Yr11 Attitudes
	Non-Subject	n.s.	p=0.024	9 Yr9/Yr11 Attitudes

n.s. = not significant

Table 6.2 shows the study support activities in which statistical differences were found between schools in the effectiveness of study support. These differences were present for all Year 11 subject based study support activities and Year 10 maths. There were also differences between schools in the impact of Year 11 non-subject based study support on school attendance and attitudes and on Year 10 non-subject based study support and school attendance. It is important to remember that some analyses were based on just 14 schools. With a larger number of schools, some of the differences may not have been found to be statistically significant.

The above findings suggest that study support is more effective in some schools than others with regard to these particular forms of provision. This is interesting because, while the main evaluation report (MacBeath *et al* 2001) used school dummy variables to explore the school effect on each of the outputs, it did not explore the school effect on the study support activities. No evidence can be found of other researchers having explored between-school differences in the effectiveness of study support.

Where differences between schools were found, the school level residuals for both the intercept and the study support coefficient were examined to assess the extent of the differences. The differences are summarised overleaf in Table 6.3.

Table 6.3: **Study support activities and outcomes: summary of differences between schools in the impact of study support where statistically significant differences were found**

Group	Baseline	Output	Study Support		Number of Schools included in Model	Correlation between intercept and 'slope'	School-level Impact of Study Support	
							Average	Difference between lowest and higher residual
1	NVR	GCSE Best 5	Subject	Yr11	32	-0.830	3.572	4.5
2	NVR	GCSE Best 5	Non-Subject	Yr11	32	-0.834	1.705	7.4
3	SATS Maths	GCSE Maths	Maths	Yr 10	33	-0.834	0.276	1.0
				Yr11	33	-0.733	0.277	1.0
4	SATS English	GCSE English	English	Yr11	32	-0.296	0.021	1.2
5	SATS Science	GCSE Science	Science	Yr11	33	-0.596	0.326	0.65
7	Yr 9 School Attendance	Yr 11 School Attendance	Non-Subject	Yr 10	14	-0.897	2.402	11.3
				Yr11	14	-0.828	3.544	10.588
9	Yr 9 Attitudes	Yr 11 Attitudes	Non-Subject	Yr11	38	-0.834	7.304	8.0
10	NVR	GCSE Best 5	Easter School (with Subject)		23	-0.782	4.035	7.7

With regard to the attainment outcomes, it would appear that the greatest difference in the impact of study support is 7.4 Best 5 GCSE points. This applies to the Year 11 non-subject based study/GCSE combination. A difference of 7.4 points would equate to, for example, 4 'A' passes, rather than one 'B' and 3 'C's. In the case of Year 11 subject based provision the difference is 4.5 points, which could translate into two 'A' passes rather than 2 'B' passes. These findings demonstrate that there is more variation in the effectiveness of provision in non-subject based provision than in subject based provision. This would certainly make sense, as one would expect the nature of subject based provision to be more similar if it is curriculum, and possibly exam, based.

In terms of school attendance, the difference between schools in the impact of non-subject based study support in both Year 10 and Year 11 is 11%. As these models included only 14 schools, the results must be interpreted with extreme caution. No differences were found between schools in the impact of subject based provision. As with the attainment outcomes, this suggests that there is greater variety across schools in the nature of non-subject based provision than subject based provision.

With regard to attitudes, there was a difference between schools in the impact of Year 11 non-subject based study support of 8 points. Again there was no statistical difference in the impact of subject based provision, suggesting there was less variety across schools in the nature of subject based study support.

There are a number of possible reasons why study support is more effective in some schools than others. For example, in some schools attendance is voluntary, while in others it is expected. It could be argued that pupils who attend voluntarily are likely to gain most from study support. Another possible difference is how study support is directed - in some schools it may be teacher-led, while in others it may be pupil-led. A third difference might be the structure of the study support classes – are study support classes different from normal lessons or are they 'more of the same'?

