Gender and Performance in the GCE A Level Examination:

Gender-Equity and the 'Gold Standard'

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Abstract

This thesis investigates gender and performance in the GCE A level examination. It attempts to acquire deeper understanding of the factors that contribute to differential performance at 18+. It identifies a 'cross-over' in gender related patterns of performance in examinations between 16+ and 18+, uses a multi-method approach and a number of sources of data to explain the complex patterns observed. This thesis aims to identify the various factors that contribute to differential performance in examinations and to assess the extent of their influence.

The impetus for the research stemmed from a concern that the A level examination has been relatively under-researched in relation to gender-equity issues in examination attainment. Previously, the focus of gender-related differences in examination performance had tended to concentrate on the compulsory stage of schooling. Little is known, therefore, about gender-related performance issues at 18+.

In this thesis, questions specifically focus on the A level examination and are asked in relation to: how we account for gender-related differences in performance; the contribution of the assessment techniques used to these differences and whether there are content, contexts and tasks types used in these examinations that benefit one gender more than another. Data has been collected, analysed and interpreted from over 3,000 examination scripts, 200 questionnaire responses from secondary school teachers and nine school case studies. Teachers' and students' attitudes to, and perceptions of, gender-related attainment at 18+ are explored for their contribution to differential performance. Three subjects - English literature, mathematics and physics - are used to illustrate the issues that are being considered.

This thesis contributes knowledge to the gender-equity debate at one of the most significant stages of examining in the UK. The debate is a complex one and the findings of this thesis reflect this. In this thesis, evidence from the data suggests that any future consideration of equity in relation to examination performance must concern itself not only with the assessment techniques used in the examination system, but also with the expectations, experiences and perceptions of teachers and students who are involved in these examinations.

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For Rhona and Joe Elwood, with love

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Chapter 1

The Research Problem Identified - Introduction, Rationale and Outline of the Thesis

Introduction

The primary aim of this study is to investigate those factors that contribute to differential performance in the GCE A level examinations. A secondary aim is to account for the 'cross-over' in gender-related patterns of performance between 16+ and 18+ examinations which results in males doing better in the higher grades at A level, where they had been behind at 16. The GCE A level examination is analysed to highlight those assessment features that may contribute to gender-related differences in performance.

Three subjects - English literature, mathematics and physics are used in this study. By focusing on these three subjects the most distinctive patterns of performance between males and females can be more adequately assessed between the GCSE and GCE examination stages. Additionally, the task is to gauge teachers' perceptions of male and female attainment and ability at 18+ and relate these perceptions to performance patterns. Students' perceptions of, and attitudes to, the A level subjects they have chosen and what influences this choice are also evaluated. It is hoped that these findings will provide a deeper understanding of those factors that need to be considered when interpreting differential outcomes between males and females at one of the most crucial stages of examining in the UK.[1]

The GCE Advanced level is the main examination taken in post-compulsory education by 18 year olds in England, Wales and Northern Ireland. It is an extremely complex attainment test. The examination operates in a high-stakes, high-status context (after Airasian, 1988) and is promoted as the 'Gold Standard'. In the main, the A level is made up of a coursework component (which is teacher assessed) and a final written examination taken at the end of a two year course of study.

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[1] In this thesis the use of the term 'UK' actually excludes Scotland but includes England, Wales and Northern Ireland who have the same education systems, i.e. pupils in schools in these countries sit GCSE and A level examinations at 16+ and 18+ respectively.

Recently, modular approaches to the assessment and examination of A levels have also been introduced that have proved popular with schools and pupils (AEB, 1995) if not with politicians. There has always been the option to take 100% examination syllabuses in the GCE A level.

The General Certificate in Secondary Education (GCSE) is the main examination taken by 16 years olds in the UK and is also a high status, high stakes examination. Students who go on to study A level usually do so after having completed the GCSE. The GCSE's less traditional assessment approach affords it somewhat less prestige than its A level counterpart. Generally, the model of assessment and examination underpinning the GCSE and the A level can be considered the same. However, there are some fundamental differences between the two examining stages, especially in approach, style, and how success is defined between the two examinations.

Within the GCSE there is a more progressive approach to assessment and examining compared to the old GCE 'O' level that it replaced. Relatively higher proportions of the syllabuses are given over to non-traditional examination techniques such as, coursework, orals, portfolios and investigations. Few (if any) multiple-choice papers are used. The inclusion of a variety of assessment techniques reflects a move to match method of assessment to its purpose. This is much more a feature of GCSE than of A level. The examination papers are presented in a more 'user-friendly' language. The examination papers use 'real world' contexts, incorporate diagrams and illustrations and questions are worded in language that generally needs little interpretation by the reader. Both the range of assessment methods and the use of 'real world' contexts are indicative of a broader view of achievement.

On the other hand, the A level employs more traditional assessment methods with a higher proportion of the syllabus examined through terminal examinations papers and multiple-choice tests. A level papers use fewer 'real world' contexts. Questions require more interpretation and use more specialised vocabulary than found in the GCSE. The A level remains more narrowly focused with achievement being expressed through written exposition and recall of procedures and knowledge.

These differences between GCSE and A level are often attributed to the fact that what is being assessed at A level, for example, to write about abstractions and to recall a wide array of procedures and knowledge, is judged as higher order achievement and therefore requires a different approach. This thesis will show that learning these different approaches is crucial when it comes to succeeding in examinations. This thesis will argue that not only is there a relationship between the style and approach of the examination and students' preferred ways of learning that contributes to differential performance, but that these differences in approach and style between the GCSE and GCE A level help us account for the cross-over in the performance patterns that arise between these two phases of examining.

Rationale

While interest in gender related differences in performance in examinations and assessment in the UK has been considerable, it has tended to focus on the compulsory phase of schooling, particularly age 16. Research at this stage indicates that 16 year old girls are outperforming boys in a range of subjects and leave school better qualified than their male counterparts (Arnot, David and Weiner, 1996; Elwood, 1995; Stobart, Elwood and Quinlan 1992). For example, in 1995 girls gained 8% more A*-C grades than boys across all GCSE subjects. More recently, the focus has extended across all phases of assessment and examining. At Key Stage 1, performance trends indicate that 7 year-old girls are generally outperforming boys at this age (DfEE, 1996a), while patterns of gender-related differences at the university level show males achieving more first class degrees than females (McCrum, 1996).

At the time of writing the proposal for this PhD study (August, 1993) there was not a similar focus on examination performance at age 18. This is surprising since examination outcomes at this stage are probably the most critical in terms of life chances and entry into higher education. A closer look at the entry and result patterns in A level examinations indicates that a focus on wider equity issues in A level examinations is over-due. Initial reviews of entry and performance data from A level examinations outline two interesting factors.

Firstly, one of the most significant changes in A level examinations over the last twenty years is female entry patterns. In most subjects examined at A level the increase in candidature is solely accounted for by the female entry. For example, Table 1.1 shows the size of the effect of female entry patterns over the last 20 years in three subjects.

Table 1.1
Entry figures for three A level subjects by gender 1970-90

Subject	Sex	1970	1980	1990	%Diff 1970-1980	%Diff 1980-1990
Chemistry	M	23385	24836	27427	6.2	10.4
	F	7385	12408	18769	68.0	51.3
	T	30770	37244	46196	21.0	24.0
French	M	9822	7456	7445	-24.1	-0.1
	F	16103	18640	19799	15.8	6.2
	T	25925	26096	27244	0.7	4.4
Geography	M	19421	20714	23524	6.7	13.6
	F	12347	14360	18146	16.3	26.4
	T	31768	35074	41670	10.4	18.8

Source: University of Oxford Delagacy of Local Examinations Archive

Secondly there is a cross-over in the patterns of performance between GCSE and A level. This pattern suggests that males achieve a slightly larger percentage of higher grades, where females had done so at 16+. For instance, in 1995 males gained 4.1% more A-C grades than females in A level French. Yet, in the same subject at GCSE, girls were 13% ahead of boys in the proportion of A*-C grades obtained. This apparent anomaly of higher female entry overall at A level but better performance rates for males at the higher grades led to the conceptualisation and commencement of this research.

Earlier explorations into gender-related issues in the A level examination concentrated on what is referred to as 'facial bias' (Cole and Moss, 1993). Facial bias refers to the composition of examination papers appearing to disfavour certain groups through the use of sexist or culturally biased language and illustrations (e.g. ULSEB, 1985; The Fawcett Society, 1987). These reviews were an important step forward in explaining issues of equal opportunities in examination practices. However, they fell short of reviewing actual performance of boys and girls on the examination papers.

Other important work has analysed the gender bias inherent in the various modes of response used on A level papers, especially multiple choice papers (Harding, 1979; Murphy, 1980, 1982; Newbould, 1980). The essential focus of this work was whether the assessment techniques and test instruments were biased towards one gender or the other. In the intervening years, up until the early 1990s, there was a lack of focus on the GCE A level as a whole. As a result, research has not focused on those features of the A level examination that may contribute to the different outcomes obtained.

The proposal for this research grew out of both a personal interest and professional concern that A level examinations had previously been under researched in relation to gender-equity issues in examination attainment. This interest and concern stemmed from previous research work that I had been involved in while working as a Research Officer with the University of London Examinations and Assessment Council (ULEAC). The primary impetus for the formulation of the proposal for this research were the recommendations and main findings of the "*Differential Performance in Examinations at 16+: English and Mathematics* " project (Stobart, White, Elwood, Hayden and Mason, 1992, hereafter referred to as the Differential Performance project). This project moved beyond any previous UK work in terms of research on sensitivity to gender-equity in examinations at 16+. In looking at the GCSE in a critical way, it was inevitable that there would be implications for the GCE A level since the two examinations are closely linked.

At the end of the Differential Performance project it was obvious that any future research agendas that considered differential performance needed to include, at some stage, investigation of the A level examination. This concern was also voiced strongly by Gipps and Murphy (1994):

> A level entries are seriously under-studied compared with GCSE/O level....Studies of gender differences do not go beyond looking at pass rates and grades achieved...Neither are there any studies of effect of question content and format of examination. This is unfortunate given that the exam is highly significant to the pupils who take it and the changing patterns of gender performance suggest that a detailed comparison between GCSE and A level could be very fruitful.
>
> (Gipps and Murphy, 1994, p. 245)

This research study was designed and implemented to take on board the recommendations of the Differential Performance project and the omissions regarding A level examinations and gender-equity issues outlined by Gipps and Murphy. At the same time as submitting the research proposal to the Institute of Education, University of London, for entry to a research degree, the proposal was submitted to the Nuffield Foundation for funding consideration. The application for funding was successful. The research presented in this thesis provided the basis of the "*Gender in Examinations at 18+*" project (Elwood and Comber, 1996) conducted over a two year period (1994-96). Although another major study by Arnot, David and Weiner (1996) for the Equal Opportunities Commission on gender equality and educational reform was completed at the same time (the summer of 1996), its overall focus was different. What makes the present study unique are the following aspects: its focus on actual performance on examination components; its attention to the type of question content and the format of the examinations; and its triangulation of this performance data with that of the attitudes and perceptions of teachers and students who take part in these high status examinations. In this respect, this research provides the much needed focus into the complex web of factors that contribute to gender-related differences in performance at A level.

Outline of the thesis

The structure of this thesis follows a conventional model. Chapters 2 and 3 put the study into context by reviewing the relevant literature that supports the various arguments put forward in the main body of the work. Chapter 2 provides definitions of common terms used in relation to equity and assessment. The research evidence on national and international gender-related differences in performance is reviewed to illustrate the consistency of differential performance and to contextualise those differences found in public examinations at 16+ and 18+.

Chapter 3 concerns itself with theories that have been used to explain gender-related differences in performance. The primary focus is on social and educational explanations that consider the gendered nature of pupils' learning and how this is manifested in their subsequent performance. The chapter concludes by reviewing another important layer of the literature that considers the role that examinations play in creating performance differences.

Chapter 4 discusses the research methodology, design and method. In this chapter I present my research questions and my rationale for pursuing the chosen line of enquiry. The multi-method approach of the study is outlined and the methodological justification is presented. The design is discussed and descriptions are given of the methods used to collect data and the techniques of analysis employed. The chapter finishes with a description of my role in the "*Gender Differences in Examinations at 18+*" project and how it relates to this thesis.

Chapter 5 is concerned with establishing that there are gender-related differences in performance in GCSE and A level examinations. Examination entry and performance data at a national level are reviewed. This review illustrates the 'cross-over' in male and female performance between GCSE and A level. The data presented in the chapter helps contextualise the rest of the study. It demonstrates that girls and boys do not make similar progress in their attainment between 16 and 18 given their GCSE results.

Chapter 6 discusses the development of the classification framework to aid in the analysis of content, context and task type on A level examination scripts. The chapter details the application of the classification and describes the outcomes obtained from the analysis of content for all three subjects under investigation. Based on the findings, I conclude that the A level examination papers themselves did not appear to be biased towards one gender or another. However, differences in performance were found at an item level that are linked to content and context effects. These findings were supported by teachers' perceptions of male and female performance.

In Chapter 7, I present a quantitative analysis of the contribution that the various examination components, especially coursework, make to differential performance. The chapter describes an 'achieved weights' analysis (Adams and Murphy, 1982) which calculates how much of the variance in the overall rank order of candidates is attributable to the coursework component and how much to the other, more traditional A level papers. The evidence presented in this chapter does not support the widespread belief that females do better in examinations because of the inclusion of coursework components. The evidence also contradicts teachers' perceptions that females are unduly affected by final examination papers more so than males.

Chapter 8 focuses on the data collected from a survey of teachers of English literature, mathematics and physics and teacher interviews from case study data. It concentrates on those sections of the teacher questionnaire and interviews that looked at attitudes and perceptions of male and female attainment at A level. The survey and interview data indicate alternative explanations for differential performance at A level. General characteristics such as confidence, motivation and certain general learning styles, are ascribed by teachers to male and female students. The conclusion suggests that even though teachers perceived their students as competent and motivated individuals, they perceived male and female differences in the degree of these characteristics. The degree of difference is not the same for all three subjects under investigation in this study.

Chapter 9 focuses on the student data collected via a student questionnaire and semi-structured interviews in the case studies. Major themes of interest related to students' perceptions of, and attitudes to, A level study in general, and to the three subjects under consideration in particular, are discussed. How students compare themselves with same- and opposite-sex peers at this stage of schooling is also outlined. The chapter ends with a discussion of how these student perceptions and attitudes compare with those of their teachers. Of particular interest is the extent to which the views expressed by the students differ from those of their teachers and, more importantly, what this difference might mean in relation to differential performance.

Chapter 10 brings together the overall main findings of this study. These findings are discussed firstly, in relation to the research questions posed and secondly, in relation to how they support the various theoretical aspects of other research in the field. The specific contributions of this study are outlined and reflections on the study are presented. The study's strengths and weaknesses are briefly reviewed. The chapter concludes by suggesting where possible future research might be directed.

A central line of inquiry throughout this study is that any consideration of equity in relation to examination performance must concern itself with both the assessment techniques used in examination system and the expectations, experiences and perceptions of teachers and students who are involved in the A level process. In summary, the aim of this research is to contribute positively to knowledge about gender-equity issues at one of the most significant stages of examining in the UK.

Chapter 2

Definitions of Terms and Gender-Related Patterns of Performance

Introduction

This chapter deals with two aspects of the research literature that will lend support to subsequent arguments made in this thesis. Firstly, the chapter defines various terms such as 'equal opportunities', 'bias', 'fair' and 'equity' which are commonly used and associated with research into gender-related differences in examination outcomes. This is followed by a discussion of the debates surrounding the problematic nature of their usage and lack of common meaning, especially in relation to assessment and examinations. The discussion outlines some historical shifts that have occurred within the area of debate. Furthermore, a working definition of what is meant by 'equity' specifically in relation to assessment is given. It is this definition that provides the building blocks for the central arguments in this thesis.

Secondly, this chapter reviews the evidence of gender differences in performance from national and international assessment surveys. These findings are presented to show consistency of differential performance and to contextualise the findings of this research. Any consideration of differential performance at A level must be located within a discussion of the broader trends and patterns in performance at different ages and stages of examining and in different cultural contexts.

Definitions of terms

One of the main concerns of this thesis is whether the assessment offered within our public examination system, especially at GCSE and GCE A Level, is biased or unfair for different groups. In this respect, the study is integrally linked to notions of equal opportunities and equity in education. It becomes clear that the use of terms such as 'bias', 'fair', 'equal opportunities' and 'equity', is not straightforward. Nor is there a simple, common understanding of definitions of these terms. It is important, then, at this stage to review the various perspectives and meanings associated with these terms, and how they relate to assessment and examinations. In reviewing current definitions I draw on a variety of sources, all of which come from divergent perspectives.

Arnot, David and Weiner (1996), Gipps and Murphy (1994) and Powney (1996) all provide extremely useful accounts of the developments in, and applications of, equal opportunities policies in education. They show how the terms 'equity', 'equal opportunities' and 'equality' have been defined and redefined over the years to suit the political climate of the day. I draw on the work of Goldstein (1993, 1996) to review current definitions of 'bias' in relation to examination performance. Goldstein has made a significant contribution to this debate in his work on assessing sub-group differences. Finally, my own work, in collaboration with Stobart and Quinlan (Stobart, Elwood and Quinlan, 1992), is discussed since it has focused on how notions of 'equal opportunity' and 'bias' have been defined and applied to the public examination system.

Equal opportunities

In the research on equal opportunity there is no single agreed definition of what is meant or understood by this term. It is a highly contentious term as are the social and political discourses which surround it (Gipps and Murphy, 1994). Arnot, David and Weiner (1996) suggest that previous interpretations of the term have focused on the equalising of experiences and achievements for boys and girls. Initially, the 1944 Education Act included 'equality of opportunity' but did so in terms of acknowledging innate differences in abilities, intelligence and aptitudes which would be best served by different schools for different groups of pupils. The emphasis was on making education accessible to all regardless of circumstances. The 1960s were concerned with eradicating social class differences and the 1970s focused more on gender and racial equality. However, during the 1980s, equal opportunities became an umbrella term used to address the different forms of educational or socio-economic inequality along some of the following dimensions: race, gender, class, disability, ethnicity, sexual orientation and age. The emphasis here was on the integration of the work on equal opportunities into overall school policies, organisation and disciplinary structures and across the curriculum (Arnot *et al.*, 1996).

In the 1990s the emphasis has shifted once again. Discussions focus on achievement and standards, the changing patterns of sub-group performances in schools, and on equal opportunities for boys. The issue of "... male underachievement ...[is] used to imply that girls may no longer face previously identified difficulties in school...[and] that it is boys who are now at a disadvantage" (Arnot *et al.*, 1996, p. 13).

Both Riley (1994) and Weiner (1990) suggest two distinctive perspectives on different interpretations of equality of opportunity. The first perspective is the more liberal interpretation, located within the liberal feminist tradition of equal opportunities, which is concerned with ensuring that the rules of the game such as employment, access to courses and /or examinations, are set out fairly. The assumption is that rigorous administrative controls and formalised systems will ensure that fair play takes place (Riley, *op. cit.*). This liberal conceptualisation tends to work within the status quo, using the structures that already exist within schooling to obtain equality for all groups. The second perspective is the more radical conception, located within the radical feminist tradition of an anti-sexist framework. This approach works from outside the present structures, attempting to re-negotiate present power relationships within schooling, and to redefine what is taught, how it is taught and how the experiences of boys and girls are integrated into the process. In their recent review of educational reforms and their effect on gender equality in schooling, Weiner and her colleagues suggest that, in the late 1980s, these quite distinct and opposite approaches began to merge with resulting equal opportunity strategies using characteristics of both traditions to achieve practical solutions (Arnot, David and Weiner, *op cit.*).

Gipps and Murphy (1994) cite Wood (1987) as providing various definitions of equal opportunities. Wood describes equal opportunities as equal life chances, open competition for scarce resources, equal cultivation of different capacities and the independence of educational attainment from social origin. However, all of these definitions are problematic as they all tend to assume that schools can in some way accommodate and control for the very different backgrounds and environments that pupils come from. This is an impossible task since pupils are not all equal in terms of their perceptions and experiences and how both these factors affect their learning and indeed what opportunities they are given to learn. Open competition to resources would assume that all pupils have had the same opportunity to acquire the talent to compete for these resources on equal terms. With the increased powers of schools to select children based on academic measures 'equal cultivation of different capacities' may begin to show that some schools (and indeed students) are more equal than others.