While there are these and other possible explanations for the apparent differences between schools in the effectiveness of study support, the strong negative correlations between the intercepts and 'slopes' suggest a different explanation. These negative correlations indicate that the schools where attainment, school attendance and/or attitudes were already high gained least from study support. Conversely, study support was most effective in schools with low attainment, school attendance and /or attitudes. One possible explanation for this is the existence of a 'ceiling' effect – all three outcomes had maximum values (e.g. the maximum Best 5 GCSE point score is 40) and the closer schools were to the maximum the less scope there was for study support to improve the outcomes. These findings suggest that, if resources are limited, it would make sense for local authorities and the Government to concentrate provision in schools with the lowest attainment, school attendance and attitudes.

Table 6.4: **Study support activities and outcomes: coefficients for FSM*study support interaction**

Output Measure	Study Support Category	Coefficients for Study Support Variable		Hypotheses Group (Baseline & output measures)
		Year 10	Year 11	
Attainment	Subject	1.158 (p=0.032)	1.892 (p=0.013)	1 NVR/Best 5
	Non-Subject	n.s.	n.s.	2 NVR/Best 5
	Easter School	n.s.	n.s.	10 NVR/Best 5
	Maths	n.s.	n.s.	3 SATS Maths/GCSE Maths
	English	0.458 (p=0.023)	n.s.	4 SATS English/GCSE English
	Science	n.s.	n.s.	5 SATS Science/GCSE Science
Attendance	Subject	n.s.	n.s.	6 Yr9/Yr11 School Attendance
	Non-Subject	n.s.	n.s.	7 Yr9/Yr11 School Attendance
Attitudes	Subject	n.s.	n.s.	8 Yr9/Yr11 Attitudes
	Non-Subject	n.s.	n.s.	9 Yr9/Yr11 Attitudes

n.s. = not significant

Table 6.4 summarises the coefficients of the FSM * study support interactions. It shows that these were only statistically significant for Year 10 and Year 11 subject based study support and Year 10 English. This finding suggests that subject based study support and Year 10 English can be used to improve the attainment of FSM pupils relative to non-FSM pupils. In other words, schools wishing to address the gap between FSM and non-FSM pupils should encourage FSM pupils to attend subject based study support and Year 10 English, which is of course a subject based example of study support.