In reviewing early approaches to achieving equality of opportunity, for boys and girls in particular, Yates (1985) suggests that the emphasis on equal access to resources and curriculum subjects was misplaced. These policies, she argues, ignore the fundamental differences in the experiences which both boys and girls encounter in and out of school. It is a deficit model where girls are 'blamed' for not being more like boys in behaviour and attitude and are therefore required to change to take advantage of the greater access that such policies offer. Building on from Yate's discussion, Gipps and Murphy (1994) suggest that such a model implies the possibility of overcoming disadvantage through the acquisition of that which is lacking. This is an essential flaw as parity cannot be achieved through the equality of resources alone.

In the 1990s, this deficit model of providing equality of opportunity is re-emerging with regard to strategies which attempt to counteract the perceived underachievement of boys (e.g. Hannan 1995). Boys are now being 'blamed' for not being more like girls in their approaches to schooling in general and to learning in particular. At the same time, we are also witnessing a sense of moral panic about the underachievement of boys and their lack of opportunity to do well (Pyke, 1996). In this respect, girls are still being 'blamed' but this time it is for boys' failure. Critics have suggested that the legacy of equal opportunities policies to enhance equality of access and resources have benefited girls more than boys. Schools in their eagerness to encourage girls' achievements have neglected boys'. The revolution of girls education, set in motion by equal opportunities policies, has been seen to be responsible for the demoralisation of boys (Judd, 1994). However, we have yet to understand fully the impact of such perspectives on boys' and girls' achievement. What is clear is that deficit models which 'blame' any one group are counter-productive in providing a better educational experience for all.

There has been a distinct trend in attempting to redefine and re-problematise the concept of equal opportunities since the early 1990s . Much of the literature in the 1990s has shown a move towards the use of the term equity (Gipps and Murphy 1994; Powney, 1996). This in itself is no less problematic. Equity has been used to incorporate a wider understanding of the more qualitative issues surrounding the debate rather than just a quantitative approach (Secada, 1989). This differs from previous definitions of equal opportunities by focusing on justice. Fennema (1990) defines equity through the notion of justice and suggests that true justice will only be achieved when the goals of education are equally met by both sexes.

Gipps and Murphy (1994) refer to Apple's (1989) comprehensive review of public policy in the USA, the UK and Australia. They assert that Apple believes that equality of opportunity has been re-defined in terms of it relating to the 'free-market' and an individual's choice within that market rather than linking it to sub-group disadvantage. The responsibility for achievement, schooling and hence success lies with the 'individual', the parent, the child, the school, and is no longer the responsibility of the government (Mahony 1998 forthcoming). Apple (*op. cit.*) stresses that such a view of equality is negative and argues that attention must be re-focused on important curricular questions such as:

- whose knowledge is taught?
- why is it taught in a particular way to a particular group? and
- how do we enable the histories and cultures of people of colour and of women, to be taught in responsible and responsive ways?
  (Apple, 1989, quoted in Gipps and Murphy, 1994, p. 14).

Gipps and Murphy add a series of important and critical assessment questions to Apple's (1989) framework:

- what knowledge is assessed and equated with achievement?
- are the form, content and mode of assessment appropriate for different groups and individuals?
- is the range of cultural knowledge reflected in definitions of achievement? and
- how does cultural knowledge mediate individuals' responses to assessment in ways that alter the construct being assessed?
  (*ibid.* p. 14).

These questions are essential if we wish to take seriously the provision of equality of opportunity or equity for pupils in schools. It is critical then that the questions that relate to the curriculum cannot be asked (or indeed acted upon) in isolation from those which address assessment. Equal access to learning, and opportunities to demonstrate that learning must include both curriculum and assessment considerations.

Examinations and equal opportunities

Stobart, Elwood and Quinlan (1992) suggest that much of the writing about equal opportunities, especially in relation to examinations and assessment, only assumes an agreed meaning in terms of the absence of bias. This however avoids the issue of whether this is judged in terms of equal access or equal outcomes. Wood (1987) provides a useful distinction between equal outcomes and equal access. He suggests that equal outcomes is, to some degree, based on the assumption that all pupils are able to show their acquired talent to good effect, whereas, equality of access assumes the same educational experience for all, the same opportunity to acquire talent. In terms of public examinations, this would extend to the same opportunities to be entered for specific examinations irrespective of gender, race, class or special educational needs. Wood (1987) quotes Dore (1976) in saying that the only way to promote equality of opportunity is to make inequality so apparent that the introduction of a compensatory measure (i.e. to compensate to equalise) seems imperative.

Stobart *et al.* (*op. cit.*) ask whether we should expect similar performances from males and females in public examinations. Since enough is known about the way in which the design of examinations affects outcomes Stobart *et al.* argue "... that to go no further than 'equality of treatment' (in terms of entry and marking) would be naive" (p. 262). The authors discuss how the style of assessment affects the relative performance of males and females (Murphy, 1982; Quinlan, 1991) but do not encourage the development of assessment schemes within examinations which ensure equal outcomes. The authors suggest that to rely simply on manipulating the style of assessment would ignore the equally important contributions of pupils' perceptions of subjects: the experiences they bring to a subject; and the type of demands that a subject makes since each differentially affects male and female performance. Stobart *et al.* suggest that the:

> difficult task is to determine how much of the problem resides in pupils' perceptions of the subjects and outside experiences and how much in the structure and assessment of the subjects.
> (Stobart, Elwood and Quinlan, 1992, p. 262).

A focus on equal opportunities instead of equal outcomes often produces a situation where it is difficult to clearly distinguish whether equal opportunities have been provided since equal opportunities and equal outcomes are not mutually exclusive. Stobart *et al.* debate the simplicity of this approach by arguing that if equal opportunities are to do with not putting obstacles in the way of particular groups it does not automatically follow that factors such as interest, diligence and relevant experience can or should also be kept constant. The issue they raise is "... whether it is legitimate to formulate a theoretical description of achievement which explicitly includes a sex difference or a difference between recognisable groups in general" (Goldstein, 1986, p. 3).

Whether we do this or whether we accept that equality of outcome is both legitimate and desirable we are bringing value systems into play. Examinations are currently shaped to promote significant differences between girls and boys in major subjects. This seems to be accompanied by assumptions that girls are better than boys in certain subjects (notably English) but not as successful in others (notably maths and science):

> If we...wished to have an exam which produced equal score or grade distributions for boys and girls, then we might well be able to achieve this by careful choice of question format, content, etc. There are, of course, considerable difficulties in the way of achieving such an end, one being that entry rates for different exams differ markedly. Nevertheless, the resulting examinations might do much to encourage the sexes to participate more equally in certain subjects and the resulting effects on teaching and curriculum would be a rather interesting example of an assessment led pedagogy.
> (Goldstein, 1986, p. 3-4, quoted in Stobart *et al.*, 1992a, p. 263)

Stobart *et al.* acknowledge Goldstein's suggestion and accept that by engineering the assessment we can bring the performance of males and females more into line. Therefore, the issue becomes one of the extent of this alignment and whether we are thereby treating gender differences in performance merely "... as artifacts of test items rather than indicative of a particular view of educational achievement" (Murphy, 1990, p. 1).

Previous research that I have been involved in (Stobart *et al.*, 1992b) takes the position that a fair examination is defined in terms of doing justice to the subject and in giving pupils opportunities to show what they know understand and can do. In practical terms this is likely to mean offering a balance of content and skill requirements within syllabuses and a range of assessment techniques which allow positive opportunities for both boys and girls to demonstrate their attainments which may not necessarily be the same. However, this can only be done effectively if there is awareness of where the gender-related differences lie and what may have led to them.

Again, this view of fairness is not equated with identical results. However, it is not the purpose of the research presented in this thesis to propose ways of manipulating schemes of assessment to produce equal outcomes. Indeed, a focus on equal outcomes is not constructive since sub-groups do have different qualities, abilities and experiences and any concentration on equal outcomes will hide these genuine group differences (Gipps and Murphy, 1994). Fairness must embrace the way in which the subject is defined and assessed, and seek equally valid but different means of assessing the same knowledge allowing both boys and girls to show their learning to full effect.

As demonstrated thus far, terms such as equal opportunities, equality and equity are problematic, lack clarity in definition and are prone to a variety of interpretations dependent upon the needs of the wider research community. Apple (1995) suggests that words like equity do not have an essential meaning but are defined by their use in real social situations with real relations of power. What equity actually means is "... struggled over, in the same way that concepts such as democracy are subject to different senses by different groups with sometimes radically different ideological and educational agendas" (Apple, 1995, p. 335).

Gipps and Murphy (*op. cit.*) do suggest, however, that equity is perhaps a more useful term to adopt since its focus is less on equal outcomes and more on the acceptance of different experiences for different groups. Gipps and Murphy's definition of what is meant by equity in relation to assessment, provides a much fuller understanding of what needs to be considered when interpreting group differences. It includes aspects of pupils' experiences and expectations in the interpretation of achievement and hence success, which is an important step forward:

> The concept of equity in assessment, as we use it, implies that assessment practice and interpretation of results is fair and just for all groups...recognising that other factors (e.g. pupil motivation and esteem, teachers behaviour and expectation) also come into play in determining achievement.
>
> (Gipps and Murphy, 1994, p. 18)

Bias in assessment and examinations

Goldstein (1996) cites Shepard *et al.*'s (1981) definition of bias in his work. Shepard *et al.* argue that : "... a test (or item) is biased if two individuals with equal ability but from different groups do not have the same probability of success" (Shepard *et al.*, 1981, quoted in Goldstein, *op. cit.*, p. 85). This definition is not straightforward as the word **ability** is itself problematic. Indeed ability can only be defined in terms of other tests (or items) which do not exhibit 'bias'. This leads to a resulting circularity (Goldstein, 1993).

According to Goldstein (1996), a more useful consideration of test 'bias' is that it refers to group differences which have nothing necessarily to do with the common understandings of bias as distortion. Differences in test performance by different groups may well be the result, not of bias, but of real differences in performance among the constituent groups. This may also in turn be due to different educational opportunities for these groups or different attainment by these groups in the topic being tested. Yet a common assumption is that differences in average performance on tests between different groups is taken to imply that the tests are biased.

As a result, Wood (1991) proposes that "... bias is an emotionally charged word for which **difference** ought to be substituted" (p. 166, original emphasis). Generally, what we are interested in is the interpretation of group differences in educational performance. However, in trying to communicate these issues, the word 'bias' is often used not in its technical sense but in an everyday, less precise way, which also has quite a 'pejorative-sounding' ring to it (Goldstein, 1993, p. 142). This invariably creates more confusion and as Goldstein suggests that we should "... try to avoid such confusions wherever possible by using less ambiguous terminology" (Goldstein, 1996, p. 85).

Taking on board the more technical aspects of bias, Gipps and Murphy (1994) outline Smith and Whetton's (1988) distinction between item bias and test bias. Item bias, they suggest, relates to those questions which disproportionately favour one group more than another. Test bias, on the other hand, relates to the average test scores for various sub-groups. In reducing test bias (i.e. reducing the mean difference score between groups), test constructors can manipulate the items which go to make up the test so as there is a balance of items which benefit the different groups taking the test.

Differential item functioning (DIF), a statistical way of identifying discrepant items in tests, has been adopted for use in discarding certain items and creating 'fair' tests (Lane, Wang and Magone, 1996; Ryan and Fan 1996). Smith and Whetton suggest that this practice is problematic in that bias is never fully removed even if one gets equal test scores for the different groups. Yet, Gipps and Murphy (*op. cit.*) argue that statistical procedures for determining item bias tell us only about the difficulty levels of the items for different groups and tell us little about the construct being assessed. Items tend to have different meanings for different groups and items which do not fit a common pattern of responses may simply be assessing a different attribute.

Bias or differential performance?

Goldstein (1996) goes on to discuss whether there would be any other way in which the term 'bias' can be used since he rejects the standard psychometric criterion (Shepard *et al.*, 1981) as inadequate. Goldstein suggests that one example of such a case is in dealing with items that are set in contexts which are familiar to one group more than another. In such a situation he suggests that the items are then more favourable to that group. If, however, the contexts are relevant to the content being assessed, any differences observed would provide useful information rather than being an artifact of the assessment item. In this sense, therefore, bias could be used to denote a difference "... which was strictly irrelevant to the attribute being assessed" (Goldstein, 1996, p. 89). When performance assessments are commonly situated in context, there is no clear cut procedure for judging whether bias exists or not, unlike objective tests and the procedures of item analysis which can identify rogue items.

Numerous examples of how the procedures for judging pupils' responses to problem-solving tasks can be biased in favour of one group more than another have been presented by Murphy (1989, 1991, 1996b). In this situation, the assessor has a set idea of what characterises a 'right' way to approach and respond to the tasks. Any one group not following the assessor's line of thought or their preferred approach is wrong. This has major consequences for those groups of students, mainly girls, who 'wrongly' engage with the task in a more general way, considering the context in which the majority of these tasks are set and seeing the relevance of the scenario put before them. There would, therefore, seem to be a case for using the term 'bias' when there is "... a clear intention on the part of the test constructor (which might have unconscious origins) to produce particular group differences" (Goldstein, 1996, p. 90).

Short of this, Goldstein asserts, " ... bias can no longer sustain its common meaning... we can talk more accurately about group differences or differential performance" (Goldstein, 1993, p. 147). In this thesis I intend to use the term 'differential performance' according to Goldstein (1993, 1996). I reject the common use of the term 'bias', except in those circumstances where it might be appropriate. In doing so I also fully acknowledge that clarification problems still exist in relation to the meaning of 'differential performance'.

Where group differences or differential performance are an outcome of particular assessments, they should be viewed as characteristics of the assessment itself, or of the interaction between the assessment and the groups who have been assessed. When these outcomes are used for selection and certification purposes this view is much more crucial. As this thesis will go on to demonstrate, the lack of review of group differences in any real sense, in public examination procedures, still remains a particular weakness in the system. Furthermore, as Wood (1991) suggests that group differences for groups as conventionally defined "... should always be looked at for what they might say about the teaching of the subject or test construction strategies and that material which is liable to be significantly correlated with group performance, and which need not appear in that form, should be removed" (Wood, *op. cit.*, p. 170).

In conclusion Goldstein (1996) argues that designing assessment items and tasks is a complex business which has been shown to involves technical considerations as well as social and political assumptions. In fact the traditional ideas of 'fairness', 'bias' and 'equity' themselves derive from the assumption that there is a set procedure that can be referred to in the test constructing process that will ensure no group will be disadvantaged disproportionally:

> To use terms such as 'bias' and 'fairness', rather than simply referring to group differences, implies a belief in an objective criterion for judgement. In many ways this is to make the same mistake as those who rely on psychometric notions of objectivity; that is to assume that some kind of 'expert' or 'technical' judgement is available and we simply need to work harder in order to find it.
> (Goldstein, 1996, p. 92-93).

Any choices that are made by test and examination designers to include certain items will be influenced by the cultural and social values of these tests makers since there are no such set of procedures or objective judgement. What is required is an examination of what we are assessing from a different cultural, social and political standpoint. In this respect, assessment and examination developers need to focus on both their own experiences and that of the growing body of research into these issues.

Gender differences in performance: national and international evidence

The contribution that the GCE A level makes to gender-related differences in performance needs to be evaluated in relation to patterns of differential performance from similar pupils at different ages and stages of education as well as the performance of boys and girls in other examination systems. The reason being that we need to consider how the foundation of performance in public examinations at post-secondary levels of education in the UK is laid down by the relative achievement of boys and girls earlier in their school careers (Powney, 1996). Trends in differential performance in other countries are also considered. In reviewing trends in international contexts, we can learn about the interpretation of such performance patterns from a wider perspective. The main difficulty with comparative data, however, is assessing the scale of the differences relative to those found at A level. All that is possible is a rough-and-ready estimate of whether A level results fit those broad trends in performance patterns, at similar ages and within different contexts, at a national and international level.

In the sections that follow, I outline the evidence of differential performance from a number of national and international surveys. From these large-scale surveys, patterns of performance for boys and girls from primary schooling to the pre-university phase are established. The review of this evidence focuses on the core subjects of language, mathematics and science since the bulk of research studies and surveys of performance having been conducted in these three subject domains (Powney, 1996). The three subjects areas reflect those which are under consideration in this thesis.

Gender differences in school performance: evidence from the UK

In considering gender-related differences in performance at the compulsory stage of schooling in the UK, I will provide a brief review of the findings of three large-scale national surveys: the Assessment of Performance Unit (APU) surveys which were conducted in the primary and secondary sectors in England Wales and Northern Ireland in the late 1970s and the early 1980s; the Assessment of Achievement Programme (AAP) surveys which have been surveying English language, maths and science on a regular basis at both primary and secondary level in Scotland since the early 1980s and the English National Curriculum assessment outcomes at Key Stages 1, 2 and 3 in English, mathematics and science.

Before reviewing this survey data, it is important to point out that these three surveys are modelled on quite different assessment frameworks and different approaches to test construction which will have a bearing on the interpretation of the data. These differences have mainly come about by different test agencies, that have different approaches and emphases on the research of assessment practice and methods, being responsible for the surveys in different subject areas (Gipps and Murphy, 1994). For example, all three surveys differ in task selection strategies and the numbers of tasks used. In the AAP and national curriculum assessment, many of the tasks administered have been newly written to match a pre-determined test specification and the assessment itself is very restricted in terms of the number of tasks and items involved. The APU surveys, on the other hand, employed domain-sampling in science, with test items randomly selected from within pre-established item pools, and Rasch modelling and item analyses in maths and language to select test items and interpret the data collected. Both these approaches in the APU surveys allowed for a far greater range and number of items to be used. Also, the nature and age of the samples used for the surveys varies. Both AAP and APU surveys used light sampling techniques to obtain the test population across the ages of 11, 13 and 15. On the other hand, at present, the national curriculum assessment programme tests every eligible child at 7, 11 and 14 years.

Bearing in mind these acknowledged differences in the surveys, it is still possible, and indeed valid, to use the data to review gender differences (Johnson, 1996). It is not through a quantitative comparison across these three surveys that interpretations regarding gender differences are supported but through a consideration of the consistency of differential performance patterns and the similar direction of the differences observed across studies and over time. The findings regarding differential performance patterns from these surveys can validate and contextualise the patterns of performance for younger pupils and hence, the types of assessment experiences that A level students may have had in earlier phases of their schooling. For more comprehensive reviews of the findings of these three surveys and considerations of their differing approaches and frameworks the works of Gipps and Murphy (1994), Johnson (1996) and Powney (1996) are crucial. The evidence below is presented under subject related areas.

English

In the UK, girls have consistently outperformed boys in both Reading and Writing across the 5-16 age range (White, 1996). Prior to national curriculum assessment data, the most comprehensive information about pupils' language performance up to age 15 was gathered in the course of the Assessment of Performance Unit (APU) language surveys (e.g. Gorman, White, Brooks and English, 1991). The findings from the APU surveys were recorded in terms of specific tasks, thus it was possible to look more particularly at the performance of groups of pupils in terms of the differing demands of different tasks.

At both ages, 11 and 15, there were marked differences in performance on the reading tasks, especially those which included narrative and expository texts. The results suggest that when a diverse range of questions are posed in relation to texts and when extended amounts of writing are not demanded, the performance of candidates shows that just as much is of a task effect as a gender effect (Stobart *et al.*, 1992b; White, *op. cit.*). The implication of these findings for overall differences in gender-effects is that the reading performance needs to be considered in relation to the task set.

In Writing, the APU surveys found gender differences, in favour of girls, that were pronounced across all tasks. The task types on which the performance gap lessened were those which either drew directly upon the pupils' recent experiences or offered some form of support in the form of relevant source material. The tasks for which the pupil had total responsibility to devise and shape subject matter as well as to define the readership proved to be the ones on which girls did considerably better.

Findings from the AAP Language surveys, in the main, reflect those found in APU surveys. The AAP results show that girls perform better than boys in reading writing and talking across both the primary and secondary phases of schooling, with only a few specific tasks showing to be in favour of boys (Johnson, 1996; Powney, 1996). In Writing tasks, girls at 9 and 11 were better than boys in the choice and use of language (Powney, *op. cit.*). In the few Listening exercises that were incorporated into the surveys the results showed mixed patterns across both groups. In these tasks there was evidence of contextual effects, with girls and boys performing better on listening to audio and video tapes respectively.

Results of standard assessment tasks and tests taken at the end of Key Stages 1, 2 and 3 show similar patterns to performance to those identified by the APU and AAP surveys. In English at Key Stage 1 (age 7) the 1996 results showed significant differences between boys and girls in all elements of the subject tested (DfEE, 1996a). At Key Stage 1, Level 2 is the expected level of achievement. In Reading, 46% of both boys and girls obtained this level . In Writing, however, 7% more girls than boys obtained Level 2 (77% and 70% respectively). Gender differences were also found at Level 3 and Level 1. At Level 3, girls were significantly ahead of boys in Reading and Writing with 9% more girls attaining Level 3 in Reading and 4% more in Writing. Conversely 8% more boys than girls attained Level 1 for Reading and Writing.