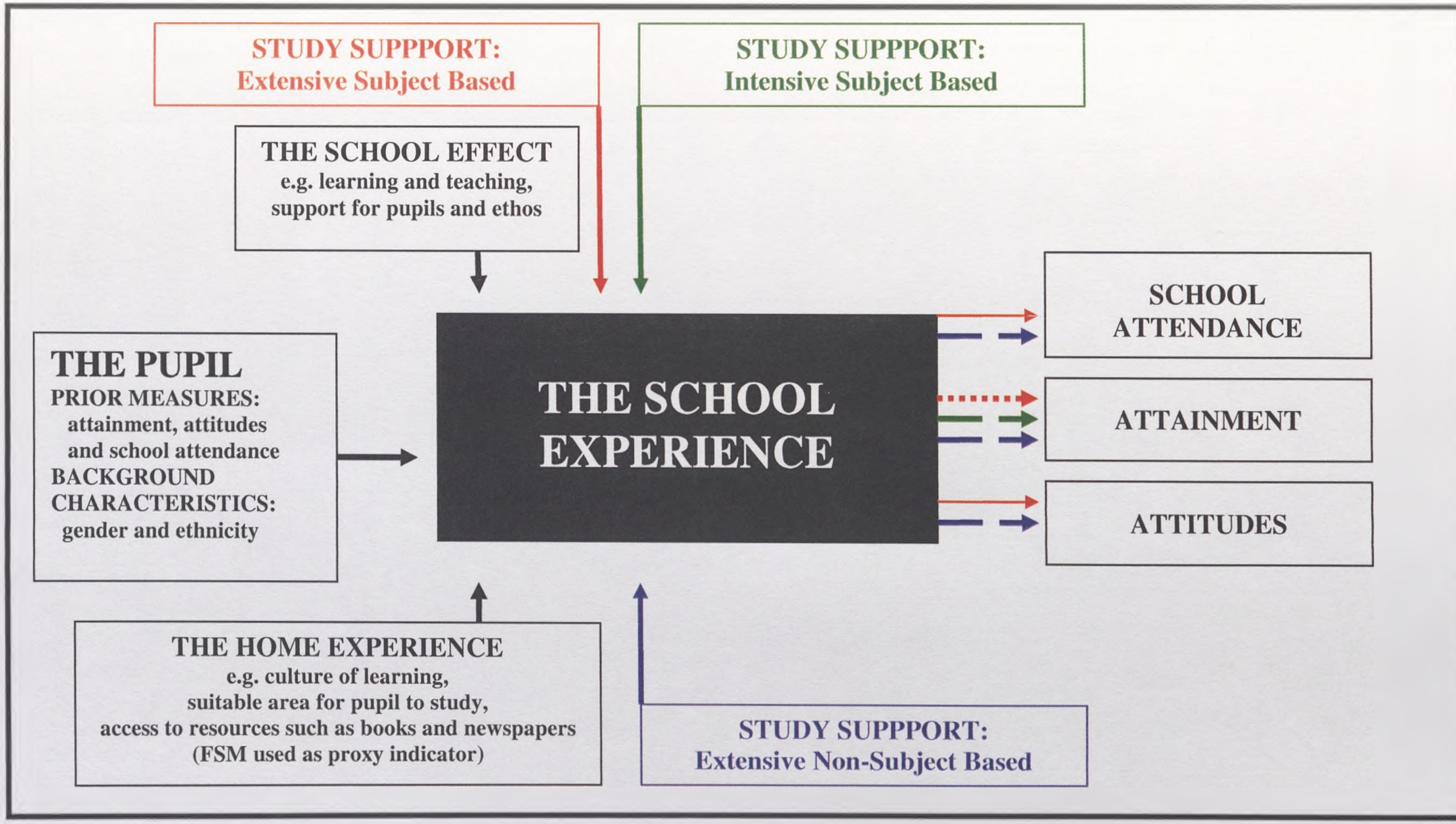
No significant differences were found for the difference in impact for FSM pupils and non-FSM pupils of any other study support attainment combinations or the school attendance and attitude combinations. A positive aspect of this finding is that, unlike some strategies that have attempted to address the inequality of attainment between socially disadvantaged and other young people, study support does not widen the gap by having greater impact on pupils who are not socially disadvantaged.

As no significant differences were found between schools for the FSM/non-FSM difference (see Table 5.6), it can be concluded that the FSM/non-FSM difference from subject based study support and Year 10 English applies to most participating schools and is not peculiar to a few (although it should be noted – see Table 5.6 - that it was not technically possible to use MLwiN to estimate all models).

The main evaluation report concluded that participation in study support has a greater impact for FSM pupils than for other pupils. The present study has confirmed that finding. Unlike the main report, this study has systematically explored the difference between FSM and non-FSM pupils for each of the study support categories in relation to the three outcomes. The main report analysis was limited to attainment.

The theoretical model from Chapter 2 is reproduced in Figure 6.1, but with revisions in the light of the findings discussed above. As the findings suggest that the school attended and FSM status can influence the impact of study support for a pupil, it would appear that it is correct for the model to show 'The school effect' and 'The home experience' as contributing, along with study support, to the 'The School Experience'. Arrows with thin lines have been used to link extensive study support with school attendance and attitudes because the impact was only found to exist in Year 11. Arrows with broken lines link extensive subject based study support with school attendance and attitudes and intensive subject based study support with attainment because the impact appears to vary between schools. An arrow with a squared dotted line has been used to link extensive subject based activities with attainment to show that FSM pupils benefit more than non-FSM pupils.