National assessment in English at other key stages has provided data on the performance of 11 and 14 year olds, "... albeit on a less-than-national scale, because of test boycotts and the smaller samples used for pilot trials" (White, 1996, p. 102). Such data that are publicly available through DfEE publications (DfEE 1996b, 1996c) indicate similar patterns of advantage for girls. For example, at Key Stage 2 (age 11), 15% more girls than boys attain Level 4 and above in English (an aggregated outcome of performance in reading, writing and response to Shakespeare) and 18% more girls that boys attain Level 5 and above at Key Stage 3 (age 14).

Maths

Historically (Burton, 1986), the pattern in mathematics has provided better results for girls during primary schooling and then increasingly so for boys during secondary schooling. In surveys of mathematics performance, the APU collected comprehensive information, from over 12, 000 pupils across six surveys, up to age 15 (e.g. Foxman *et al.*, 1985). At age 11 years the APU found little difference between the overall performance of boys and girls. However, evidence showed that girls were substantially ahead of boys on computation topics and boys doing much better than girls on items involving measure. As higher level cognitive tasks were introduced at age 15, boys tended to perform better than girls in most topic areas of mathematics. Boys showed better performance in areas of descriptive geometry, rate and ratio and mensuration. Girls were performing better than boys in tests assessing problem solving strategies rather than mathematical content. Some of the largest differences found at age 15 were on items involving spatial visualisation of 3-D shapes and the ability to rotate objects in the mind. Boys were consistently performing better on these types of items than girls.

The third AAP mathematics survey was conducted in 1991 and was concerned with three main elements of the mathematics curriculum: information handling; money and measurement; shape, position and movement. Results in the primary sector showed "... no significant gender differences on any aspect of the assessment framework..." (Johnson, 1996, p. 39). Among secondary pupils, however, statistically significant differences were found in favour of boys in some of the number tasks and on tasks within the 'shape, position and movement area' (Powney 1996). Girls outperformed boys on all aspects of whole number (Johnson, *op. cit.*).

For Key Stage 1 mathematics, results from national curriculum tests are reported at the subject level. In 1996, 6% more girls than boys attained Level 2 in mathematics. Running counter to the patterns highlighted by the APU and the AAP, the results of the 1996 tests at Key Stage 1 in maths showed 2% more boys than girls obtaining a Level 3 which is an above average performance at this stage. At the other Key Stages, patterns of performance show that there is very little difference between boys and girls in mathematics performance at ages 11 and 14.

Science

The APU science surveys focused on the use of a wider range of instruments and a broader spectrum of science content and process which included the use of extensive practical tests. The APU science results showed girls outperforming boys across the ages on practical tests of making and interpreting observations, and planning and performing investigations. Boys continued to demonstrate superior performance in applying and interpreting physics concepts and use of graphs which increased with age (Gipps and Murphy, 1994). The surveys were also able to note early-developed gender differences in the use of measuring instruments (Johnson and Murphy 1986). At all ages (11, 13 and 15), girls and boys performed equally well on the use of thermometers, measuring cylinders and weighing scales, with boys producing slightly better performances on using hand lenses and stop clocks. At ages 13 and 15, however, boys produced better performances when using microscopes, forcemeters, ammeters and voltmeters (Johnson, 1996). When pupils were asked, through questionnaires, what their experience was of these instruments, the results showed that boys' results had been better on precisely those instruments for which they claimed to have more experience (Murphy, 1991).

The AAP science surveys used seven categories of knowledge, understanding and skills which were assessed in written and practical formats (Powney 1996). From the latest AAP science results, in 1993, no overall differences in performance were found but there were differences on different tasks. At age 15, boys were better in knowledge type tasks which covered recall and explanation; girls were better in process type tasks such as handling information, observation inferring and investigative skills (Powney, *op. cit.*).

In the English national curriculum assessment, science is no longer reported at Key Stage 1. At the other key stages performance is reported at the subject level only. At Key Stage 2 girls are slightly ahead of boys at Level 4 (a 2% difference in favour of girls) whereas boys are obtaining a slightly higher proportion of Level 5 (a 1% difference in favour of boys). At Key Stage 3, there is no difference between boys and girls in the percentage of pupils attaining Level 5 and above (57% of both boys and girls) (DfEE 1996b and 1996c).

The findings from the APU and AAP surveys and the results of national assessment suggest that there are differences in performance at school between boys and girls. In summary, this brief review has highlighted that up to, and including the end of, compulsory schooling girls show better average performance than boys in language, the gap in gender-related performance in maths is closing and that gender differences in science still exist, mainly at the task level if not overall. This information is important for this study since it contextualises the situation prior to the GCSE and A level (see Chapter 5) and highlights more effectively the change in patterns of performance that are obtained at GCSE and A level. The next section of the discussion moves on to identify findings from international surveys. The assumption here is that we can benefit, in a comparative sense, from what these large-scale national and international surveys have to tell us about differential performance since we can apply this knowledge to differences found between 16 and 18 year olds here in the UK.

Gender differences in performance: international perspectives

Johnson (1996) acknowledges that both national and international assessment programmes and surveys have reported gender differences in achievement and in curriculum exposure. Large-scale surveys have also supplemented the overall picture of gender-related differences in performance, by identifying strengths and weaknesses of sub-groups in different elements of the subject domain and in linking differential performance to influences of other factors, such as context.

Johnson (*op. cit.*) compares and contrasts the reported findings from a number of large-scale assessment programmes in language, mathematics and science covering both primary and secondary education. Johnson covers two international studies; the International Association for the Evaluation of Educational Achievement (IEA) which has been carrying out international performance surveys since the late 1960s and the International Assessment of Educational Progress (IAEP) which conducted international surveys in science and maths in 1988 and 1991. As well as reviewing the APU and the AAP surveys, outlined above, Johnson reviews four other cross national surveys including: the National

Assessment of Educational Progress (NEAP) in the USA, one of the longest running surveys of pupils' achievement; the School Achievement Indicators Programme (SAIP) in Canada, which is one of the most recently established national surveys; the French National Assessment programme (referred to as the EAE), which resembles the national curriculum assessment model in England and Wales, by blanket testing in French language and maths at significant key stages in the French education system; and finally the Dutch National Assessment Programme in Education (referred to as PPON) which was launched in the late 1980s and conducts surveys mainly in the primary sector.

Similar to the performance patterns found in the UK surveys, there are differences between these large-scale cross national and international studies that have consequences for the interpretation of the data. They have all focused on different pupils at different ages and stages of their schooling; have employed various sampling techniques to produce large numbers of pupil samples, and have various subject assessment frameworks to test elements of the subject in different ways. They have also employed a variety of analysis procedures to produce achievement measures and have reported these achievements in numerous ways. Different surveys have defined the subject domains differently in terms of the subject coverage incorporated into their survey tests and the mode of assessment used to assess pupil performance. Many of these surveys have relied exclusively on the recall of facts and multiple choice tests whereas others have given more emphasis to the assessment of skills using short item response and extended theme based tasks with practical tests utilised in science. Yet, Johnson (1996) suggests that the findings related to gender show remarkable similarities and, in some instances, are complementary. Sufficient evidence has accumulated from these surveys to indicate that :

> individual pupils and pupil groups, including boys and girls, show differential performance strengths and weaknesses within a global subject area and indeed that they...react differently to the context embodied in individual assessment tasks.
>
> (Johnson, 1996, p. 31).

Two other recent reviews of differential performance are useful to acknowledge at this stage. Firstly, the Equity in Senior Secondary School Assessment (ESSSA) project carried out by the Senior Secondary Assessment Board of South Australia (SSABSA, 1993) into gender equity and assessment of Year 12 students (aged 17). The ESSSA project stemmed from the need to research the relationship between gender and assessment at a national level in Australia. It focused on both school-based assessment and publicly examined subjects.

Secondly, the review by Linn (1992) of research in the USA which synthesises research work from national tests, individual studies and course grades analyses. The last two reviews are pertinent to the present discussion as they are based on older students (17+) who are of similar age to A level students. Findings from these studies are helpful in understanding the patterns of performance obtained at A level.

The gender-related findings from these surveys and reviews are summarised below. The focus is on the work of Beller and Gafni (1995), Linn (1992), Johnson (1996), Powney (1996), and the SSABSA (1993). These reviews provide a useful insight into what national and international surveys can tell us about sub-group performances but also the inherent weaknesses of such surveys in relation to design and definition, curriculum coverage and cultural contexts. For a more complete discussion of these issues that goes beyond the scope of this thesis refer to Beller and Gafni (1995), ETS (1992), Gipps and Murphy (1994), Johnson (1996), Murphy (1996d), Powney (1996) and SSABSA (1993).

Language

Many of the large-scale surveys support previous knowledge about gender differences in one's native language. Generally, differences favour girls at all ages and tend to decrease with age. In both the IEA and the IAEP girls performed better than boys on tests of Reading and Writing. Girls showed superior performance on three domains of reading literacy - 'narrative', 'expository' and 'documents'. The largest differences occur in the narrative element (Johnson, 1996). Some of the cross national surveys, however, show that the gap in male and female performance persists throughout the three stages of schooling assessed, ages 9, 13 and 16/17 (NEAP, 1993, SAIP, 1994). The Dutch national survey (the PPON), in separating assessment for a relatively extensive range of specific tasks of language competence within reading, writing, speaking and listening, demonstrates that girls excel when dealing with fictional material and boys when handling functional reading material (instructional material, maps, tables, etc.) (Johnson, 1996; Powney, 1996). Girls showed superior performance on all aspects of writing. In speaking, observed differences were equally in favour of boys and of girls .

In Australia, girls were found to outperform boys on Writing tasks that were in response to poetry, drama and prose, the biggest differences were found in the poetry tasks (SSABSA, 1993). Girls also showed better performance on writing classified as 'explain', 'evaluate', 'transform' and 'analyse'. The biggest differences in performance occurred on questions classified as 'explain' (*ibid.* p. 181-182). Girls performed better at extended writing, either essay or continuous prose format. When questions were placed in a multiple-choice format boys performed better than girls, but this was not the case for all questions on all passages. Similarly, as with the APU data, there appeared to be links between the subject matter of the passage on which the questions were based and differences in male/female performance.

Trends in performance from the USA indicate that over the last 20 years gender differences in verbal ability have declined essentially to zero (Linn, 1992). However, the narrowing of the gap in verbal performance has paralleled the alteration of tests of verbal ability to focus on constructs associated with male success. Patterns of performance on college admission tests of verbal ability illustrate the influence of question context on gender performance. College admission tests draw on vocabulary and concepts from the humanities, political science, natural science and other domains featuring questions that require discriminating word meanings, interpretation of passages, organisation of ideas and writing coherently. Research (Linn, *op. cit.*) has shown gender differences which are associated with the question domain. For example, natural science items are easier for males than females, while humanities items are easier for females. This research also suggests that males perform better on multiple-choice tests requiring discrimination among responses, whereas, females do better on questions requiring organisation of diverse ideas and writing of coherent paragraphs.

Maths

Many surveys (Beller and Gafni, 1995; Johnson, 1996) at an international and at cross national level in maths have confirmed previous knowledge about gender differences in performance in mathematics. These differences suggest that on average, boys and girls in the earlier stages of schooling perform similarly in mathematics but as age increases boys generally outperform girls and that by age 15/16 boys achieve better performances in virtually all aspects of mathematics tested. In the IAEP surveys, conducted in 1988 and 1991, boys performed better than girls in the undifferentiated field of mathematics (Beller and Gafni, *op. cit.*). At age 9 there did not seem to be a performance gap between boys and girls across all countries participating. By age 13, in total test score and in the various aspects of the subject tested (numbers and operations, measurement, geometry, data analysis and probability and algebra and functions) there were larger gaps in performance in favour of boys which were found across all participating countries. Boys were also ahead across the cognitive procedures tested - conceptual understanding, procedural knowledge and problem solving (*ibid.*).

The national surveys, such as the NEAP, EAE, PPON and SAIP found similar findings to those reported on the international surveys. For example, in the NEAP surveys, boys and girls showed few differences at age 9, although girls were slightly better at whole number computation and boys at estimation and measurement. However, by age 13 gaps had become larger. In fact by age 17, boys had shown significantly better average performance on virtually all aspects tested - knowledge, skills, understanding and application (NEAP, 1993). It has been suggested that the gender differences on surveys, such as the IEA and the NEAP, are related to the fact that they are predominately tested through the use of multiple-choice tests (Johnson, 1996).

Recent evidence from Australia suggests that gender-related performance patterns in mathematics are less clear and less consistent than those found in English (SSABSA, 1993). Over the years 1987-1991, female performance in mathematics improved. However, males still performed better than females in a number of 'high level', pre-tertiary mathematics courses. Males tended to figure more predominantly at the highest and the lowest levels of achievement whereas females were situated around the middle to upper range of scores. In public examinations females performed better than males in school-assessed components, but males scored more highly in examinations. At a more detailed level of analysis girls performed better than boys in those questions that required the routine use and manipulation of mathematical knowledge. Boys, on the other hand, performed better in those questions that required the application of mathematical knowledge. The understanding of calculus, probability and geometry tended to be better demonstrated by girls through theoretical questions and by boys through questions demanding application of mathematical concepts. Boys seemed to deal more successfully with extracting essential information from complex, information-dense question structures in mathematics than did girls, and were generally more successful in questions that demand the use of diagrams.

The patterns of performance in mathematics in the USA show similar trends (Linn, 1992). Gender differences in educational achievement in mathematics have shown consistent declines and are almost non-existent (Hyde *et al.*, 1990). Reviews of the research results (Linn, 1992, Feingold, 1988), as well as, analyses of standardised tests also reveal that the gender gap in the ability to reason about spatially represented information has essentially closed . However, differences still occur when the context of spatial visualisation tasks are more familiar to one group than another. For example, tests of spatial visualisation that asked students to make inferences about screws, bolts, and angle brackets were shown to be easier for those students (mainly boys) who were familiar with these objects. The gender gap in reasoning about unfamiliar objects is closing, but the gap remains for reasoning about objects more familiar to males than females (Linn, 199, p. 20).

Science

The overwhelming evidence from the large-scale assessment programmes at both a cross national and international level is that boys perform better in science than girls. The largest differences found were in the physical sciences with smaller differences, that still favoured boys, occurring in the biological sciences. By comparison, girls have been seen to show better performances in observational skills (Johnson, 1996).

Reports from the IAEP studies refer only to 'science'. These reports show gaps which are substantially larger than those observed in maths with boys of ages 9 and 13 performing better than girls in this domain (Beller and Gafni, 1995). In the 1991 IAEP survey, boys once more did better than girls at age 13 particularly in physical and earth and space sciences. In a number of countries girls were ahead of boys on questions about the 'nature of science' (Foxman, 1992). However, no gender differences were found on questions involving integration of science. These results may suggest that when items involve an understanding of scientific methods and process, but do not depend on specific scientific content, no gender differences arise.

Other survey programmes have tended to offer assessments on differential aspects of science. Those that have done this, such as the IEA, NEAP and the Dutch PPON (Johnson, 1996), have shown the gender gaps to be especially large in physics, with smaller differences, usually in favour of boys, in chemistry and biology. In most cases the physical science advantage to boys has been noted from the earliest ages tested (8 to 11) and seen to persist and to increase with age, in association with gender differences in optional subject choices in the secondary school (Powney, 1996).

Findings from both Australia and the USA, indicate that the gap in both the national sciences and the biological sciences is decreasing (Linn, 1992, SSABSA, 1993). The gender differences in scientific reasoning have been shown to be mixed. Meta-analyses and national assessment results suggest that gender differences are most pronounced for the measures of scientific information and least pronounced for measures of scientific reasoning (Linn, 1992, p.32). Still achievement test scores are higher for those who take science courses, but as in mathematics, exposure to science courses in high school does not reduce the gender gap on national tests. Studies in the USA have also concluded, as with those in Australia, that measuring scientific reasoning in the context of expertise results in a more equitable assessment than does the measurement in the least common context (Linn 1992; SSABSA, 1993).

The evidence presented in this chapter from cross national and international surveys confirm that girls across many countries of the world outperform boys in language throughout their school career, that boys are better in sciences overall and that by the end of compulsory schooling, boys outperform girls in maths. The evidence from Australia and the USA in relation to older pupils suggests that females continue to do better in language courses and assessments, but that females still are behind in maths and sciences, even though the gaps in male and female performance in these subjects are closing.

In summary, it is extremely difficult to make cross-cultural comparisons as Gipps and Murphy (1994) and Johnson (1996) emphasise, since definitions of assessment are culturally and context dependent. In the surveys reviewed above there is generally little, if no, critique of the tests used (Murphy, 1996d). It is therefore difficult to make longitudinal international comparisons between these tests as the items used are not always released for further analyses. As Johnson (*op. cit.*) points out no quantitative comparisons can be made as the measurements taken on these test the quantification of results are all carried out in different ways. In acknowledging these caveats, there is, nevertheless, a high degree of commonalty across these survey findings in regard to gender differences in performance. The shifts in these patterns of performance over time, and the different curricula and cultural contexts present, suggests that the patterns of differential performance are probably best explained through socio-cultural factors. It is these explanations of gender-related differences in performance that I explore in the next chapter.

Chapter 3

Explanations of Gender-Related Differences in Performance

Introduction

This chapter is concerned with outlining those explanations of gender- or sex-related differences in performance which are reported in the literature. Attempts to explain why there are gender-related differences in performance are numerous. Explanations have ranged from the biological (with assertions about inherent, biologically based differences between males and females) to the social (more critical discussions of the social and educational experiences encountered by boys and girls) to debates about test characteristics (Wilder and Powell, 1989). Wilder and Powell suggest that many of the debates about the differences between male and female performance treat these differences as 'real' and seek to justify this stance by identifying the mechanisms which underlie them. By comparison, other explanations regard differences as 'artifacts' of the differential treatment of men and women within society in relation to existing socialisation patterns and experiences at all levels of the education system, as well as, aspirations and expectations.

Although the role of biological factors in explaining differences in performance is acknowledged in this chapter, they are of secondary importance because these explanations are sketchy and incomplete (Halpern, 1992). The chapter is more concerned with those explanations which focus on the social and educational factors, such as expectations, experiences and attitudes and how these factors influence the learning of boys and girls. The chapter considers the gendered nature of pupils' learning and its effects, especially in relation to assessment and examinations. The argument here is that when interpreting gender-related differences in performance we need to take into account the complex interactions of the perceptions and expectations that pupils bring to the examination situation. The final sections of the chapter look at the role of examinations, their structure and the assessment techniques used, in explaining the differences in performance.

Biological explanations

Halpern (1992) outlines the biological theories assumed to account for the differences observed in cognitive abilities. She refers to these as genetic or chromosomal differences, brain differences and hormonal differences. Halpern (1992) notes that these systems do not operate separately in any one individual and therefore it is difficult to isolate the contribution of each to the differences between males and females.

Early genetic theories suggest that with regard to sex differences in intellectual ability, spatial ability is inherited and determined by a recessive gene on the X-chromosome. These theories have now been disproved. They are no longer viewed as valid explanations due to the complex nature of cognitive abilities which are considered unlikely to be the result of merely one gene. Halpern (*op. cit.*) also suggests that such a hypothesis falls short when one considers evidence that all individuals exhibit spatial abilities to some degree.

Theories about sex-related brain differences have asserted that the different hemispheres of the brain are dominant for different cognitive functions and are sex-linked. Halpern (*op. cit.*) reviews the evidence in this area and concludes that males and females differ in brain organisation for intellectual behaviours, with the female brain being more symmetrical than that of the male. Differences that have been found suggest that male brains are more lateralized or specialised for certain cognitive functions than female brains. The hypothesis here is that females have language functions represented in both cerebral hemispheres, whereas, men are more lateralized for language, i.e. the functions for language and spatial tasks are in different cerebral hemispheres. The evidence, however, that strong lateralization leads to highly developed spatial skills and that weak lateralization promotes good verbal abilities is inconclusive. Indeed Halpern concludes that "... before the relationship between sex, brain organisation and cognitive abilities is understood" (Halpern, 1992, p. 106) more research is needed which relates the degree of lateralization to cognitive abilities.

Another dimension explored as affecting the development of cognitive abilities is the concentration of sex hormones at puberty. Halpern (1992) outlines that certain theories have focused on girls' earlier maturation compared to that of boys'. These theories link early physical development with intellectual development in an attempt to explain girls' early advantage in verbal and language-related skills. However, such theories suggest that different biological mechanisms are responsible for verbal and spatial abilities and that verbal abilities for both sexes are advantaged by early maturation. Other theories have suggested that late maturers (generally males) show more highly developed spatial skills than early developers (generally females) who show highly developed language skills. In general, however, research evidence indicates that the association between better spatial abilities and age at puberty is weak, if not non-existent. Moreover, research showing spatial abilities emerging before puberty have called into question these earlier theories (Gipps and Murphy, 1994).