Figure 6.1: **Model showing the benefits of participation in study support as evidenced in this study**



Arrow with thin line = Applies to Year 11 only
Arrow with broken line = School differences present
Arrow with square dotted line =School differences present and FSM pupils benefit more than other pupils

THE STRENGTHS AND LIMITATIONS OF THE RESEARCH

There are a number of positive aspects of the research, not least the support of the DfEE for the main evaluation which permitted the creation of an extensive dataset. While the datasets analysed in some previous studies were limited to one or two outcomes - typically attainment and/or attitudes - (e.g. Mason *et al* 2004 and Mason *et al* 2000), the dataset used in the present study included a range of outcomes (i.e. attainment, attitudes and attendance). As the present study collected baseline measures for each of the outcomes, it was possible to use these to control for intake in the analyses. This was important as it eliminated the possibility of any observed benefits of study support participation being dismissed as being due to the expected high attainment, attitudes and attendance of the particular pupils involved. Adopting a broad definition of study support, the dataset recorded pupils' attendance at a range of study support activities. Given that some previous research projects were limited to attendance at specific study support initiatives, the range of activities included was a strength of the present study.

A second positive aspect of the study was the use of multilevel modelling. Multilevel modelling offered full justice to the dataset, permitting analyses that would have been limited – and in some cases impossible - using traditional regression analysis. School effects were explored in relation to attainment, attitudes and attendance. The main evaluation study used school dummies to explore school effects in relation to the three outcomes, but multilevel modelling calculates larger – and more accurate – standard errors. The results from multilevel modelling therefore tend to be more conservative.

A particular strength of the present study was that it compared the benefits of participation in study support for FSM and non-FSM pupils in terms of attainment, attitudes and school attendance. It also explored the school effect with regard to FSM pupils. While the main evaluation compared the benefits for FSM and non-FSM pupils of participating in study support with regard to attainment, the analysis of attitudes was limited to one of the five factors - academic self-esteem - and there was no analysis of the impact of study support on school attendance. Furthermore, the main evaluation did not investigate the school effect with regard to FSM pupils.

A general comment that can be made concerning the limitations of this study is that the research made use of an inherited dataset. As the dataset had been created for another – albeit closely related – study, the researcher was not in direct control of the data collected. As has been stated above, without the support of the DfEE it is very unlikely that it would have been possible to gather such an extensive dataset. When considering the limitations of the research, it is important to bear in mind that it would have been well nigh impossible to create such a large dataset for a postgraduate research project alone.

The first five limitations outlined below were acknowledged at the outset of the project and were reported in Chapters 3 and 4 of this thesis.

The first of these was the atypical sample of schools that participated in the research. As is noted in Chapter 3, the participating schools included some of the most disadvantaged in the country. At the time of the National Evaluation, the national school average for free school meal entitlement was 17% (MacBeath *et al* 2001), but 40% of all pupils who participated in the study were in receipt of free meals. Due to missing data items, not all pupils were included in the analyses and the percentage of free school meal pupils ranged across the ten analysed sub-samples from 28.1% to 33.9%. In each case it was well above the 17% national average, indicating that none of the groups could be considered typical of schools in general. As the sample was not representative, it is not possible to generalise the findings to the general school population. The findings, therefore, must be limited to the schools that participated in the study.

A second limitation was the use of free school meal entitlement as an indicator of social disadvantage. The issues associated with the use of the FSM variable are well rehearsed in Chapter 4.

While there are benefits of tracking a large cohort of pupils over a number of years, it is inevitable that such a research project will result in missing data. The extent of missing data in the present study was greater than would have been hoped for and this could be considered a third limitation of the research. There were four reasons for missing data. Firstly, some pupils moved school during the evaluation and, as is explained in Chapter 4, resources were not available to track their attendance at study support (or GCSE results) in their new schools. It is regrettable that those pupils who change school most often are likely to include some of the most disadvantaged and may benefit most from participation in study support activities. Although based on speculation, this point should be borne in mind when interpreting the research findings as it is possible that those who benefit most from study support will have excluded themselves from the analyses by changing school between data collection periods. Secondly, some pupils were simply absent from class when the data were collected. Schools were asked to chase up non-respondent pupils, but this was not always possible. Thirdly, because Scotland has its own examination system, the pupils who attended the Scottish schools were excluded from all analyses involving GCSE results. Finally, some of the data items (e.g. school attendance) were requested directly from the schools and not all schools provided the requested data. In hindsight it is unfortunate that more was not done to secure the data at the time.