Halpern (1992) concludes in her work that the current knowledge of biological-cognitive influence remains sketchy and largely incomplete. She suggests that even theories that have received empirical support remain open to criticism on methodological and logical grounds. We are guarded against "... interpreting sex differences as a cognitive deficiency for either sex" (*op. cit.*, p. 106). As a result, there is still some way to go in understanding the mutual influences of biology and cognition.

Social and educational explanations

Since biological factors are inconclusive, it is necessary to turn our attention to the social and educational factors which provide us with clearer explanations of male and female differences in performance. Support for the importance of social and educational factors. comes from the relative changes in performance between males and females over time (Johnson, 1996; Stobart *et al.*, 1992a). These variations in performance are more likely to reflect changing social structures and expectations rather than any biological or physiological developments.

Research indicates (Wilder and Powell, 1989) that the social and educational factors cited to explain gender differences are linked to the different socialisation processes that girls and boys experience from birth. Wilder and Powell (1989) focus on early sex-role development. They suggest that such roles include behaviours that are expected of, and rewarded in, males and females. Wilder and Powell (1989) argue that there is ample evidence that boys and girls are treated differently from birth and that parents react more positively towards smaller children when they are engaged in gender-appropriate behaviour. Parents' expectations differ for boys and girls and this is reflected in the activities and toys they provide for them and in their reactions to them. Consequently girls and boys engage in different hobbies and pastimes from an early age and their interests continue to diverge with age.

Murphy (1996a & b) suggests that an important outcome of these different socialisation patterns is that not only are children channelled into gender-appropriate experiences but also into gender-specific ways of experiencing. As a result, children develop different ways of responding to the world and making sense of it. This in turn has an important influence on how and what they learn, what they perceive as appropriate behaviour for their gender and what others expectations of them are. Murphy (*op. cit.*) asserts that gendered aspects of learning are witnessed (and maintained) through differences in experiences, views of relevance, expectations, attitudes to schooling and styles of expression and communication. In the discussion that follows, I have used Murphy's categories of differences since they are a useful structure in which to locate and summarise the expanding field of literature on explanations of gender and assessment performance.

Differences in experiences

Early sex-role development and the different interactions that boys and girls have in their home lives influence how young children understand that gender is a means of organising people and society. As such, they develop clear ideas about what girls do and what boys do (Browne and Ross, 1991). In terms of learning activities and situations, Browne and Ross identified boys and girls choosing to be associated with different activities; the choice being linked to the roles that boys and girls see as appropriate for themselves in social interactions (Murphy, 1996a & b). The learning experiences which boys and girls then have in relation to these activities are quite different. Cohen (1986) suggests that by the time children enter secondary school they are likely to be firmly established in gender-type activities, socialising with peers of their own sex and following different out of school activities. Boys' and girls' socialisation patterns are not only very different but the interactions between boys and teachers and girls and teachers have also been shown to vary in frequency, duration and content (Measor and Sikes, 1992; Randall, 1987). Consequently, boys and girls develop different perceptions of their abilities and relationships with academic disciplines (Powney, 1996). Furthermore, teachers' expectations and judgements of girls' and boys' achievements and needs have also been found to vary in stereotypical ways (Walden and Walkerdine, 1986).

Evidence also exists on students' differential experiences out of school and the direct effects that these have on the measured achievements in school (Johnson and Murphy 1986) . For example, both UK (APU) and USA (NAEP) surveys have shown that girls' and boys' experiences of scientific equipment and apparatus out of school differed. Where gender differences in the use of apparatus arose in the surveys they were in favour of boys and on precisely those instruments which boys reported more experience of outside school (DES, 1988a, 1988b).

These performance differences increased in range and magnitude as students progressed through school (Johnson and Murphy, 1986). In this respect, it is important to consider whether we are assessing achievements that have been solely acquired in school.

Murphy (1991) suggests that if we are concerned with understanding how pupils may or may not construct meaning in assessment tasks, it is important to consider the nature of their different experiences. Students who use instruments outside of school will therefore not only be more familiar with them but will be able to appreciate more how they are used, when to use them and to the degree of accuracy required. Hence, the different skills and knowledge that students develop and their understanding of situations and problems will be influenced by their experiences.

Boys, more than girls, continue to play with and explore electrical toys and apparatus outside school. Such experience enables boys to develop an implicit understanding of the effects and characteristics of electricity. As the research for this PhD will demonstrate, teachers drew attention to the issue of electricity as one of the areas of physics that they believed to be more difficult for girls. Yet, this difficulty may be caused by their limited exposure, within laboratory settings only, to electrical apparatus and instruments.

Differences in views of relevance

A consequence of pupils' differential ways of responding to their environment is that girls typically tend to value the circumstances that activities are presented in, they consider the context gives meaning to the task and take account of this information when giving their response. Conversely, boys generally consider the task in isolation and judge the content and context to be irrelevant. These differences in approach affect pupils' perceptions of assessment tasks. An example of this is given by Murphy (1996b). A science task was given to 13 and 15 year old pupils to investigate which of two materials would keep them warmer. The context for the activity was how suited such materials would be for a person stuck on a mountain in windy, cold conditions:

> Many of the girls integrated this dilemma into their task....They cut out prototype jackets to see whether the materials were suitable for making a jacket and they dipped the materials in water to see how effective an insulator the material was if by chance it rained....Several girls tested the insulating properties of the materials when dry and wet. Consequently, although the girls were pursuing an appropriate scientific investigation, their investigation was more complex than intended...the science in these girls' behaviours went unnoticed.
>
> (Murphy, 1996b, p. 4-5)

Murphy (*ibid.*) argues that girls' and boys' observations indicate their differing views of relevance rather than competence; girls' attention to human concerns (which they have been encouraged to attend to outside school) affects their ability to focus down on certain aspects of a task.

Teachers and assessors are generally looking for responses that will parallel their world view and are less likely to accept alternative positions. Murphy (1991) argues that the failure of students to correspond with the assessor's view is taken as a measure of lack of achievement. Girls' concern themselves with the more human aspects of the assessment situation which can be viewed as trivial. Their interpretations can also influence teachers' judgements about their ability and how they are treated: "... girls' tendencies to be distracted by powerful cues or true but irrelevant facts seem to reflect the hesitant, dependent, anxious, unmotivated, help-searcher learner" (Levin, Sabar and Libman, 1987, p. 111).

Differences in expectations

Closely linked to the role of experience are the expectations which pupils, parents and teachers bring to the study of a subject. For example, in mathematics there has been a long history of teacher and parent expectations that girls have neither the same ability nor the need to do well in this subject (Shuard, 1982). However, since the introduction of the GCSE and the implementation of the national curriculum the patterns of girls' involvement and attainment in all subjects including mathematics and science have changed dramatically. This suggests that such expectations seem to have changed. More girls now enter for GCSE examinations and obtain proportionally more A*-C grades than their male counterparts (Elwood, 1995). More girls enter for A level examinations and go on to study at university (McCrum, 1996; Gallagher, McEwen and Knipe, 1996, Stables and Stables, 1995. These trends are not restricted to the UK (Hildebrand, 1996, Matters, 1997).

However, within these changing patterns of entry and performance we are still seeing boys and girls choosing 'traditional' subjects to study at A level. Gender differentials in choice of subject at GCSE are carried through, not surprisingly, to A level (Cormack *et al.*, 1992b). Even though more girls are entering for maths and science A levels, most girls still tend to concentrate on the arts and humanities and most boys on science and technology (Montgomery, 1994). Whitehead (1996) suggests that the subject choices made by boys and girls at A level are strongly connected to stereotyped attitudes towards school subjects, which are in turn linked to stereotypical attitudes towards occupations and conformity to traditional sex-roles for boys and girls. The relationships between subject choice and these attitudes is complex but has been shown to be different for boys and girls, proving more significant for the former than the latter.

Powney (1996) suggests that teachers have had (and still do have) different expectations of male and female students. Walden and Walkerdine (1982) suggest that the social stereotyping of girls' success ascribes it to hard work, diligence and rule following. This stereotype unfortunately creates a self-fulfilling prophecy: in the classroom the assumptions of lack of confidence or anxiety about certain subject domains can in turn both reinforce what is expected and lead to 'caring' practices of lessening pressure and offering softer options for girls. The social stereotyping of boys' success presents them as ebullient, aggressive risk-takers who achieve with minimal effort. Such behaviour is commonly interpreted as an indicator of high ability, but it often obscures boys lack of acquisition of knowledge or skills thus affecting their overall achievement. Turner, Riddell, and Brown (1995) suggest that responding to pupils in ways that reinforce stereotypes, e.g. expecting boys to be mischievous or girls to be passive, is done quite often unconsciously by teachers. It can however, "... lead to a disproportionate amount of time being devoted to clamorous boys while the quieter, non-troublesome girls are disregarded" (Turner *et al.*, 1995, p. 25).

It seems, therefore, that the success of girls is double-edged. The characteristics of femininity such as 'helpful', 'kind', 'attractive' and 'nice' are precisely the characteristics which render girls good, hard working and successful in the classroom. Yet, when it comes to teachers' expectations of performance in examinations, they infer that girls may not possess the qualities of 'real understanding', 'flair' and 'brilliance', (often characteristics ascribed to boys) which are thought to get candidates through on the day and an aid to good grades.

Differences in attitudes to school

Research cited in the literature suggests that a relationship between differential performance and gender differences in pupils' attitudes to schooling in general and to learning in different subjects in particular exists (e.g. Barber, 1994; Burton, 1986; Fennema *et al.*, 1990; Gallagher *et al.*, 1996; Gorman *et al.*, 1988; Joffe and Foxman, 1988; Johnson and Murphy, 1986; Rudduck *et al.*, 1996; Pickering 1997; Stables and Stables, 1995; Walkerdine, 1989; White, 1987). These studies tend to suggest that girls are more positive about school than boys, are more likely to enjoy school than boys, and by the end of primary schooling are more likely to conform to the norms of schooling and work harder. Harris, Nixon, and Rudduck (1993) suggest that girls do better in school because they learn to work within the conventions of school which tend to emphasise neat presentation, attention to learning within the classroom and social interactions around the school.

Boys, on the other hand tend to conform less to the social norms of school, pay less attention to the neatness and presentation of their work and consistently tend to overrate their ability (Barber, 1994). Boys also tend to be more selective in terms of the subjects which they see has having value and in which they will work hard (Stobart *et al.*, 1992b). Boys' disaffection with school in comparison to girls' resides particularly in the area of motivation to learn (Barber, *op. cit.*). By their mid teens, girls were consistently more motivated than boys. Evidence from interviews with students (Barber, *op. cit.*) indicates that it is not 'cool' for boys of that age to be seen by their peers as 'achievers'.

Characteristics of attitudes ascribed to students in compulsory schooling, surprisingly still exist amongst post-16 students who have actively chosen to stay on for advanced study and who are at a similar level of ability. In their study of first year A level students, Stables and Stables (1995) found that girls continued to lack confidence relative to boys: girls were more likely to mention the difficulty of A level subjects as reasons for finding their courses different from their expectations, despite the fact that they had done better than the boys generally at GCSE; and girls tended to spend longer talking to advisers regarding A level subject choices and were less inclined to trust their own judgement than boys. However, when girls opted for physics and chemistry at A level (generally the more able girls) they tended to be slightly more confident about their A level choices and future performance. Stables and Stables conclude that confidence (or lack of it) seems to be a major factor in the differing perceptions of boys and girls to A level study.

These findings are supported by the work of Gallagher, McEwen and Knipe (1996) who investigated girls' attitudes to A level science subjects. Gallagher *et al.* argue that girls in their study seemed to agree with the gendered images of physics (a 'male' subject) and biology (a 'female' subject). Some girls also felt that boys were more confident, naturally gifted, competitive and geared towards more scientific careers, especially those which needed a physics qualification. On the other hand, girls felt that they have to work harder in physics in order to get similar grades as boys. It was this pattern, however, which was seen as alterable and provided the encouragement and confidence for girls to study physics in recent years.

Differences in styles of expression and communication

White (1996) argues that there is ample evidence suggesting that the styles of communication students' adopt are strongly influenced by learning outside school. As such, White suggests that there is a specific connection between how and what pupils write and what they read. The evidence cited comes from the APU language surveys (Gorman, White, Orchard and Tate, 1981; 1982a; 1982b; 1983). This research demonstrated that both boys and girls enjoy reading various kinds of fiction in primary school, with preferences differing along gendered lines.

By age 15, girls and boys look to their reading material to provide them with different kinds of knowledge: girls read "... to understand their own and other peoples' problems" (White, 1996, p. 98) whereas boys prefer books or magazines which provide them with facts about hobbies or how things work. White (1996) goes on to suggest that there is more of a connection between girls' preferred reading material and what is read as part of English literature courses. Moreover, she argues that there are also similar connections between the more technical material that boys read and scientific and mathematical areas of the curriculum. Furthermore, White suggests that the styles of writing which pupils adopt is influenced by their preferred choice of reading: girls choose to use extended, reflective composition while boys responding to the same task choose an episodic, factual approach and focus on commentative detail. Moreover, certain styles of expression are expected in particular subject areas. It is these required styles of expression White argues, that often influence teachers' judgements of students' ability in ways that misrepresent students' real achievements.

For example, in reviewing GCSE English coursework folders, Stobart *et al.* (1992b) found that only a limited number of types of writing were offered for examination. This resulted in folders containing stories, descriptions, pieces of writing about personal life plus a form of argument based on issues of public concern and a piece of writing in response to reading fiction. Teachers in their marking seemed to reward and encourage narrative and descriptive writing over and above factual and analytical work; the type of piece boys preferred to submit. Writing which drew on the field of personal affection and emotions was more highly valued than that based in the public or political domain. Stobart *et al.* (1992b) argued that there seemed to be bias, both in the selection of pieces of coursework and how these pieces were judged.

Therefore, depending on which subject is being assessed and the modes of expression and learning style favoured in the subject, girls' and boys' preferred style of communication or expression will be seen as either suitable or unsuitable. In fact, what is viewed as the correct style of expression in English might be considered inappropriate for science and vice versa. Boys' out-of-school reading preferences seem to disadvantage them in English as it is taught and defined in school. However, their preferred choice of reading actually provides a content and style of writing and communication that appears to be valued in science and increasingly in a range of subjects in the later phases of education.

For example, in reviewing performance in history, Cambridge University staff acknowledged that the style of writing and communicating which male students choose to adopt actually coincided more with lecturers' ideas of what constituted 'good' undergraduate history writing than that adopted by female students (Gender Working Party Report, 1994). A female style of response was characterised as showing "... a preference for cautious, discursive and synthetic approaches, a willingness to consider a range of options and a strong personal investment in getting it right". This contrasted with a male style of writing which was seen to embody "... an argumentative and self-assertive approach to questions, risk-taking, the bold affirmation of a particular view and a confident dismissal of others." Students' learnt styles of communication and ways of working combined with their preferred choice of reading material exert a powerful influence on the solutions and form of responses they consider to be appropriate.

The effects of gendered learning

The preceding sections of this chapter described the differences in how, and what, boys and girls learn, as a consequence of their gendered socialisation. As outlined above, this gendered learning tends to display itself in a variety of forms; with each form having an effect on performance. In terms of the focus of this thesis, there would seem to be two important effects of gendered learning that are important in explanations of gender-related differences in performance. The first are achievement-related beliefs and what boys and girls attribute their success and/or failure to. The second are different learning or cognitive styles acquired and preferred differentially by boys and girls. Within the literature, achievement-related beliefs and learning styles are generally discussed within the framework of individual differences (Wilder and Powell, 1989). However, it is possible to argue that it is more constructive to discuss them as manifestations of gendered learning (Murphy, 1996a). As Murphy argues, they are constructions of the gendered nature of how and what girls and boys learn. Moreover, what boys and girls attribute their success and failure to on the basis of what they learn and the acquisition of different cognitive and learning styles is a consequence of different views of relevance, differential experiences and expectations.

The next few sections of this chapter will review the relevant literature on achievement-related beliefs and learning styles with particular focus on how they help us to explain gender-related differences in performance.

Achievement-related beliefs and their effect on performance

One of the most consistent findings from this field of inquiry is that when children's beliefs about their performance in situations of intellectual achievement are examined, it is girls, relative to boys, who have less confidence in their ability to succeed (Licht and Dweck, 1983). This pattern emerges during the early school years despite the fact that girls consistently perform as well as, if not better than, boys during these years across a variety of achievement domains.

The most popular work cited that focuses on achievement related beliefs and their relationship to sex differences is by Dweck and colleagues. Over a series of research projects Dweck and colleagues identified the construct 'learned helplessness' which relates to the differential attributions of success and failure (Dweck, 1975; Dweck and Bush, 1976; Dweck, Davidson, Nelson and Enna, 1978; Licht and Dweck, 1983). Later developments of this work include the identification of patterns of motivation described as 'adaptive' and 'maladaptive' (Dweck, 1986), with learned helplessness being a characteristic of a maladaptive motivational pattern.

Girls are more likely than boys to show the 'learned helpless' patterns of achievement-related beliefs and behaviours. Girls are more likely than boys to attribute their failure to a lack of ability and their success to sufficient effort. Boys, on the other hand, are more likely to ascribe their failure as due to insufficient effort and their success to sufficient ability (Dweck and Bush, 1976). In viewing their successes as due to factors such as luck and effort, girls tend to imply that future success might be attainable only if such factors are in their favour in the future (Licht and Dweck, 1983). The type of feedback that girls and boys receive from their teachers has an effect on achievement-related beliefs and as a consequence their intellectual performance (Licht and Dweck, 1983). This research has shown that not only are children's beliefs about their achievements reflections of their learning but that they can be the *cause* of their achievement, or indeed, underachievement.

In forming expectations of success, Dweck *et al.* (1978) suggest that pupils are more likely to reflect on those past outcomes that are relevant to future performance and more so those outcomes that convey information about their ability. In this respect, boys are more likely to dismiss their past failures (as they have been due to motivation and effort) and emphasise their past successes in thinking about future successes. Therefore, following an experience of failure, boys expectations of success seem to change when the teacher is changed or when changes in the situation suggest that renewed effort may be fruitful. Such an occasion might be the move from GCSE to A level where the move is seen as a "fresh start". Girls' expectations, on the other hand, seem to remain low as long as the ability being tested remains the same. Dweck *et al.* (1978) imply that girls' more than boys' academic failures are cumulative and have long-term effects on their confidence and hence their performance.

Teacher feedback and achievement-related beliefs

The different types of feedback that boys and girls receive from their teachers has been linked to their perceptions of achievement-related beliefs. Dweck, Davidson, Nelson and Enna (1978) suggest that the pattern of evaluative feedback given to boys and girls in the classroom can result directly in girls' greater tendency to view negative feedback as indicative of their level of ability. Dweck *et al.* (1978) argue that teachers use negative feedback in a more diffuse way for boys than for girls. Most of the negative feedback that boys experience is unrelated to its intellectual quality and based more on the presentation and neatness of their work and their lack of compliance to rules. Boys therefore tend to view any negative feedback as irrelevant to the intellectual quality of their work. Teachers also are more inclined to attribute boys' failures to a lack of motivation more often than they do for girls, thereby encouraging boys to believe that any negative feedback on the quality of their work can be blamed on their lack of effort.

Teachers' feedback to girls is generally positive, using negative feedback in a highly specific manner for girls' intellectual failures. Motivation is not emphasised as the main factor in girls' failures. The more diffuse use of positive feedback to girls makes them more likely than boys to view work-related praise as generally referring to non-intellectual aspects of their performance. What is of importance in this discussion is not whether boys' and girls' achievements warrant this differential treatment by teachers, but whether such feedback influences how boys and girls subsequently evaluate their work.

Maladaptive motivational patterns and bright girls

Sex differences in motivational patterns and associated behaviour appears to be more pronounced among the brightest students (Dweck 1986). Bright girls, compared to bright boys, have a tendency to display less confident expectancies of success, a lower preference for novel or challenging tasks, more frequent failure attributions to lack of ability and more frequent debilitation the face of failure. Dweck (1986) has termed these characteristics maladaptive motivational patterns. Being a high achiever, therefore, and knowing one has done well in the past does not appear to equate directly into high confidence in one's abilities when faced with future challenges. It may be that it is in the later school years (such as during advanced level study) that maladaptive patterns impact more on achievement when students (mainly girls) with these patterns tend to drop out of those courses that pose a treat of failure.

Licht and Dweck (1984) suggest that some of the characteristics of mathematics and science are precisely those that would work against students with maladaptive motivational processes and would favour students (such as bright boys) with more confident, challenge-seeking (adaptive) patterns. In this respect, the greater novelty and difficulty of advanced maths and science courses might be expected to decrease the confidence of success of bright girls more than bright boys. In contrast, bright girls tend to prefer situations in which they are fairly certain they will succeed, whereas bright boys are more attracted to those situations which pose a challenge (Licht *et al.* 1984). Dweck (1986), therefore, suggests that mathematical areas appear to differ from verbal areas in ways that would make them more compatible with the motivational patterns of bright boys and less compatible with those of bright girls. Thus, given two students with the same mathematical ability, the difference in motivational patterns may well impair the achievement of those students (mainly bright girls) who display maladaptive patterns.

Dweck's (1986) response to the negative effects on achievement of maladaptive processes is to promote and foster adaptive motivational patterns in students. She suggests that procedures which will bring about more adaptive patterns are those that incorporate challenge and even failure within a learning-orientated context which supports mastery and progress through effort and which explicitly addresses underlying motivational factors. A significant point is that the presentation of challenging tasks while preventing undue competition may create more balanced motivational patterns between boys and girls and lessen the gaps between their learning achievements (Seegers and Boekaerts, 1996).

Recent critiques, however, of attribution theory and maladaptive tendencies, have shown that many of the intervention strategies based on fostering adaptive tendencies in students have concentrated on 'attribution retraining' (Dweck, *op. cit.* p. 1046). This suggests that it is the individual who should change and not the pedagogy received, nor the way in which subjects (and indeed success in these subjects) are defined. Emerging feminist perspectives, especially within mathematics education, suggest that attribution theories have placed too much emphasis upon women and girls for their underachievement and have not paid enough attention to the wider school system (Rogers and Kaiser, 1995). Mura (1995) argues that many of the intervention strategies that emerged in the early and late 1980s focused on the changing of girls, and suggested ways in which they could become less anxious and more confident, in essence, more like boys. Mura concludes that such a focus falls short in presenting sustainable explanations for the underachievement of girls and increasingly, the underachievement of boys.

Learning styles and their effect on performance

Head (1996) outlines the renewed interest in the area of learning and cognitive styles as a way of explaining gender-related differences in performance. Prior to the 1980s, research into cognitive styles had been popular. However, researchers such as Hyde (1981) demonstrated that measured cognitive differences were too small to account for the differential experiences of women and girls in the education system as a whole. Interest, therefore, in this area of research diminished. In the early 1980s, the work of Gilligan (1982) made a major contribution to the renewed interest in the area of cognitive styles. The argument here was that "... differences in ability were minor but there might exist alongside that fact ...the possibility that men and women tended to *use* their abilities in different ways" (Head, 1996, p. 60, my emphasis).

In reviewing the literature on learning and cognitive styles two common problems arise. Firstly, researchers tend to work within their own preferred style, failing to mention the existence of others (Riding and Cheema 1991). Indeed, attempts to unite these schools of thought are rare. Secondly, the terms cognitive and learning style are used interchangeably within the literature to describe either innate constructs or learnt styles of operating. The term 'learning style' seems to be used as an umbrella term. It is related to more practical and educational settings, within which cognitive style is taken into consideration (Riding and Cheema, *op. cit.*). Cognitive styles are reserved for more academic descriptions. For the purposes of this review and building upon my previous arguments, learning and cognitive styles are seen as not fixed but learnt. In the sections that follow, the two terms will be used interchangeably as they both '...address issues of the structure and process of thinking rather than the content of thought' (Head, 1996, p. 60). If a preference is shown for the use of the term learning style it is in keeping with the more educational focus of my discussion.

Both Head (1996) and Riding and Cheema (1991) suggest that learning styles are essentially "bi-polar" (Head, *op. cit.*, p. 60). Two contrasting ways of working, learning, knowing, are presented. Each is seen as a viable alternative and individuals are at an advantage depending on their preference of style and on the context of the task. Values, therefore, cannot be meaningfully attributed to any particular measure of style. There is no right or wrong style just the appropriate style for the situation.

Certain individuals may show some flexibility in alternating between styles; "... under these conditions a person is said to display *coping behaviour*...[but] will revert to their preferred style as soon as possible" (Head, 1996, p.60, original emphasis). Riding and Cheema (1991) identify this 'coping behaviour' as "learning strategies" (p. 195) which are ways used to cope with the situation and the task. Strategies may vary from time to time and may be learned and developed. They are influenced by the external processes such as the learners' environment, their expectations and their teachers' expectations.

What is important for this thesis is the argument that suggests that males and females **choose** different learning styles and even adopt different coping behaviours. Moreover, all of these factors can affect both the opportunity to learn and the ability to show this learning to good effect. Various researchers (e.g. Gilligan, 1982, Becker, 1995, Scott-Hodgetts, 1986) have related the under- achievement and non-participation of girls and women, especially, to their learning styles and ways of thinking and knowing. The section below outlines some of the different learning styles that have been identified in the literature and how these styles are differentially preferred by males and females.

Examples of learning styles and gendered preferences

Riding and Cheema (1991) state that more than thirty learning styles are discussed in the literature and examination of them suggests that there is a fair amount of overlap among those cited. For simplicity, in this review, I have clustered together the most common styles that have a bearing on this thesis, into five main groups.

(i) extracting and embedding

The most common style under this heading is that of field-dependence and independence developed by Witkin *et al.* (1962, 1967), and more commonly measured by the Group Embedded Figures Tests (EFT). The EFT generally requires the test taker to separate stimulus material from background material in which it is 'embedded'. Group differences in performance in such tests are designated as 'field independence' for males and 'field-dependence' for females. However, there have been serious criticisms of this concept and this type of measure (McKenna 1984; Gipps and Murphy, 1994). A key issue is that it is more a test of spatial ability rather than cognitive style and is inappropriately used as a surrogate test for general intellectual capacity in males for analytical thought. The EFT therefore, is used less frequently in assessing this cognitive style and a more neutral terminology is more frequently used, that is extracting and embedding (Head, 1996).

The model of extracting and embedding relates closely to the work of Gilligan (1982). The research evidence suggests that females embed and that males extract. Gilligan (1982) suggested that males tended to adopt an analytical, legal stance and create and apply rules when making a moral judgement. Females on the other hand exercised more empathy in a relational approach and considered the wider context of the situation to determine as far as possible the relationships and motivations of those concerned. Gilligan's work, therefore, provides further evidence of the gender differences in extracting and embedding in problem solving. As Head (1996) suggests, style can be seen in value-free terms and that certain situations call for an embedded mode of thinking and others for an extraction mode. Certain assessment techniques tend to require either an embedded or an extraction mode of thinking and operating. For example, multiple-choice tests would advantage a (male) extraction mode of thinking.

(ii) impulsiveness and reflection

Research suggest that males tend to be more hasty and impulsive in test situations while females tend to be more careful and deliberate about their approach (Maccoby and Jacklin, 1974). Head (1996) argues that in science practicals, boys show a preference for 'jumping into' the tasks even if they are not totally sure what they have to do. Girls on the other hand tend to be generally more reticent and may hesitate at beginning the task. However, in essay writing, the greater deliberation of girls tends to put them at an advantage. In terms of the present research, impulsives are more likely to take risks and in certain assessment and examination situations. This risk taking can be advantageous. 'Guessing' the correct answer in multiple-choice tests can been seen as risk taking as can discarding irrelevant and redundant material in essay writing. Both these practices have been shown not to be gender-neutral (Wood 1978, White 1988).

(iii) serialist and holist

Scott-Hodgett's (1986) used Pask's (1976) distinction between serialistic learners and holistic learners as a explanation of differences in performance between boys and girls in mathematics. Serialists have a tendency to use a step-by-step approach with a logical linear progression displayed in their work. They concentrate on each step of the argument and do so cautiously and critically. Holists, on the other hand, search for patterns and relationships, they also use global strategies. Scott-Hodgetts (1986) argued that the way in which primary school mathematics was taught and presented to children tended to be overwhelmingly serialistic. The teacher does not control the strategies adopted by students, but there may be occasions where the teacher actively directs the learning process and this is where the serialistic approach has most influence. The author also argued that a flexible strategy (holistic and serialistic) is best for learning mathematics. Generally, those who adopt a more flexible strategy (mainly boys) become more versatile and better learners of mathematics.

This notion that boys and girls adopt different strategies to learn mathematics builds on an observation by Shuard (1982) that suggests that pupils who pay attention to the teacher's traditional emphasis in primary mathematics give themselves a positive disadvantage for future success in maths since pedagogical styles in mathematics between the two phases of education are quite different. Stobart *et al.* (1992a) argue that a paradox of the preferred adoption of a serialist approach in mathematics by girls makes them better learners at primary school but leaves them unable to excel in maths at secondary level. Furthermore, coursework may utilise a serialist approach more effectively which may go some way towards accounting for girls better performance in this examination component (Elwood, 1995).

(iv) separated and connected

Blenkey, Clinchy, Goldberger and Tarule (1986) extended the work of Gilligan (1982) in relation to how the various ways women and men come to know. Becker (1995) provides a useful summary of the Blenekey *et al.*'s work. Becker extends their work into the subject of mathematics. In the work of Blenkey *et al.*, they identify 'stages' in knowing which are not necessarily meant as developmental sequences through which learners will pass. The stages are: silence knowing; received knowing; subjective knowing; procedural knowing and constructed knowing. It is at the stage of procedural knowing where separated and connected knowing (after Gilligan, 1982) are identified.

Separate thinkers as those who prefer to work within subjects that are characterised by logic, rigour, absolute truth and rationality. Separate knowing often takes an adversarial form, relies on rhetoric and deductive logic. Separate knowers use impersonal procedures to establish truths. Becker suggests that males are more likely to be separate knowers. Connected thinkers, on the other hand, prefer to use intuition, creativity, personal processes and experience. Connected knowing builds on personal experiences and authority is derived through shared experiences. Becker suggests that most connected knowers are more likely to be female. Becker goes on to argue that the differences in separated and connected ways of knowing show the most conflict with the traditional way of knowing in mathematics:

> If the only knowledge accepted as valid is that which an be statistically demonstrated or is based on deductive logic, methods that are independent of the knower's actions, then that which is known through induction would be devalued.
>
> (Becker, 1995, p. 167)

These claims also have relevance for other subjects in the curriculum (Becker, 1995). It is suggested that connected knowing and separate knowing are valued differently within different domains. If more females are connected knowers and more males separate knowers, then their preference for one style over another may help explain the differential choice and entry patterns into different subjects of the curriculum.

(iv) co-operation and competition

Head (1996) suggests that schools often employ systems of rewards and prizes in the belief that competition will motivate learners. The interrelationships between boys are marked by competition which is shown through the nature of their discourse and their tendency to assert their own point of view and ignore the contributions of others. The characteristics of the discourse of girls are more relational with stress being laid on similarities rather than differences. Therefore, girls may be more motivated by co-operative work opportunities rather than by competitive work opportunities. As demonstrated, problems arise in co-educational contexts in which girls and boys clash in relation to their chosen way of operating, especially if competition is valued above co-operation. Boaler (1997) has also shown that conducting lessons at too fast a pace can contribute to girls feeling that they cannot contribute fully or that understanding is being sacrificed for speed of completion of tasks. Slowing down the pace of lessons markedly improves the quality of the responses and of the learning.

Summary

The claims made in the literature about the gendered preferences of students for certain learning styles and ways of knowing are important in our understanding of difference in relation to achievement and participation. The preference for different learning styles by boys and girls in itself may not be crucial but when combined with other factors it may appreciably affect outcomes. It may also be the case that in subjects like maths and physics, females who take these subjects at higher levels might be more likely than other female students to be separate knowers and thus are attracted to these subjects as objective disciplines. The opposite may be true of males who opt for English literature. The reasons students give for taking subjects at a higher level are varied and complex, but it may well be the case that the majority of students opt for those subjects in which their preferred style of learning is promoted and valued.

Thus far, this chapter has considered the contribution of biological, social and educational factors, and their effects, in explaining gender-related differences in performance. While social and educational factors have been supported as more valid explanations of the differences observed, there is another, important layer of the literature that deals with the role of the assessments used to measure performance and their contribution to the differences observed. For the purposes of this thesis, it is important to consider the contribution of the assessment techniques and structures used within public examinations in creating performance differences.

The role of examinations

In 1992, Stobart, Elwood and Quinlan published a review of gender-related differences in public examinations (Stobart *et al.*, 1992a). The authors' interest in producing this review stemmed from their professional involvement in examination development as well as a concern that the male/female gaps in performance in the new GCSE, which in some subjects were quite large, had changed from those identified in the old O level/CSE. The review argued that social and cultural factors play a bigger part in creating the differences in examination performance than biological factors.

The Stobart *et al.* (1992a) review was mainly concerned with the impact of the introduction of the GCSE on differential performance. It suggested that the introduction of the GCSE provided the 'ideal experiment' in reviewing the relationship between assessment techniques and differential performance since it introduced various assessment modes into mainstream examining. Central to this was the feature of compulsory elements of coursework, a component that had rarely been present at O-level and less defined at CSE. The rationale behind the introduction of coursework was to provide opportunities to assess the wider aspects of children's achievement that traditional examination papers were unable to do.

Furthermore, as Gipps and Murphy (1994) suggest, research into gender differences in performance has tended to follow initiatives in assessment practice. Thus the introduction of the GCSE represents an example of such a shift in assessment practice.

For those designing the assessment of public examinations there is a responsibility to ensure fairness. Deciding what counts as fair is both a complex and value laden activity. As Stobart *et al.* (1992a) state it is not just a matter of making sure that examination papers are screened for gender and cultural insensitivity; "... [t]his is merely the tip of the iceberg" (p. 270). The authors suggest that the critical issues are more to do with ways in which public examinations shape pupils' experiences, their perceptions of subjects and the ways in which their understanding is assessed. Although their focus was on the assessment techniques and structures used, Stobart *et al.* were concerned that the importance of pupils' perceptions and experiences of subjects was not ignored in any discussion considering gender-related performance in examinations as these factors are crucial for both selection of, and performance within, examination courses. Murphy (1979) has suggested that sex-role stereotyping plays a significant part in influencing the choice of examination subjects and even the performance on examinations in different subjects. However, he also goes on to suggest, like Stobart *et al.* (1992a) and more recently Whitehead (1996), that attitudes and hence sex-role stereotypes, about such things as sex differentiation in schooling, have altered and it is not unreasonable to suspect that this has some influence on examination entry and performance statistics.

Assessment techniques and differential performance

The following sections of this chapter are concerned with those areas of the literature that focus on how the various assessment techniques and structures within public examinations may contribute to differential performance. The various aspects of examinations and assessments that are reviewed include; the type and mode of response, the contribution that coursework makes to differential performance, the role of tiered entry in creating performance differences, the use of 'real life' contexts in which examination and assessment tasks are set and the sampling of subject content on to examination papers. The research evidence brought together here, illustrates the importance of the effects of assessment measures as explanations of gender-related differences in performance and to locate the present study within its appropriate context.

Mode of response and differential performance

Different response modes have been shown to have a critical role in the relative performance of various groups of pupils (Harding, 1979; Murphy, 1979, 1980, 1982; Wood, 1976, 1978). Early work by Murphy (1980, 1982) and Harding (1979) focused on the relationship between gender and performance on multiple choice tests in public examinations in the UK. Murphy (1980) looked specifically at sex differences in GCE examination entry statistics and success rates. This review included both O and A level entry and performance rates for the years 1951-1977. It showed that female candidates had achieved a higher pass rate at both O and A level in the majority of subjects studied. The better female performance at O level was argued to be the result of girls' greater maturity. The higher female pass rate at A level was explained by the smaller, more select group of girls who stay on at school to do A levels. This 'small select group' argument is still a robust one and is relevant to this thesis since it supports the various performance patterns occurring at A level at the present time. Unlike the population for GCSE, that for A level is indeed still highly self-selecting and, as the work in later chapters will show, it is the small select groups in the majority of subjects (either male or female, depending on the subject) who continue to do well.

Murphy (1980) suggested that some of the changing trends identified in gender-related patterns of performance may have been the result of the use of different assessment techniques within individual examinations. To investigate this point further he looked more closely at the Geography O level of the Associated Examining Board from 1970 to 1979. In this subject, the pass rates of male and female candidates had always been similar until 1977 when changes were made to the scheme of assessment that introduced an objective test component. After these changes, the difference in the pass rate (grades A-C) between boys and girls was 10% in favour of boys. The boys were found to perform at a higher level on the multiple choice paper than on the written paper. Murphy suggested that the advantage gained by the male candidates on the objective paper was the most important factor contributing to their higher overall pass rate (p. 176). Murphy's later enquiry (1982), demonstrated that male candidates, in comparison with female candidates, perform better on objective tests than they do on other types of educational examinations and assessments. This evidence was drawn from a range of O and A level examinations which had both objective tests and written paper components. Murphy concluded that the superior performance of male candidates on these tests was caused by general factors related to the format of the test rather than by specific items contained within the tests (Murphy, 1980, p. 216).

Work by Harding also concentrated on the comparison of the different component parts of examinations. As part of the Girls and Science Education project (GaSE), Harding and Graig (1978) analysed six O level examinations which included the Nuffield Science Teaching project syllabuses and traditional examinations, all of which had objective test components, short answer items and essay-type questions. Sex differences in performance were found in favour of boys, on three of the multiple-choice papers. The one paper ('conventional biology') that contained the essay questions, was the only part of any examination in which girls were significantly more successful than the boys.

Both Harding (1979) and Murphy (1982) argue that multiple-choice tests place less emphasis on language skill and this may be why male candidates perform relatively better on them. Newbould's work (1980) suggests that this sex-bias in multiple-choice testing is more likely to occur in some subjects rather than others and where the "... specific demands of the items focus upon the higher skills or non-verbal operations" (Newbould, 1980, p. 9 quoted in Gipps and Murphy, 1994, p.214). In Newbould's (1980), Murphy's (1982) and Harding's (1979) view, the issue is not the form of the response itself but the way in which the form is perceived in the context of the subject. It is the skill demanded by the item that is the major factor creating the sex-bias. Indeed Murphy (1982) suggests that the evidence of differences in male and female performance in objective tests tells us rather less about any profound differences in male and female examination candidates and more about the different types of skills that are required on such tests.

More recent research has focused on whether contextual variables in objective tests items have an effect on the differential responses of pupils to these items (Beller and Gafni, 1995, Linn 1992). The tendency of boys to ignore the context in which questions are set may make them better suited to choosing one out of a number of options as correct whereas girls may see the relative rightness/wrongness of many of the distracter options (Harding, 1979, Bolger and Kellaghan, 1990). Bolger and Kellaghan's (1990) research suggests that it is the degree of familiarity with the mode of response that creates the differences. They argue that the different ways of measuring the same content and skills produce occasions when the item is either 'novel' to the test taker (as with multiple-choice items) or familiar (as with open-ended tasks, similar to classroom activities). Females were shown to perform less well than males when the items were classified as 'novel'. Research carried out by Schmitt *et al.* (1991) in the USA indicates that the multiple-choice effect in relation to the performance of boys and girls remains as robust as ever with the gendered performance effect remaining even when extreme items are removed.

In expanding this areas of debate, Beller and Gafni (1996) have looked at item difficulty and gender effects and suggest that the **difficulty** of the item actually overrides any gender effect due to the format of the item. Their work, based on the IAEP surveys of 1988 and 1991, found that girls did not perform relatively better in open-ended questions as other studies had shown (although they were looking at mathematics which as a subject happens to value a certain type of open-ended question, with little language skill required). Their conclusions state that there is a "... possibility that the inconsistent patterns of gender effects with regard to item format in the 1988 and 1991 assignments might be associated with the level of difficulty of items in each format within each assessment" (Beller and Gafni 1996, page 13). Beller and Gafni (1996) go on to conclude that item format *per se* cannot account for gender differences in test performance indicating that a relationship exists between item difficulty and gender effect regardless of item format. Some research studies have identified sources of difficulty within examination items (for example, see Pollit, Hutchinson, Entwhistle and de Luca, 1985; Fisher-Hoch and Hughes, 1996; Hughes and Fisher-Hoch, 1997) but they unfortunately have not considered the gendered effects of item difficulty. However:

> .. revealing those cognitive variables that effect item difficulty is, in and of itself, of great theoretical and practical importance, and it may also assist in a better understanding of gender differences in test performance.
>
> (Beller and Gafni, 1996, p. 18).