As is reported in Chapter 3, of the 8390 pupils in the initial sample a complete set of 36 data items was available for only 260 (3.1%) pupils. The analyses, however, were not limited to these 260 pupils as none of the ten sets of analyses required a complete set of data items. Each set of analyses required a different sub-set of variables and a pupil would be included in the sub-sample if s/he had valid data for each of the variables included in the set. Pupils could therefore be included in all, some or none of the models, depending on the data items available for him/her. The number of pupils included in each model ranged from 1200 to 2699, while the number of schools ranged from 14 to 38. Although 1220 pupils are considerably less than 8390, and extreme care has to be exercised when interpreting the findings of such a sample which is limited in size, the sample was larger than those typically used in other study support evaluations. Furthermore, the present study was not limited to one local education authority (e.g. Pocklington 1996) or pupils attending specific initiatives (e.g. Schagen *et al* 2002 and Sainsbury *et al* 1998). In addition to the number of pupils included in the analysed samples, the small number of schools included in some of the analyses also has implications for the interpretation of the findings. The differences identified between schools in these analyses must be viewed with considerable caution as the extent of the differences may be amplified due to the small number of schools involved.

In addition to the issue of the interpretation of the findings from a study with a considerable amount of missing data, there is also the issue of whether the characteristics of the analysed samples differed from the initial sample. As is stated above, the percentage of pupils receiving free school meals is less than the overall percentage but still greater than the national average. There is little difference between the gender and ethnicity of the sub-samples and the overall sample. Participation in study support was slightly higher amongst the analysed samples. The attainment, school attendance and attitude measures were also greater amongst the analysed pupils. The characteristics of each of the ten analysed samples are summarised in Chapter 4.

A fourth limitation of the research was the disparate nature of the study support activities included in the study and the taxonomy that was used to categorise the activities. Given the diverse range of activities offered across the schools, such a classification was necessary if an analysis was to be undertaken across all participating schools. The purposes, methods and name by which the pupils knew all study support activities in the participating schools had been collected prior to the design of the individualised questionnaires and this information was used to place each activity within the taxonomy. However, whilst all activities placed within the same category would have similar aims, the reality is that some of these activities would be quite different from others. For example, two schools may offer after-school maths but these two activities might be very different in terms of ethos, approach and organisation (e.g. are they teacher-led or pupil-led?).

A fifth limitation of the study was the lack of a matched control group. The control group consisted of those pupils who attended the participating schools but did not attend the particular study support category included within each statistical model. As the non-participants attended the same schools as the study support participants, it is likely that there would be at least some similarities between the two groups. However, Chapter 3 reported differences in the take-up rates of study support activities between FSM and non-FSM pupils. There may also have been differences between the two groups in respect of – for example - gender, ethnic origin, baseline attainment, baseline attitude and baseline school attendance data. As the statistical models that were created for the research included baseline attainment, attitude and school attendance data as appropriate, the models did take cognisance of these. A matched control group is, of course, difficult to obtain within education research, unless the researcher is prepared to decide which pupils are to take part in an initiative (in the present case, study support) rather than allowing the pupils to opt-in. Where the outcome attainment measures are GCSE results, it is not possible to offer half a group of pupils study support for the first part of the session and the other half of the pupils for the remainder of the session and have an outcome measure at the end of both stages.

A sixth limitation of the research was the use of self-report questionnaires to record study support participation. As with all self-report instruments, the questionnaire relied on the pupils completing the questionnaire honestly. The pupils were assured that the completed questionnaires would not be read by anyone in the school, but it is possible that some pupils would have over-reported their attendance in an attempt to please any teachers who read them. It is also possible that some may have under-reported their attendance if study support was considered by their friends to be 'uncool'. In addition to the problem of under- and over-reporting, the use of the self-report questionnaire also gave rise to possible differences in interpretation by the pupils of the terms 'regularly' and 'occasionally' when asked to indicate if they participated in study support activities 'regularly', 'occasionally' or 'never'. A related issue was the differences between schools in the frequency and length of time over which an activity is offered – 'regular' attendance at an activity offered twice a week over a complete session is different from 'regular' attendance at a weekly activity that is offered over an eight week period. While one would assume that a more accurate and consistent method of recording pupils' attendance at study support activities would be through the teachers keeping a record of attendance at the activities, this approach was tried initially in the National Evaluation, but was found to be problematic (see Chapter Three).