Coursework

With the introduction in 1988 of the GCSE, we have seen new evidence of the effect of changes in teaching and assessing on the relative performance of boys and girls. Central to this is the role of coursework. The introduction of coursework into the GCSE has had a chequered history (Tattersall, 1994) . Even among those who design and develop examinations there has been difficulty in identifying an agreed perception of what constitutes coursework. Macintosh (1986) succinctly defines this as "...work that is undertaken during a course" (p. 22), whereas Kingdon and Stobart (1988) state that coursework is " ... defined as any teacher-assessed component..." (p.72). The 'official' view of what constitutes coursework is that offered by the Schools Curriculum and Assessment Authority (SCAA, 1995a):

> Coursework consists of in-course tasks set and undertaken according to conditions prescribed by an awarding body. Coursework activities are integral to, rather than incidental to, the course of study. Coursework is normally marked by a candidate's own teacher according to criteria provided and exemplified by the awarding body, taking national requirements into account. It is moderated by the awarding body.
>
> (SCAA, 1995a, p.13)

In the 1994 examination session, the GCSE was used to test the end of Key Stage 4 (KS4) of the national curriculum in England and Wales. To fit this role some major changes were made to the GCSE in relation to coursework; a maximum 20% coursework in most syllabuses, a return to 100% examination syllabuses in mathematics and a reduction from 100% to 40% coursework in English (with 20% of this 40% being associated with the oral component). This diminution of the contribution of coursework within the GCSE was seen as indicative of governmental attitudes towards this assessment technique. Macintosh (1986) also suggests that, due to long standing attitudes, coursework has fallen foul of the "...British obsession for preferring to do worse on those examinations which carry greater prestige rather than to do better on those that are more useful" (p. 22). However, before 1994, the possibility of following 100% coursework syllabuses in English proved very attractive to teachers, with two-thirds of GCSE English entries being for such syllabuses (Stobart *et al.* , 1992b). Even in mathematics, a subject that delayed the introduction of compulsory coursework until 1991, the largest entry group continues to be in those syllabuses with at least 20% coursework (Goulding, 1995).

There is a wide spread perception in the UK that while coursework generally benefits pupils it is the girls who gain from it most (TES 1991a, 1991b). Stobart *et al.* (1992a & b) took seriously this perception and investigated whether coursework may account for much of the advantage that girls demonstrate over boys at GCSE. They argue that there is some empirical support for this which suggests that there is a direct relationship between the improvement in girls' examination grades between 1985 and 1988 and the type and weighting of coursework in GCSE syllabuses (Quinlan, 1990). Yet, with additional investigation this seemed to be an over simplification. In English, geography and history, subjects with substantial written coursework, differential performance between girls and boys was greater than for 'O' level (Stobart *et al.*, *op. cit.*). However, in French, which had no compulsory coursework prior to 1991, girls showed similar performance patterns to those in English. The explanation for these patterns of performance seems to lie in the radical change in the tasks and style of communication between O level and GCSE. The emphasis switched to functional tasks and spoken communication as it was with many CSE syllabuses (Stobart *et al.*, 1992a). It appeared to that the girls had made the transition more successfully than boys.

Two other pieces of research are important to note at this stage. First, Patrick's (1990) analysis of gender differences in the GCSE that showed that even where overall differences favour of one gender there may be many syllabuses within that subject in which the balance tilts the other way. For example, in mathematics, results indicate that girls performed better than boys on some of the 139 syllabuses that Patrick reviewed. While many of these involved coursework, the SMP (11-16) syllabus, in which coursework plays a major part, showed boys doing considerably better than girls. Patrick suggested that these results could be influenced by the entry; at the time SMP had a large entry from boys' public schools. However, she also recognised that the results could also be influenced by the task and assessment techniques employed in the SMP syllabuses.

Secondly, Cresswell (1990) investigated centre effects in the GCSE and how they interacted with gender effects in accounting for differences in performance. He analysed entry and result patterns in English, mathematics and integrated science from mixed schools. His analyses suggested that there was considerable variation between the coursework component and the written examinations, particularly in maths. When the average gender effects were analysed, after controlling for centre effects, a clear pattern emerged that demonstrated that girls' average coursework marks were higher than the boys' in every case and also girls' coursework marks were more 'bunched' (in terms of the variance) than those of the boys. Later investigations by Stobart *et al.* (1992b) and this thesis (see Chapter 7) show that this pattern of bunched coursework marks for girls and more spread out marks for boys creates an interesting paradox in which coursework begins to play a more significant role for boys than for girls.

Building on from Cresswell's research, Stobart *et al.* (1992b) carried out a quantitative analysis of the effect of coursework on differential performance in examinations. The syllabuses analysed in this study integrated large proportions of coursework (up to 50%). Evidence from the study suggested that even when the proportion of coursework within the syllabus was substantial (e.g. 50%), it played only a minimal role in explaining patterns of gender-related performance.

Through the analysis of the 'achieved weighting' of components (Adams and Murphy, 1982), Stobart *et al.* investigated whether coursework contributes disproportionately to the final grade. This analysis used Cresswell's focus on the variance of the component marks. If coursework marks are bunched and the exam marks spread widely then it is the examination that is likely to play the main role in determining pupils' rank order: the coursework mark will not offer much discrimination[1]; it will be the examination marks, on

[1] Discrimination is used here in its technical form: "... the capacity of a test to distinguish among different candidates of different levels of performance." (Good and Cresswell, 1988).

which pupils differ considerably, that contribute most to the overall grade distribution, and the examination paper will have a higher achieved weight.

In their investigation of the 1992 GCSE English examinations, Stobart *et al.* discovered that coursework marks seemed to contribute somewhat more to the grade distributions of boys than of girls. For boys, coursework offered slightly more discrimination than the examination component. For girls, both the coursework and examination component made much the same contribution to the final grade. Thus, it was possible to argue, that coursework made a slightly larger contribution for boys at the subject level, than for girls. From this analysis, there was no compelling evidence that coursework contributed disproportionately to determining pupils' subject grades.

If we were to apply a similar analysis to more recent syllabuses, such as those examined from 1994 onwards with much reduced amounts of coursework, it is likely that the contribution of coursework to the final grade would be even less. Any continued claims, therefore, that girls' success in the GCSE is due to their better performance in coursework components would perhaps seem misplaced. An 'achieved weight' analyses of examinations components forms a major part of the research carried out for this thesis in relation to coursework and its contribution to differential performance in A level examinations (see Chapter 7). This approach has been applied to the A level examinations under consideration and has produced interesting results. These results would tend to reflect those found at GCSE. The achieved weights analyses has helped immensely in providing evidence to dispel the myth that girls are running away with examination grades because of the presence of coursework.

Tiered levels of examination entry

The background discussion surrounding tiered schemes of entry and assessment, especially in GCSE mathematics, is well documented (Gipps, 1986; Kingdon & Stobart, 1988; Nickson and Prestage, 1994; Wiliam, 1995). Since the introduction of the GCSE and more recently with national curriculum assessment at KS4, examination syllabuses are structured into two or three different levels, or tiers, of entry; each tier having a restricted set of grades. For example, GCSE mathematics has three tiers of entry with associated grade ranges: lower tier (grades D-G); middle tier (grades B-F) and higher tier (grades A*-C) (SCAA, 1995b). Candidates are only permitted to enter for one tier at any one sitting and any candidate not achieving the lowest restricted grades on any tier is unclassified.

Research has shown that choosing the appropriate tier of entry for pupils has been problematic (IGRC 1992). Tiers of entry still continue to provide teachers with difficult entry decisions similar to those that were present at the time of GCE 'O' level and CSE. It is interesting to note that one of the arguments put forward by the Schools Council for a common examination (such as the GCSE) was the need to alleviate the pressure of entry decisions on teachers:

> at present schools have to make difficult decisions on the selection of pupils for GCE and CSE courses, perhaps as early as the end of the third year ... Early choices cannot allow for the development of pupils' abilities ... many teachers would say that the task ... is one ...which they find particularly difficult and unrewarding.
> (Schools Council, 1975 p. 9, in Gipps, 1986 p. 15)

Proponents of tiered entry schemes suggest that tiering actually increases the reliability of the assessment and has little, or no, adverse impact on validity (William, 1995). Moreover, it is a more efficient use of the assessment time as pupils are only asked those questions that are likely to tell us something useful about what the student knows and understands. However, entry decisions are based on a teachers' knowledge of the pupil and it is the judgement of the teacher as well as the performance of the student that determines the range of grades available (Wiliam, *op. cit.*).

Stobart *et al.* (1992b) have indicated that there are several aspects of differentiated entry, especially in GCSE mathematics, that might create and influence differential performance. Firstly, more boys than girls are entered for the lowest tier of the mathematics examination with its maximum grade D. Disaffection with GCSE mathematics seems to be increased by the restricted grade range at this lower end and has been found to be greater amongst boys than girls (*ibid.*). In reviewing teachers' comments from surveys and case study interviews Stobart *et al.* (1992b) maintain that it is clear that teachers considered boys who were placed in the lower tier to be less motivated, and as a consequence disruptive, than girls in the same tier: "... low ability girls are generally better motivated than low ability boys..."; "... boys tend to feel that the foundation (lower) tier is not worth it. Girls are often more content to take a lower tier..." (Stobart *et al.*, 1992b, p. 28). This greater disaffection shown by lower attaining boys influenced teachers' decisions whether to enter them at all.

Secondly, more girls are entered for the middle tier with its maximum grade B. In 1994 nearly 59% of the female entry in GCSE mathematics were entered for the middle tier as opposed to 54% of the male entry; the 5% difference accounting for nearly 21,000 candidates. The larger female entry in the middle tier may represent the underestimation of girls' mathematical abilities by teachers. Teachers perceived girls to be less confident and more anxious of failure in maths than boys and believed that girls were more adversely affected by final examinations: "... weaker girls feel more secure in the middle tier..."; "...there is a tendency (of girls) to lower expectation of self" (Stobart *et al.*, 1992b, p. 30).

Consequently teachers tended to place girls in the middle tier protect them from such anxiety. The middle tier offers the key grade C whilst avoiding the risk of being unclassified if performance drops below this grade on the higher tier. Research has shown that schools often demand the attainment of a grade C from the higher tier before taking A-level mathematics; in fact grades B and A, (even A*) are often the criteria (Elwood and Comber, 1996). The gap on percentage A*-C grades between males and females in maths is closing. However, more girls are obtaining their grade C from the middle tier. This therefore marginalises the disproportionate number of girls who are entered for this tier from taking their mathematics any further.

Finally, at the higher tier more boys than girls are entered and more boys obtain the top grades of A* and A than do girls, with girls getting more B and C grades in this tier than boys (Elwood and Comber, *op. cit.*). Entry for the higher tier usually provides adequate motivation for pupils. Teachers referred to pupils as competitive, expectant of good grades and hard working to achieve their potential. One factor that still tended to surface in teachers' comments, however, was girls' lack of confidence as opposed to boys' abundance of confidence in this tier: "... many girls do not see themselves as having the ability to get an A..."; "... at higher tier boys are more arrogant, girls more worried..." (Stobart *et al.*, 1992b, p.30).

Boaler (1997) has shown that the underachievement of 'bright' girls within the higher tier may be due to the context of the environment in top set mathematics classes. Common features of top set maths classes (which are synonymous with higher tier entry) are speed, pressure, competition and reward is given for getting answers correct rather than for the acquisition of understanding. Boaler suggests that this may cause particular conflicts for girls in the higher tier who may become more anxious in response to these environments. Girls' awareness of the prioritising of memory over understanding is likely to increase their dissatisfaction and anxiety in the maths classroom and as a consequence their attainment in examinations.

Tiered entry will be compulsory for most core and foundation subjects under the new regulations for GCSE syllabuses from 1996 onwards (SCAA, 1995b). However, we have yet to investigate the influence on differential performance of the introduction of tiered levels of entry in this wider group of subjects. The evidence suggests that differentiated entry schemes interact significantly with teachers' perceptions of pupils' ability and what they are capable of. Although supported as a valid way of assessing students which enables them to show what they know, rather than what they don't know, differentiated entry tends to perpetuate the old GCE/CSE divide, maintaining a lower status route into which many boys and girls are assigned.

The use of context in examination items

The use of context (e.g. situating examination questions or items in 'real life' scenarios), can effect how pupils respond to, and perform on, assessment tasks. Research has shown that context affects performance by obscuring the task in dense, often irrelevant information which some pupils believe to be relevant to obtaining the answer. To enable students to access their knowledge and apply it they first have to see the link between what they know and its relevance to the task in hand (Murphy, 1995). This use of context also introduces certain assumptions about similar cultural and social experiences for all groups and that therefore enables all groups to understand the particular contexts used (Boaler, 1994; Cooper, 1996; Murphy, 1995) The context then becomes inseparable from the task and integral to it.

One of the main problems with setting tasks in context is that often the context is 'made up' or not real; that the situation is believable but the pupil has to suspend their common sense so as to answer the question correctly. Cooper (1996) acknowledges that as a result, children often have to"... negotiat[e] the boundary between esoteric [subject] knowledge and their everyday knowledge" (p. 2). He also suggests that the national curriculum paper and pencil tests, especially in mathematics, seem likely to disadvantage pupils who take seriously the injunction to relate mathematics to the 'real world' (Cooper 1992). Furthermore, such tests, via the marking scheme, seem to make the "... achievement of higher levels of national curriculum attainment dependent on a child's capacity and/or willingness to avoid drawing on, or referring to, everyday knowledge when responding to items" (Cooper 1996, p. 4).

Boaler (1994), Cooper (1996) and Murphy (1995) all bring attention to the fact that contexts do not offer a unique meaning for every student and that students will interpret the situations they are presented with in different ways. These interpretations will be influenced not only by the pupil's gender, but also their social class, and race. This will invariably lead to different approaches in attempting the tasks, and hence results based on what the pupil believes to be relevant to the task in hand. Depending on the domain and what is valued as achievement in this domain, the gendered perceptions of what is relevant will appear successful or unsuccessful (Murphy, 1995). If we look at students' responses to the contexts used in assessment tasks we can see that assumptions about transfer and learning in context (Lave, 1988) are somewhat simplistic and ignore the gendered and indeed, socio-cultural influences, on performance on these tasks.

Boaler (1994) presents us with an example that illustrates these above points. A maths question that assessed whole number operations and used the context of fashion garments was given to students in two secondary schools. The question did not require the students to engage with the context in any significant way, nor where students required to introduce any of their own knowledge about the context or their experience with it. The fashion context presented the students with a description of a group of people and a number of certain jobs that needed to be carried out in the making and selling of fashion garments such as cutting, sewing, deliveries to shops, etc. Students could approach the question in two ways: if they wanted to get the answer right they needed to ignore the context and deal with the numbers in the task; if they dealt with the context then a different approach was needed and the numbers in the questions related to various jobs to be carried out. If a student had taken these 'real life' factors into account they would have answered the question wrongly. When students' responses were reviewed, more girls than boys attained lower grades on this question. Boaler suggests that the lower attainment of the girls was caused, or influenced, by a greater involvement with the context. Girls were attempting to integrate the context into the task and use their common sense, as well as, their maths knowledge, which caused them to underachieve. Boys, on the other hand, were more able to discard the context in the task and get the right answer. Boaler concludes that ' [t]his strategy must appear to be sensible to girls and it is extremely worrying that such a strategy, eminently more sensible when encountering 'real world' problems, leads to failure" (p. 561).

Cooper (1996) argues that one of the problems of the pedagogic approach of embedding assessment tasks in contexts is that it contributes to differential validity (Gipps and Murphy, 1994) and hence introduces unfairness into tests. The combination of relatively open-ended items with 'real' contexts produces a particular set of threats to valid assessment, especially if no account is to be taken of them in the assessor's view of the task and the marking of responses (Murphy, 1995). These threats might be expected to operate differently for boys and girls (Murphy, 1995). Cooper suggests that any attempt to address these problems of using contexts in assessment tasks must ask how "...does cultural knowledge mediate individuals' responses to assessment in ways which alter the construct being assessed" (Gipps and Murphy, 1994, p.14, after Apple, 1989). The concerns addressed by Cooper (1996) and Murphy (1995) require difficult decisions to be made about the use of items in assessment that might, on the one hand, operate to 'improve' pedagogy but on the other might lead to less fair assessment outcomes.

Subject content

Certain areas of content within subjects have been shown to favour one group over another (Wood, 1976, 1978; Foxman *et al.* 1991; Gorman *et al.* 1988, 1990; White, 1996). Writing about his 1976 study of London Examination Board objective tests, Wood (1991) indicated that geometry and maths reasoning items were relatively more difficult for the female candidates and that the more algorithmic computation-oriented items, such as matrix manipulation and algebraic operations generally, were relatively easier. The APU studies showed similar findings. In certain content areas of mathematics, for example, boys consistently out performed girls on tasks which tested rotating 2-dimensional and 3-dimensional shapes, indices and conversion of units of measurement. Girls, on the overhand consistently outperformed boys in content to do with computation of money, modern algebra and probability (Foxman, *et al.*, 1991). In English, it was found that girls had better writing skills in certain genres than boys; genres that are quite popular in the assessment of English at the end of compulsory schooling.

Issues of inequity can be introduced in the sampling of subject content from the syllabuses to be tested on examination papers. This sampling exercise is a value laden activity, which must be influenced by examiners' social and political values and also what they see as valid assessment of their subject. Wood acknowledges that the sampling of content for examinations makes the whole issue peculiarly difficult as the choice of material is always liable to be controversial (Wood, 1991). He suggests that "... the extra knowledge gleaned about gender differences can and should inform the final composition of a paper, not by veto but as a moderating influence" (Wood, 1991, p, 169).

In sampling content for examinations from the syllabuses studied, examiners may be weighting papers with content favourable more to one group than another. An investigation into this particular issue was one of the focuses of the Stobart *et al.* (1992b) study. Using known differences in content areas identified by the APU in mathematics and English Stobart *et al.* classified and analysed GCSE examination papers in terms of the content they covered in an attempt to judge whether the examination papers contributed, if at all, to differential performance (Elwood, 1995).

From the analysis of the GCSE English papers it was found that only a narrow set of literacy skills were in fact sampled for assessment on the examination papers. The questions set focused on characters and their feelings and motivations; these are known to be types of questions that girls are good at (Gorman *et al.*, 1991). In terms of 'face validity', the papers seemed fair in their deliberate balance of gender-specific texts. However the scope and the focus of the questions asked, together with the nature of the stimulus material, opened up possible differences in the ease or difficulty of articulating a response which tended to interact with the gender of the candidates.

The analysis of the GCSE mathematics papers were analysed in terms of well-established differences found at age 15 by the APU. The findings demonstrated that in content areas that had previously shown small and statistically significant differences in favour of boys (e.g. measurement of angles, geometrical transformations), boys and girls now appeared to be performing similarly. On those content areas where the APU had identified substantial differences (e.g. rate and ratio, shape and space) gender-related differences remained but the size of the differences had decreased. What was suggested from these findings is that well-established differences in performance on certain content areas were changing.

Murphy and Elwood (1998, forthcoming) consider that performance on certain content areas is related to notions of confidence and alienation. Specific situations are considered, by pupils to be part of their 'territory' (Browne and Ross, 1991). When they are in these situations they behave with confidence whereas being out of their 'territory' makes them feel alienated. The APU science surveys found that on questions which involved content that girls felt was within their 'territory' (such as health, reproduction, nutrition and domestic situations), they performed at a higher level than the boys across the population samples of 11, 13 and 15 year olds (Murphy, 1996b). Moreover, more girls than boys attempted such questions. In questions where the content was overtly 'masculine'(such as cars, building sites, machinery, etc.) the converse was true. Students had definite views about which areas of content they expected to be successful in and would avoid those contents that were seen to be the domain of the other sex.

The content related performance effects can be traced to the different learning opportunities that boys' and girls' play affords them (Murphy, 1996a). As girls and boys engage with activities outside school they develop skills and knowledge and confidence in them. Faced with similar activities on examination papers and assessment tasks, boys and girls tackle them with confidence. However, presented with content they feel to be outside their domain of competence, both boys and girls withdraw from these tasks. This withdrawal is often unobserved by pupils and teachers alike. Pupils may be appearing to be involved with the tasks set but actually have a very low level of cognitive engagement with it and "...consequently, the effects of alienation go unchecked and lead to underachievement ..." (Murphy and Elwood, 1998, p.10 manuscript).

Other sources of inequality of opportunity in public examinations

Much of the earlier work into sources of unfairness in examinations (e.g. The Fawcett Society, 1987; The Mathematical Association, 1989) concerned itself with what Cole and Moss (1993) have referred to as 'facial bias; that is "...particular words or item formats [which] appear to disfavour one group whether or not they have an effect." (Gipps and Murphy, 1994, p. 25). Facial bias usually manifests itself in the inadequate or stereotypical representation of one group or another or in the use of sexist or stereotyped language.

The Fawcett Society's review of 1987 London Board Examination papers concerned itself primarily with facial bias issues. It attempted to establish whether changes in society, indicative of a relaxation of traditional gender roles, were being reflected in examination papers; it concluded that this was not the case. The Society's report is based on the reading of over 1000 papers set for the 1986 examination session. It relies heavily on quotations from the papers and strong commentary from the authors but it covers enough to show that they had identified a real problem. On the few occasions when women or girls appeared in examinations texts or questions they tended to be portrayed as "... flighty, inadequate, domesticated or servile" (Wood, 1991, p. 173).

The Society commented at the time of the review that "... the most frequently occurring sexism, and the easiest to identify, is the overpoweringly masculine flavour of the papers" (The Fawcett Society, 1987, p. 38). The report identified a variety of discrimination types from this review: the overall effect of a paper being biased because reference is made predominantly to one sex; the presentation of the sexes on question papers is stereotyped; questions are based predominately on subjects that are of interest to boys; the assumption that the genotype is male with female pronouns appearing in brackets if at all; the authors of texts are predominantly male; stimulus materials have a strong male bias and opportunities to mention eminent women are often missed. Reviews of present day examination papers, however, show that many of these types of discrimination have been removed. Examining bodies are now more conscientious about whether examination papers show facial bias and have mechanisms in place to monitor such stereotyping.

Additional sources of unfairness in examinations can be found in the ways in which examiners mark the test and the types of mark schemes that accompany the test. Multiple-choice tests allow the assessor to become the marker and their values about what constitutes a right or wrong answer is built into the test. Open-ended questions also provide opportunities for marker bias with markers given latitude to interpret responses. Inflexible mark schemes do not allow for alternative interpretations of what the assessor requires. Again the assessor's interpretation of what constitutes a correct answer influences outcomes. Concerns over reliability of markers become concerns of bias when markers are influenced by group -related characteristics. Common examples of this are the presence of candidates' names on examination scripts and the handwriting of candidates, both of which may lead to inferences about the sex of the candidate (Baird, 1997; Goddard-Spear, 1984). Here the danger is that the assigned score may be influenced by the marker's conscious (or unconscious) expectations about the candidate based upon gender (and other defining variables).

Conclusion

In this chapter explanations of gender-related differences in performance have been examined. What is clear from the discussion is that the variety of explanations put forward are not, and cannot be, mutually exclusive. Gender-equity in relation to performance in assessment and public examinations is a complex issue; it goes well beyond insensitivity in the setting of examination papers. It must involve the differential experiences that girls and boys acquire through their socialisation and the different expectations of their capabilities in terms of their schooling achievements. The way in which their learning is assessed will have a crucial influence on the patterns of differences observed.

The choices made about the structure of the examinations and the content chosen to assess what students know, understand and can do, will play an important part in making an examination fair. As we have seen in this chapter, there is a large body of research that shows that to vary the type of performance required, accompanied by assessment methods which show 'fitness for purpose', can significantly reduce differential performance. However, it is not the purpose of this thesis to propose that manipulating the assessment techniques will suffice in addressing fairness issues in examinations. The goal of this thesis is to further enhance our understanding of what causes the differential patterns of performance in the GCE A level examinations. In pursuing this goal, this thesis takes seriously the arguments from the literature, by acknowledging that more factors are involved in understanding differential performance than just the assessment techniques chosen to assess pupils' knowledge and skills. Rather, the perceptions and expectations of students and teachers about attainment and success in A level study must also come into play when interpreting the differences observed.

Chapter 4

Research Questions, Methodology, Design and Method

Introduction

This thesis investigates the cross-over in gender related patterns of performance between 16+ and 18+. The specific purpose is to determine the contribution that examination structures and assessment techniques make to differential performance and the role of teachers and student attitudes in providing an explanation for performance variations. A multiple method research design is used that employs both quantitative and qualitative research techniques. A research design of this nature acknowledges the multiple factors that contribute to differential performance in examinations.

The research for this thesis was carried out as part of the Gender *Differences in Examinations at 18+* project. I was director of this national project which was funded by the Nuffield Foundation over a two year period (1994-96). This thesis extends many of the ideas discussed in this earlier work and utilises the data. It also reflects the scope of both a nationally funded and nationally based project.

In this chapter the research methodology, design and methods are discussed I begin by presenting the research questions. I then move on to a reflexive discussion of the research methodology, the research design and its methods of data collection. The chapter concludes with a discussion of the relationship of this thesis to the larger project on which it is based.

Research questions

This investigation into gender and performance at A level developed out of earlier research studies, notably those of the APU (Foxman *et al.* 1985, Gorman *et al.*, 1988) and the *Differential Performance in Examinations at 16+* project (henceforth referred to as the Differential Performance project) (Stobart *et al.*, 1992b). Alongside the detailed knowledge provided by the APU surveys about boys' and girls' achievements in various curriculum areas (see Chapter 2), the surveys also developed a classification framework for the analysis of assessment data at the item level. These surveys considered the content, context and type of task presented in the item. The Differential Performance project applied the APU classification framework to GCSE performance in English and mathematics. Although application of this framework to GCSE data had its limitations (Elwood, 1992) the results of the project furthered our understanding of the nature of the interaction between gender and performance at the examination item level.

Evidence collected from the Differential Performance project and the APU surveys provided an interesting profile of how boys and girls perform in certain subjects, across different contents and contexts up to and including the age of 16. The findings from the GCSE research, however, pointed to questions about A level examinations; the two stages of examining being closely linked. Previous studies of gender differences and A level examinations had focused mainly on entry and result patterns, mode of assessment and face-validity reviews of examination papers (Gipps and Murphy, 1994; see Chapter 1). What was missing were considerations of the effect of question content and format in A level examinations and how gender-related differences in performance at GCSE were linked to those found at A level. In the light of these identified gaps in the research evidence, the present research study was developed and the following research questions formulated:

(i) What are the patterns of male and female performance in the A level examination?
(ii) How have these patterns changed over time and between the GCSE and A level stages of examining?
(iii) How can we account for the change in performance patterns between these two stages of examining?
(iv) Are the A level examinations biased towards one gender more than the other?
(v) Are there content areas, contexts and task types used in A level questions that benefit one group more than the other. If so, are these similar to those found at GCSE?
(vi) Is there a difference between coursework and examination components within the A level in terms of the contribution that each makes to the overall award. If so does this contribute to differential performance?
(vii) What are the attitudes of teachers towards male and female performance and how do they perceive male/female ability at 18+?
(viii) What are students' perceptions of their abilities/attainment in the subjects they have chosen at A level and why do they choose the subjects they do?

(ix) What are the school- /college -specific factors which serve to minimise gender related differences in performance while at the same time maximise individual pupils' achievements?

Research methodology

I attempt to account for gender-related differences in performance in A level examinations by concentrating on the contribution made by the structure of these examinations, the mode of assessment chosen at this level, and the effect of teachers' and students' perceptions in relation to these examinations. Although these contributions are reported separately in subsequent chapters, they are in fact highly interrelated. For example, patterns of examination results cannot be separated from schools' policies about post-16 provision and from students' and teachers' attitudes to the subjects taught.

The research questions identify a complex web of factors, both in relation to successful performance at A level and in variations in achievement. These complex issues make the search for unique causative factors highly problematic. The research, therefore, employs a multiple method approach in an attempt to isolate those factors associated with outcomes which differ by gender and to evaluate their influence.

The rationale for a multi-method approach is two fold. Firstly, in addressing the fairness of A level examinations, questions have to be asked at different levels and from different participants. These different questions then dictate the line of inquiry adopted. Secondly, in reflecting the complex nature of the topic, no single method or data source can completely capture all the relevant features that contribute to gender-related differences in performance. Gipps and Murphy (1994) acknowledge that more than just the practices of assessment need to be taken into account when we want to consider equity in relation to assessment. Support for a multi-method perspective is linked to, (a) the extensive amount of research which has been conducted in the area of gender and achievement and related fields as outlined in Chapters 2 and 3, and (b) to my own previous research experience in related areas (Elwood, 1992; Stobart *et al.*, 1992a, b). The reality of pupils' educational experiences and how these interact with assessment, demands a multiple approach to the investigation of causes. Therefore, any investigation into gender-related issues in assessment must look for explanations beyond student performances.

The nature of the research questions

Guba and Lincoln (1994) suggest that research questions dictate any subsequent decisions about the research approach, data sources and collection. These decisions, in turn, are linked to the choice of inquiry paradigm made by the researcher. The ontological and epistemological assumptions surrounding the nature of inquiry and how one comes to know and understand the real world is dictated by the inquiry paradigm in which the researcher locates herself. This location then goes on to constrain the methodological approaches and choices which she adopts:

> Inquiry paradigms define for inquirers what it is they are about and what falls within and outside the limits of legitimate inquiry.
> (Guba and Lincoln, 1994, p. 108)

Earlier research into gender differences and attainment adopted a linear, single method approach to investigating differences in performances between the sexes. Studies were characterised by an emphasis on biological factors determining sex differences and more 'scientific' approaches to the collection and interpretation of data (Halpern, 1992; Maccoby and Jacklin, 1974). Here the received view was that the demonstration of sex differences in performance could be used to justify a preconceived causal explanation. Variations in performance between males and females could be measured using experimental approaches and statistical models highlighting causal factors which could be generalised to a wider (though generally male) population (Gipps and Murphy 1994).

These earlier research studies are located in a positivist paradigm (Cohen and Manion, 1994; Guba and Lincoln, 1994). A characteristic of this paradigm is a belief in an objective reality which can be measured by the sole use of quantitative methods; the argument being that the more quantification used, the more scientifically mature the investigation, following a belief that only quantitative data are ultimately valid or of high quality (Guba and Lincoln, *op. cit.*).

Many of the earlier studies into sex differences in performance have been criticised for locating themselves in the positivist paradigm with its obvious limitations (see Gipps and Murphy, *op. cit.* for a full discussion). Critics of singular, quantitative methodological inquiries into issues of gender and achievement suggest that we can no longer ignore the more social, affective and environmental factors which impact on pupils, their engagement with assessment tasks and their views of success (Gipps and Murphy, 1994; Wilder and Powell, 1989). Moreover, the growing body of work that suggests factors such as mode of assessment, task type and the context in which questions are situated (Boaler, 1997; Cooper, 1996; Harding, 1979; Murphy, 1982; Murphy 1996a and b;

Stobart *et al.*, 1992a and b) forces us to acknowledge the limitations of a single method, linear approach to investigations concerned with the causal factors of gender-related differences in examination performance.

The current research accepts the criticisms of Gipps and Murphy and others and adopts a multi-method approach to investigate the variety of factors which impact on pupils' performance. Such an approach offers a more rounded view in attempting to articulate fairness in relation to examinations and assessments. The study locates itself in a 'post-positivist' paradigm of inquiry (Guba and Lincoln, 1994). This paradigm responds in a constructive way to the problematic criticisms of positivism by using both quantitative and qualitative techniques to enhance the validity of research findings. Research located in this paradigm acknowledges the influence of context in social inquiry; is informed by participants' understanding of their surroundings; is interested in uncovering local, insider views which enrich the data collected and acknowledges that the research process is not value-free, how the researcher proceeds must be affected by the knowledge they accumulate during the research process (Guba and Lincoln, *op. cit.*).

The nature of the research design

The adoption of a multi-method approach in this research study was not only dictated by the research questions but also by practical experience gained from other research studies (Stobart *et al.*, 1992a and b). An exclusive reliance on any one method would distort the investigation and might mistakenly identify single factors which cannot fully explain differential performance. The use of multiple methods is often referred to as triangulation, defined as "... the use of multiple methods in the study of the same object..."(Denzin, 1989, p. 236).

Also in attempting to account for gender differences in examination performance it is necessary to be confident that any data generated are not simply artifacts of one method of data collection. Therefore, when looking at performance on examination papers, it is essential to triangulate with other sources of data to be confident that any differences observed are not only differences due to the measurement instrument, i.e. the test, but are actual differences in how males and females apply themselves to their learning and how this impacts on their achievement.

Patton (1980) suggests that multiple methods and triangulation contributes to "methodological rigour" (p. 18) by employing multiple methods to seek out diverse empirical sources in an attempt to develop interactionally grounded interpretations

(Denzin, *op. cit.*, p. 234). In using a multiple method approach and triangulation, this research study aspires to such methodological rigour. It acknowledges the weaknesses in the separate methods of data collection and data sources that have been chosen (Cohen and Manion, 1994, Oppenheim, 1992) and aims to overcome those weaknesses by pulling together several lines of evidence in an attempt to identify and validate those factors which contribute to gender variations in outcomes.

Furthermore, Denzin (1989) suggests that it is convenient to conceive of triangulation as involving varieties of data, investigators and theories as well as methods. For the purposes of this research study **two** of these categories are applicable: *data triangulation* and *methodological triangulation.*

(i) Data triangulation

Data triangulation involves the researcher in explicitly searching for as many different data sources as possible that bear upon the events under analysis. The sources of data identified for this research project are:

- national examination statistics;
- A level examination papers and mark schemes;
- students' examination scripts and sets of marks;
- schools/colleges providing A level examination courses;
- teachers of A level English literature, mathematics and physics and
- students who are involved in taking A level examination courses in these subjects.

It is acknowledged that there is a relationship between these diverse sources of data (Stobart *et al.*, 1992b), and that each contributes in different ways to the topic under consideration. The links between them are fundamental for the outcomes of the research.

(ii) Methodological triangulation

The type of methodological triangulation adopted for this research is "across method" triangulation (Denzin, 1989, p. 244). Here the researcher combines dissimilar methods to illuminate the same class of phenomenon and she is fully aware that :

> ... [t]he flaws of one method are often the strengths of the other; and by combining methods [researchers] can achieve the best of each while overcoming their unique differences.
>
> (Denzin, 1989, p. 244)

Both qualitative and quantitative techniques are used. They include both tried and novel techniques: semi-structured interviews, questionnaires and a classification for the analysis of examination papers, which has been developed for the purposes of this research. The quantitative data is collected via national examination statistics databases, examination performance outcomes, postal questionnaires and attitudinal scales. The qualitative data is collected via open-ended questions on questionnaires and semi-structured interviews with participants through the conduct of case studies. The case studies allow for the in-depth look at particular sites of interest such as teachers and students in their own contexts. The aim of the case studies is to bring expert knowledge to bear upon the issues studied (Stake, 1994).

However, triangulation and the use of multiple-methods in social research has not gone without criticism (Lincoln and Guba, 1985; Patton, 1980). Patton (1980) suggests that "... there is no magic in triangulation..." (p. 330) and that the comparison of multiple data sources will "... seldom lead to a single, totally consistent picture" (p. 331). At the heart of this research project is an understanding that different types and levels of data reveal different aspects of what is being studied. The emphasis is on not ignoring these differences but understanding and interpreting them. It is not expected that "... the findings generated will automatically come together to produce some nicely integrated whole" (Patton, 1980, p. 330) as each method, like each data source, reveals a different aspect of reality. What is critical to this research, however, is that different pictures are allowed to emerge to complement the complex nature of the topic. It is in the data analysis stage of the research that the full scope of the strategy of triangulation emerges.

Research design and method

To operationalise the research questions, the design of the study was structured into three strands:

- **Strand I** - concerned itself with the research questions that considered patterns of male/female performance at A level and the structure and format of the examination and whether they contributed to differential performance (research questions (i), (ii), (iv), (v) and (vi) above). In Strand I the analysis of GCE A level examination papers and scripts was carried out to identify the nature of gender-related differences in performance alongside a statistical review of entry and results patterns from all the GCE Examination boards.

- **Strand II** - concerned itself with the research questions directed at teachers' attitudes towards male and female performance and achievement at A level (research question (vii) above). Data was collected on these issues by means of a questionnaire survey of school and college departments teaching English literature, mathematics and physics regarding entry decisions, syllabus choice and teachers' perceptions of, and attitudes to, students' attainment at 18+.

- **Strand III** - pursued, in more detail, both teacher and student attitudes to, and perceptions of, success and achievement at A level through case studies (research questions (vii), (viii) and (ix) above). The case studies were used to explore pertinent issues arising from the earlier Strands of the research and to gain insight into A level students' attitudes to the subjects they study and their attainment in general.

The research is unique in focusing on these three strands as a means of understanding differential performance; the three strands represent a broad conceptualisation of the issues around the GCE A level and gender equity. In the following sections, each strand is outlined in detail; the purpose of the research under each strand, the sampling issues and how the research was carried out. Data analysis is also briefly mentioned at this stage, and is explored more fully in later chapters.

Strand I - Analysis of performance

In Strand I, techniques for the analysis of gender-related differences in performance were applied to the requirements of the 1993 GCE A level (examinations scripts and coursework) in English literature, mathematics and physics. These were, in the main, statistical techniques which described the patterns inherent in the data and which gave some indication as to why such patterns existed. The frameworks for analysis developed from the Differential Performance study were applied to A level examination papers. Evidence about known gender-related differences in performance at different ages and stages was used. Such evidence exists at a detailed level concerning the way male and female performance differs in relation to sets of items, question formats, activity types and modes of examining. It is acknowledged that what is known about gender-related differences is based on performances of 11, 13, 15 and 16 year olds. However, this knowledge was extrapolated and used for the purpose of building understandings of 18 year old male and female performance.

In Strand I a predominantly quantitative approach to the research was taken in the following ways. Firstly, an analysis of patterns of entry and results in A level examinations by gender from 1990 to the present was carried out. This time span was used because entry and result data are more reliable from 1990 onwards (Stobart *et al.* 1992b). This year was also the first in which students with GCSE backgrounds took GCE A level. Results in the years preceding 1990 were reviewed and used to inform the discussion of the later years. The data used for this analysis were the Inter-Board GCE Statistics (AEB, 1990-95) and the Inter-Group Statistics (SEG, 1988-95). This analysis took the form of a comparison of raw numbers of males and females entering A level and GCSE subjects and the proportion of these students who obtained each of the key grades (A-C). This exercise outlined the cross-over in male/female patterns of performance between the two stages of examining, one of the main focuses of this study. The analysis of the Inter-Board/Group data was supported by data from a matched data set which linked GCSE and A level performance data at a candidate level. From this data set it was possible to see the differential effect of performance of candidates across the two examination stages.

Secondly, the APU classification framework was applied to 1993 ULEAC examination papers and student performance on these examinations papers and coursework components was analysed. Questions on examinations papers were classified in terms of the content they examine, the type of task required, the context in which they were placed and the style of answer that was required. A statistical comparison of mean scores for males and females at the item level and paper level was carried out. This analysis of performance on examination scripts was linked back to the classification of items to try and identify those item characteristics which may influence sub-group performance and possible favourable outcomes for males and/or females on the various items.

The contribution of different examination components to differential performance was dealt with through an 'achieved weights' analysis (e.g. Adams and Murphy, 1982). Their analysis took into account the spread of the marks on the examination components and the correlations between the components and the overall grade awarded. This procedure helped to identify those components which were more likely to have a greater influence on a candidate's final grade.

Sampling issues in Strand I

For the analysis of performance on examination papers, a 10% stratified random sample of candidates from the population who sat each subject was selected across subject grades A to E. A stratified random sample across the whole population who sat each subject was felt to be the most representative in reflecting the ratio of males to females who enter these subjects; these ratios were considered to be important in looking at effects on male and female performance. It was not attempted to obtain a matched sample of male and female scripts by grade or mark as such sampling had proven limited in the previous GCSE study (Stobart *et al.*, 1992b).

The sampling frame for this exercise was a list of all candidates who had completed a ULEAC A level examination in English literature, mathematics or physics in the Summer 1993 session. The final random sample of scripts consisted of nearly 3480 scripts for maths (across six papers), 1220 scripts for physics (across two papers) and 1670 scripts for English literature (across two papers for the coursework option and three papers from the non-coursework option) from which question and question-part level data was collected. This random sample enabled a large number of candidates' performance to be analysed and statistical techniques used to establish relationships and patterns among the data (further details of script selection are presented in Appendix 6(i)).

Research method in Strand I

The main purpose of the analysis of examination entry and result patterns was to describe the current profile of gender differences in performance at 18+. A secondary purpose was to illustrate how these patterns had changed over time. The analysis used simple descriptive statistical techniques in calculating mean differences in male/female performance, the proportions of males and females entering subjects and the average mean differences in performance over time. The analysis looked at a variety of subjects, not only those under consideration in the research. It was felt that analysing and presenting data via the well known benchmark of percentage A-C grades obscured more distinct patterns which were emerging at the individual grade level. As a result, a decision was made to look at the top grades in more detail as it became obvious that this is were the 'cross-over' in male/female result patterns between GCSE and A level resides (see Chapter 5).