A seventh limitation of the research was that the data analysis distinguished only between regular/occasional study support attenders and non-attenders. In terms of attenders, it did not distinguish between pupils who attended only one study support activity within a category and those who attended more than one activity. A more refined coding system (i.e not merely 'attenders' and 'non-attenders') would have permitted an analysis of whether the amount and frequency of attendance at study support were significant in terms of outcomes. For example, perhaps a pupil's attendance at study support activity could measured in hours of participation per school session?

A final limitation of the research is that the study was based on correlational data. It assumes that the changes identified in the outcomes (i.e. attainment, school attendance and attitudes) are a result of participation in study support over and above the other variables identified in the theoretical model and included in the multilevel models (i.e. baseline centered, gender, FSM, ethnicity). However, the reality is that another variable, or variables, may be responsible for the changed outcome which is perceived as the impact of participation in study support. As is explained in Chapter 2, it is possible for two variables to correlate when there is no clear causal link. While commonsense would suggest there could be a causal link between participation in study support and improved outcomes, when interpreting the results from the present study it is necessary to acknowledge that, although the results suggest participation in study support does result in improved outcomes, they should not be considered concrete evidence of this as there may be other factors responsible for – or at least contributing to – the improved outcomes.

None of the limitations discussed above is peculiar to this study. Chapter 2 included a critique of the study support research studies documented in the literature and this included a summary of the common criticisms and limitations of researching such initiatives. Almost all of the above limitations were included in that summary. In comparison with the limitations of previous study support evaluations, the two key strengths of the present study were the sample size (albeit that the sample was not representative) and the use of 'hard' data (especially in relation to the attainment data).

The study demonstrated the value of multilevel modelling as a technique for exploring variations between schools in the effectiveness of study support for all pupils and for FSM-pupils. However, it did require important decisions to be made as to the terms to be included in the statistical models. This could be considered a limitation of the study as terms were excluded that other researchers may have chosen to include. For example, it would have been possible to include more than one category of study support in the same model. The inclusion of additional categories would have required additional interaction terms. Given that the research involved a series of nested models, it was decided that the number of terms within each model should be kept to a manageable number. The principal reason for doing so was to avoid the creation of models that would not converge within MLwiN. Decisions also had to be made as to the terms that were to have random coefficients. The models used in the present study did not include random coefficients for all predictor variables – gender and ethnicity were only included as fixed terms. Extending the number of random terms resulted in the models becoming less manageable and some did not converge within MLwiN. A common reason for these more complex models not converging was that the variances and covariances had become negative definite and interactions could not proceed. (This was indicated in the MLwiN warning message 'V has gone negative definite'.)

IMPLICATIONS FOR FUTURE RESEARCH

The preceding section outlining the limitations of the present study raises a number of issues that should be considered by other researchers working this area. Some of these are, in fact, not peculiar to research on study support – for example, the need to consider whether the sample should be representative, the appropriateness of self-report questionnaires and how to minimize the loss of subjects in a longitudinal study. Other issues which are specific to study support research are: how can pupils' attendance at study support be most accurately recorded (can attendance be recorded by teachers?), how much detail is required to be recorded for the research (e.g. it is necessary to record the number of study support sessions attended and the length of those sessions?) and, given the uniqueness of certain study support activities, is it appropriate to use a taxonomy to classify all study support activities and compare the effectiveness of a study support activity in one school with that in another school (e.g. an after school maths club in one school may be very different in purpose and organisation from an after school maths club in another)?

The present study was very much a quantitative one which suggests that, overall, study support is beneficial for pupils. The study raises a number of questions that could be explored in future research. Firstly, the variance found indicated that study support was more effective (at least in terms of the outcome measures used in this study) in some schools than in others. The data imply that study support is most effective in schools with lower attainment, school attendance and attitudes and it is suggested that this may be due to a ceiling effect, rather than to a superior quality of study support being provided in these schools. However, a future study could explore, qualitatively, the experiences of pupils who attend these schools in an attempt to ascertain whether there are activities that are particularly effective and, if so, the features of these activities which make them effective. The study support guides referred to in Chapter 1 suggest the aspects of study support that are considered to be good practice, but a qualitative study could explore whether these elements of good practice can be evidenced in the study support provided in the schools that have been identified through the quantitative study as being most effective.

A second possible focus for study support research is whether the effectiveness of study support increases with the amount of study support attended. Such a study could explore the number of study support activities attended by pupils and the frequency of their attendance. A question to investigate would be whether there is a saturation level beyond which there is no additional value for pupils attending more study support. A related study could explore the effectiveness of attendance at different combinations of study support. Does attendance at a range of different types of study support (e.g. subject based and non-subject based) have a greater impact than attendance at a number of study support activities within the same category?

A third area that could be explored in future research is the 'knock-on' benefits of participation in study support. For example, the present study has indicated that participation in study support results in improved attitudes – but do these translate into improved attainment? Similarly, the study suggests that participation in study support results in improved school attendance, but does this then result in improved attainment? Such a study is likely to involve qualitative research which explores the impact of study support on individual pupils.

A further issue that could be explored in future research is the long-term benefit for pupils who attend study support. Are the skills which the pupils learn transferable into future academic courses? Could it be that subject based study support is course specific and therefore raises attainment only in the courses being undertaken at the time, while non-subject based activities have more long-term benefits?

A final consideration for other study support studies using multilevel modelling is the choice of terms to be included in the statistical models. As is explained within the preceding section on limitations, it was decided to restrict the number of terms in the present study to a manageable number. However, a future study may wish to include additional terms (e.g. attendance at a number of different categories of study support) or additional interaction terms. Including additional terms would be more practical if only a limited number of models is being tested.

While none of the possible areas for future research suggested above specifically mentions pupils from disadvantaged backgrounds, in each case there would be value in assessing whether study support has a different role to play for these pupils than for others.

IMPLICATIONS FOR STUDY SUPPORT POLICY

Chapter 2 included the following quote from MacBeath

> If Study Support is to develop we need to find out just how effective it is, and how we can maximise its effectiveness. We need evidence to show that it works the way we think it should. We need hard data to convince policy-makers, as well as the individual testimony and success stories of individual young people. We need to know what approaches and techniques work best, and to share that knowledge with those who organise and run Study Support Centres. (MacBeath 1997, p.14)

As has been noted earlier in this chapter, given the unrepresentative nature of the sample used in the study it is not possible to generalise the findings to the school population. Nonethelesss, four of the findings suggest answers to MacBeath's questions and should at least be noted by policy makers. They are as follows:

1. Participation in study support has a positive impact on attainment, attitudes and school attendance
2. In terms of attainment, the single most effective form of study support is intensive subject based provision (such as an Easter School)
3. Generally, there is no difference in the effectiveness of study support for FSM and non-FSM pupils. The exceptions are Year 10 and Year 11 subject

focused study support and Year 10 English. In terms of attainment, FSM pupils benefit more from attending these activities than non-FSM pupils

4. A school effect was found for certain of the study support/outcome combinations. These were: Year 11 subject based/Best 5, Year 11 non-subject based/Best 5, Year 10 maths, Year 11 maths, Year 11 English, Year 11 science, Year 10 non-subject based/school attendance, Year 11 non-subject based/school attendance, Year 11 non-subject based/attitudes and Easter School/Best 5. Study support appears to be most effective in schools with lower attainment, school attendance and/or attitudes.

The positive impact of study support on the three outcome measures suggests that study support is indeed working 'the way we think it should'. It suggests that the funding that has been provided for study support by national and local government will have translated into benefits for the participating pupils. It also suggests that funding should continue for study support. Of course a cynic might argue that, although study support has an effect, there might be other strategies which are equally or even more effective and possibly better value for money. There is also the regular issue of maintaining 'targeted' funding beyond a pilot stage into a regular commitment. Politicians like new initiatives and there is also the possibility that initiatives only work while they are new.

The study suggests that the activities that 'work best' are intensive subject based activities, such as Easter Schools. Where resources are limited, this second finding suggests that these should be targeted at Easter School-type provision (i.e. short-term, intensive study support provided shortly before the exam diet) as it is this form of provision that is most likely to result in raised attainment.

The third finding suggests that study support can be used as a strategy for improving the attainment, attitudes and school attendance of FSM pupils. However, the general conclusion that FSM and non-FSM pupils benefit equally from study support suggests that, while study support can be used to assist FSM pupils, it will not narrow the attainment gap between FSM and non-FSM pupils as the non-FSM pupils will also benefit. The exceptions are Year 10 and Year 11 subject based study support and Year 10 English, which appear to be particularly beneficial for FSM pupils. Policymakers wishing to narrow the attainment gap between FSM and non-FSM pupils should either (1) ensure that funding is offered for the provision of study support to FSM pupils only or (2) ensure that funding is offered for the provision to all pupils of those activities that are of particular benefit to FSM. The provision of any educational initiative (including study support) to only some pupils does, of course, raise ethical issues of fairness and equality for the pupils who are not given the opportunity to participate. For the FSM pupils, targeted provision is likely to result in feelings of stigma and isolation. Such feelings could result in the FSM pupils refusing to participate. It is therefore likely that the preferred option for policymakers would be to fund the activities from which FSM pupils appear to benefit most.

The final finding will be of interest to policy makers as it suggests that study support is more effective in some schools than in others and that it appears to be most effective in schools with lower attainment, school attendance and attitudes. Policy makers are likely to be interested in pursuing a qualitative research project which explores the experiences of pupils in the schools in which study support is most effective. The data suggest the presence of a ceiling effect, but a qualitative study might identify activities in these schools that are particularly effective and the features of these activities which make them effective. Where possible policymakers will want to see the good practice transferred across to other schools, although it must be acknowledged that an activity that is successful in one school may not necessarily be successful in another.

FINAL CONCLUSIONS

This thesis set out to explore the role of study support for pupils from socially disadvantaged backgrounds. A key question was whether study support could be adopted by schools and local authorities as a strategy for tackling the effects of social disadvantage.

The findings from this study suggest that participation in certain forms of subject based study support is of particular benefit to the attainment of FSM pupils. Encouraging FSM pupils to attend these activities will help to promote the position of FSM pupils in relation to their peers. There was no evidence of any school effects, indicating that the advantage for FSM pupils applied equally across all schools that participated in the research.

The findings suggest that all pupils benefit in terms of attitudes and attendance from participation in study support. There are, however, no particular benefits in respect of these outcomes for FSM pupils.

The findings indicate that study support is more effective in some schools than others. It would appear that the schools in which study support is most effective are those in which there is lower attainment, school attendance and attitudes. It may be that a ceiling effect limits the value of study support in schools with higher attainment, school attendance and attitudes.

In conclusion, participation in study support appears to benefit all pupils (including FSM pupils) with regard to attainment, attitudes and school attendance. Participation in subject based study support is of particular benefit to the attainment of FSM pupils and will help to tackle the effects of social disadvantage.

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Information on eligibility for free school meals
www.direct.gov.uk/en/Parents/Schoolslearninganddevelopment/SchoolLife/DG_4016089

Quality in Study Support (QiSS)
Information on the QiSS Recognition Scheme and the Study Support Quality Development Programme
www.canterbury.ac.uk/education/departments/professional-development/centres/quality-in-study-support

Scottish Index of Multiple Deprivation
www.scotland.gov.uk/Topics/Statistics/SIMD/map.asp

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Information on data gathered for the Annual School and Pupil Census in Scotland
https://www.scotxed.net/jahia/Jahia/cache/offonce/lang/en/pid/447;jsessionid=366243D95542538A0969DF0B73709220

Teachernet
Information on data gathered for the Pupil Level Annual Schools' Census (PLASC)
www.teachernet.gov.uk/management/ims/datacollections

University of the First Age
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