The matched 16+/18+ data set was analysed by the Oxford Examinations Board on behalf of the research project. Analyses were conducted in English literature, mathematics and physics only. Mean GCSE grades were calculated for those candidates taking A level in the three subjects. Also subject pairings were calculated to investigate how candidates performed in the three subjects in relation to at least one other subject that they had chosen to study at A level. This data included all candidates across all boards who had taken A levels in 1993 (the sample candidates from ULEAC, whose scripts had been selected, would have been included in this data set).

The analyses of the examination papers were carried out in two ways. Firstly, the classification framework developed through the Differential Performance project was adapted and applied to the mathematics and physics papers with advice from two subject experts. Each question and sub-question was classified and their item characteristics identified. Examination papers were then reviewed in the light of the classification exercise to determine which questions were likely to favour males, favour females or act in a neutral way (i.e. not in favour of any one group).

Secondly, the performance data from the scripts was analysed. This analysis was mainly concerned with the calculation of mean scores, mean percentage scores and standard deviations at sub-item, item and paper level. Both t-tests and analysis of variance (ANOVA) were calculated to identify those questions which showed a significant difference in mean scores in favour of either males or females. The t-test and ANOVA were suitable statistics to calculate as the groups were independent and drawn form random samples. The significant differences were then reviewed in the light of the classification of items to see if similar patterns as those identified by the APU surveys and Differential Performance project were present in A level questions. The results and interpretation of this part of the research can be found in Chapter 6.

The analysis of the English literature papers

The English literature papers did not lend themselves to the classification exercise as marks on English literature questions are awarded holistically and there is no possibility of aligning specific marks awarded to the associated marking criteria. Therefore, a simple analysis of performance only on the English literature papers was conducted. Performance on each item was analysed and then any question showing a significant difference in mean performance between males and females was reviewed in relation to the authors on which they were based and the style of question which had been posed. The analysis was able to provide some indication of male and female choice and preference for question type and author within the English literature papers.

Strand II - Questionnaire survey

This strand investigated the opinions of teachers in relation to gender-related difference in performance by means of a questionnaire survey. The survey incorporated questions formulated as a consequence of the evidence found in Strand I as well as more specific questions about school/college practices in A level provision and entry decisions. The questions attempted to extract information about how teachers perceive students' attainment and participation in the subjects they choose. Respondents were asked to indicate their agreement or disagreement on a series of comparative statements such as: *'males are more adversely affected by final examinations than are females', 'females are more confident of success than are males'*, etc.

This exercise was designed to asses the degree to which teachers' perceptions are rooted in stereotypical ideas about male and female performance and how much their practice is influenced by these perceptions. In other questions teachers were asked to identify, from a list provided, the areas of subject content in which they feel one gender experiences more difficulty than the other. The aim was to determine teachers' opinions on how they gauge students' attainment in the different content areas of the subjects they teach. They were also asked to indicate where they believe the problem/success areas for males and females lie in syllabus content . The items on the questionnaire were a mixture of fixed-response and open-ended questions, encouraging a wider response from teachers on the issues under discussion. Questions investigating school/college practice in A level provision and entry decisions ask respondents for information on how departments recruit A level candidates and whether or not positive discrimination is encouraged in gender-stereotyped subjects and whether they analyse their own results by gender. Respondents were also asked whether or not their school/college was proactive about matters of equity in post-compulsory education. The whole questionnaire was aimed at gaining information about teachers' awareness of equity issues, in general, and gender differences in performance in their subjects in particular. Teachers were asked to what extent any awareness of these issues affects their own practice and interaction with students, and whether it guides any decisions teachers make for, or advice that they give to, A level students.

Sampling issues in Strand II

The identified population for the questionnaire survey was heads of English literature, mathematics and physics departments in ULEAC centres who had registered to take examinations in the summer session of 1994. The assumption was that schools who sat A level examinations in the three subjects with ULEAC in 1994 had also taken A levels with the board in 1993. The questionnaire, therefore, was sent to teachers who had taught students for the 1993 examinations and whose scripts were involved in the analysis of examination performance in Strand I. A systematic random sample of heads of departments was taken. Centres who had chosen both coursework and non-coursework options were included (this was particularly important for the English literature centres). Finally, 100 centres for each subject were identified, 300 centres in total. Both single-sex and co-ed institutions were selected. These institutions were a mixture of colleges and comprehensive, grammar, grant maintained and independent schools.

Research method in Strand II

The questionnaires that were developed were of a common design but had subject specific questions (see Appendix 8(i)). They were initially piloted in a number of schools in a midlands town and commented upon by the Steering Committee for the project. Suggestions about design improvement concentrated on length, complexity and clarity of the questions being asked. The problem of sending questionnaires designed to investigate relative gender differences to single-sex schools was also raised. A decision was made to include single-sex schools. Respondents from such schools were asked to complete the questionnaire in relation to any prior experience of teaching boys and girls. If this was not the case, respondents were directed to other sections of the questionnaire which they could complete.

The final version of the questionnaire was sent to 300 heads of department in the randomly selected centres. The initial response rate was disappointing and despite a postal reminder and subsequent telephone calls to all non-responding schools, the response rate remained at approximately 25%. A second round of questionnaires was sent to new centres, so in all 200 questionnaires for each subject were distributed. Again, the new sample was followed up with postal reminders to non-respondents. The final response rate increased to approximately 30%. Although this was still low, the actual numbers of returned questionnaires for each of the three subjects were close to the original projected figures and the various types of institution were adequately represented.

The questionnaires for each subject were analysed separately. Simple descriptive statistics were calculated on the data; frequency distributions, mean scores, standard deviations and proportions/percentages of respondents in the various categories. On the attitudinal questions, percentages of respondents in each of the three subjects agreeing or disagreeing with the statements were calculated and the degree of the differences in response highlighted. Cross-subject analyses were also carried out on those sections of the questionnaires that were common to all three subjects. These cross subject analyses were revealing and contribute much to the main discussion of the questionnaire findings which are presented in Chapter 8.

The questionnaire was chosen as a method of data collection since it was seen as the most efficient way to obtain a national profile of teachers' opinions on gender-related performance issues at A level. The questionnaire, however, was not unproblematic. Aside from the design problems commented on above, respondents generally returned the questionnaires partly completed providing teacher attitude information only; school examination data was rarely provided. These partly completed questionnaires were included as it was the attitude data that was of importance. Examination performance data could be collected at a later stage. The research acknowledges that these (and other) problems are well rehearsed in using surveys to collect information from large groups of people (Oppenheim, 1992).

Strand III - Case studies

The final strand involved a series of case studies which provided more in-depth exploration of issues generated from the questionnaire and performance analyses. From the questionnaire returns it was possible to identify some centres who had varying policies on A level provision and entry decisions which may have implications for equality of opportunity for their students and who were seen to be either proactive or inactive with regard to equity issues at this phase of education. These schools and colleges were identified as being of interest for further exploration. The evidence collected in Strand III, together with that collected in the other Strands enabled triangulation to occur. Through triangulation, the validation of findings was supported (Denzin 1989) and the combination of the information from the three strands provided a more rounded picture of the issues surrounding gender equity in A level examinations.

Sampling issues in Strand III

Nine case study sites were selected; three sites for each subject. The population from which the sample was drawn were those schools/colleges who returned a completed questionnaire. While both positive and negative responses to the issues of gender-equity in A level study were of interest, the criteria for selection of case study sites also specified that certain types of centres should be included: single-sex and co-educational centres;

centres of differing funding status (comprehensive, grammar, grant maintained and independent) and centres which covered a wide geographical area. However, after selection and identification of centres against this criteria, access was not always granted. The final nine case study sites, therefore, consisted of seven comprehensives, one independent and one grammar school: two comprehensive and one grammar school in English literature; three comprehensives in physics and two comprehensives and one independent school in mathematics. Schools were located in the midlands, inner and outer London, Bedfordshire, Hertfordshire and East Sussex.

Data from the case studies cannot be used to generalise to all schools, to all A level teachers of English literature, mathematics and physics or to all students. What the case studies do, however, is provide a look at the 'realities' of teachers and students in relation to A level provision in context (Cronbach 1975; Yin 1989). They illuminate issues raised by teachers regarding the subjects they teach and students regarding their A level experiences and those of their peers.

Research method in Strand III

Access to case study sites was gained in two stages. Firstly, initial telephone contact with the heads of departments in the schools was made. This was followed up with a letter identifying issues that would be explored in the visits. Teachers were also provided with an outline of the proposed data collection strategies: semi-structured interviews with the head of department (see teacher interview schedule presented in Appendix 8(ii)); a questionnaire survey of year 12 and 13 A level students and semi-structured interviews with groups of students (see student questionnaires and interview schedule presented in appendices 9(i) and 9(ii)). Finally, a suitable time for visiting the schools was negotiated.

Participating teachers took responsibility for selecting students for semi-structured interviews. Although this may have introduced bias into the sample in terms of teachers more likely selecting good and co-operative students, it was felt their prior knowledge of the students made them best suited to make the selection. Teachers were, however, asked to ensure that students were not forced to present themselves for interview; the wish was for students to co-operate freely with the research. Students were informed that they could clarify any problems they had with the researcher.

In observing the 'life' of the institutions, the role of the 'limited observer' was assumed (Ely, 1991, p. 45). Teachers and students knew the focus of the research and the researcher was treated as a visitor to the school, with all the formality that this position acquires. The presence of the researcher was acknowledged as having an influence on what was being studied (Ely, *op. cit.*). This influence manifested itself most in the completion of student questionnaires; some schools took the completion of the questionnaires as a formal activity and as a courtesy to the researcher, others were less formal in asking students to complete the surveys. Teachers also reacted in different ways to talking about gender difference, some of them did not want to appear uninformed about the issues or in any way inactive in combating unequal opportunities, others welcomed the time to discuss the issues which they felt were important to achievement and success at school.

The teacher interviews were one hour in duration. Teachers were aware that the interviews were concerned with comments they had made on the questionnaire. They were also encouraged to comment freely on other aspects of the topic that were of interest to them; e.g. the syllabuses they were using, the approaches to teaching and learning and general opinions about male and female achievement at 18+. The interviews reinforced earlier information obtained via the survey and analyses of students' performance in the examinations.

All A level students who were taking English literature, mathematics and physics (depending on the school visit) were asked to complete the student questionnaire. Students were promised confidentiality and anonymity and as such their responses would not be seen by their teachers. The student questionnaire was adapted from the teacher questionnaire and focused on students' attitudes towards various aspects of the A level syllabus in the respective subjects. The questionnaire also included items concerning specific areas of the syllabus which students may or may not have found difficult. In addition, the survey asked about students' perceptions of how they compared in confidence, motivation, enjoyment and aptitude in their subject to their same- and opposite-sex peers. The student surveys also collected background information on GCSE attainment and wider subject choices at A level.

Group interviews of students also lasted for approximately one hour. The interviews explored issues raised in the questionnaires in more depth. Students were co-operative in offering to be interviewed. At most sites, two groups of students were interviewed; one group each from Years 12 and 13, each comprising of three males and three females. There were obvious gender imbalances that could occur in such groups but participants were encouraged to contribute to the discussion; no one sub-group dominated the discussions. Students were reassured of confidentiality and anonymity and were informed about the research.

The teacher and student interviews were transcribed and analysed for themes connected with issues that had arisen as part of the earlier strands of the research. In the time available it was not possible to return interview transcripts to the interviewees for clarification. Data validation at this point was carried out by comparing the interview data with the questionnaire responses of the individuals involved. A statistical analysis of gender differences in responses on the student survey was conducted. Descriptive and summary statistics were calculated by gender as were t-tests to gauge statistical significance of difference on each item of the questionnaire. The results of these analyses are presented in Chapter 9.

The aim of collecting the student data was to make comparisons between what teachers perceive the attitudes and abilities of their students to be and what the students themselves actually believe. While such comparisons are examined in subsequent chapters (see Chapter 9), the following two points need to be taken into account when interpreting the results of the students' survey:

- while the sample of teachers was randomly selected from national pool of schools offering ULEAC syllabuses, the student sample was restricted to the nine case study schools which were selected on the basis of responses to the teachers' questionnaire;

- while departments were encouraged to circulate the questionnaire amongst the whole A level cohort in their subject area, responses to this request varied. The result of this was that some schools were over represented in the data, and that there were different student response rates for the three subjects.

In reporting the case study data, I do not take the conventional approach of describing and documenting each case (Yin, 1989). Instead, later chapters of this thesis deal separately with issues relating to teachers (Chapter 8) and students (Chapter 9), highlighting the major themes emerging from both survey and interview data. The Strands of the research were an effective organisational structure within which to conduct the research. However, in later chapters I have chosen to report the research in relation to the research questions. This approach emphasises the important general issues identified through the examination, teacher and student data. It also allows for the illustration for the more subject specific concerns.

My research role and responsibilities

The research on which this thesis is based was carried out as part of the *Gender Differences in Examinations at 18+* research project, which was funded over a two year period by The Nuffield Foundation. The proposal that was submitted to The Nuffield Foundation was also submitted to the Institute of Education, University of London to support my enrolment for a research degree. I commenced my PhD studies in the Autumn of 1993 and the research for The Nuffield Foundation started in January 1994.

My initial ideas about the focus of the research and the subsequent design and planning of the study stemmed from my close involvement with the *Differential Performance* project (Stobart *et al.,* 1992b). The recommendations from this study pointed to the gaps in the research literature regarding equity considerations within the A level examination. Research instruments from the Stobart *et al.* study, such as the teacher questionnaire and the APU-type classifications of examination papers, were subsequently modified and adapted and used in the present research.

My role within the Nuffield project was a dual one of director and researcher. As director of the project my responsibilities were leadership, decision making and day-to-day planning and management. As researcher I was involved in carrying out fieldwork at all levels. The research team consisted of myself and a research officer, who was employed for a period of eighteen months to work on the project. During the project, the research team met at regular intervals to review progress, talk through particular issues and discuss and develop interpretations of the data. Furthermore, as part of the management of the research project, a steering committee was established to guide the research and to provide expert advice in relation to interpretations of findings. Membership of this committee consisted of three experts in the subjects under consideration, three experts on assessment and gender issues, a representative of ULEAC and the Assistant Director (Education) of The Nuffield Foundation. I was responsible for chairing and servicing this committee.

The research team took responsibility for the formation and the development of additional research instruments such as the student questionnaire and interview schedules. Decisions about statistical techniques used to analyse the quantitative data and the more interpretative approaches to the analysis of interview data were taken collectively. The research officer's responsibilities were the formation of data sets, computer analysis of the data, the administration of the survey and the organisation of the case studies.

Fieldwork tasks were shared. The direction, write-up and structure of the final report presented to The Nuffield Foundation trustees was my responsibility.

This thesis, therefore, involves the discussion of research that grew out of a nationally funded project. It benefits from being of this scale in that most of the data collected is at a national level and can thus say something about a more general population of teachers and students, especially in relation to the latter's performance on examination papers. The work that is presented in this thesis builds upon the findings reported to The Nuffield Foundation (Elwood and Comber, 1996) in two ways. Firstly, through the positioning of the work within a theoretical framework (see Chapters 2 and 3) and secondly, through an expansion of the analyses and arguments put forward by the research team in the final project report.

Chapters 5 to 9 present an in-depth discussion of the data which was collected, its analysis and interpretation. Chapter 5 specifically deals with the profile of gender differences in performance at GCSE and A level, while Chapters 6, 7, 8 and 9 focus on explaining these differences through a consideration of the findings from the different lines of inquiry used within the research.

Chapter 5

Gender-Related Differences In Examination Performance

Introduction

The purpose of this chapter is to present the current profile of gender differences in GCSE and A level examinations. In doing so the chapter considers the first two research questions outlined in the previous chapter:

- *what are the patterns of male and female performance in the A level examination?*
  (Research question (i), Chapter 4)

- *how have these patterns changed over time and between the GCSE and A level stages of examining?*
  (Research question (ii), Chapter 4)

Examination statistics are presented to show the scale of the differences in male and female performance patterns between the two stages of examining and to introduce the 'cross-over' in gender-related patterns of performance between 16+ and 18+ examinations. The entry patterns and examination outcomes presented here complement those gendered patterns of performance in national and international surveys reviewed in Chapter 2. The outcomes of these large-scale assessment surveys provide evidence with which to evaluate the differences observed in public examinations data, that is, both the scale of the differences and their direction.

The examination data presented in this chapter are taken from the Inter-Group and Inter-Board statistics (SEG, 1988-95 and AEB, 1990-95 respectively). They provide detailed information on examination outcomes at the syllabus level for all examination boards in England, Wales and Northern Ireland. The starting date to review examination statistics is 1988 for the GCSE (this being the first year in which the GCSE was examined), and 1990 for the GCE A level (this being the first year in which A level candidates had GCSE backgrounds). The 1995 cut-off date marks the end of the data collection phase of this research project. In this study, I was also able to gain access to a matched data set developed by the Oxford Examination Board (UODLE) on behalf of the other examining boards. This matched data set links GCSE and A level performance at the candidate level and enables a review of performance for all candidates across the two examinations. The matched data used in this analysis comes from the 1991 GCSE and the 1993 A level sessions. Thus, the A level and GCSE performance of those candidates whose scripts were selected for the analysis of examination performance are included in this analysis.

Patterns of entry and performance in the GCSE

GCSE entry patterns

More girls than boys are entered for the GCSE. For example, in 1995, girls provided 51% of the total GCSE entry, despite making up only 49% of the 16-year-old cohort. More boys, however, are amongst those candidates classified as absent (those who do not complete/sit the examination) and those not entered at all. For example, in 1992, 89% of all 16 year olds were entered for GCSE English; 92% of girls and 86% of boys at this age. These figures had improved by 1994 with 92% of all 16 year olds sitting GCSE English; 94% of girls and 90% of boys at this age. The increase in 1994 can be accounted for by the assessment of Key Stage 4 (KS4) of the National Curriculum through the GCSE, with the statutory requirement for all 16 year olds to be assessed. However, such differences in entry policy must bear upon the interpretation of the data, particularly if the figures represent lower attaining boys not being entered for the GCSE while girls with similar performance levels are.

Indeed, gender differences in examination entry are an important background factor in any interpretation of the actual results, particularly where there are clear imbalances. As can be seen in table 5.1, girls over the eight year period (1988-95) have made up only 30.9% of the physics entry, 41.6% of the chemistry entry while providing 57.4% of the biology entry. These figures suggest a highly selective entry for physics with a less selective entry for girls in biology; if girls have to choose a science they are more likely to opt for biology. Moreover, as table 5.1 illustrates, the male/female entry ratios in the three sciences have changed considerably between 1988-95. This is mainly due to the subject 'science' becoming compulsory as part of the KS4 requirements. The majority of schools now offer combined science syllabuses at GCSE, leaving the independent sector as the main provider of single science syllabuses. These entry differences, therefore, may well help to explain the very different outcomes in the science subjects. Other major subjects which attract a large proportion of female entrants are French and English literature with an 1988-95 average of 56.1% and 53.6% respectively. It would seem that opting for French and

English literature would be a positive choice for females, therefore producing different result patterns to biology.

Table 5.1
Proportion of male and female entrants in eleven GCSE subjects 1988-95

Subject	M % of entry 1988	F% of entry 1988	M % of entry 1990	F% of entry 1990	M% of entry 1992	F% of entry 1992	M% of entry 1994	F% of entry 1994	M% of entry 1995	F% of entry 1995
Biology	34.6	65.4	36.7	63.3	40.7	59.3	48.5	51.5	52.6	47.4
Chemistry	55.6	44.4	55.1	44.9	57.5	42.5	61.0	39.0	62.8	37.2
Economics	60.3	39.7	60.8	39.2	64.8	35.2	66.5	33.5	68.4	31.6
English	48.8	51.2	49.4	50.6	49.8	50.2	50.0	50.0	50.2	49.8
English Literature	44.6	55.4	45.9	54.1	47.0	53.0	47.3	52.7	47.4	52.6
French	40.2	59.8	41.8	58.2	44.5	55.5	46.1	53.9	46.8	53.2
Geography	58.3	41.7	57.9	42.1	56.9	43.1	57.0	43.0	56.5	43.5
History	48.7	51.3	48.8	51.2	48.1	51.9	47.9	52.1	48.5	51.5
Maths	48.9	51.1	48.1	51.9	48.3	51.7	49.2	50.8	49.3	50.7
Physics	72.5	27.5	70.9	29.1	70.1	29.9	66.9	33.1	65.8	34.2
Science (DA)	-	-	53.0	47.0	50.5	49.5	50.0	50.0	50.0	50.0
Total All Subjects	48.7	51.3	48.7	51.3	48.9	51.1	49.3	50.7	49.3	50.7

M = male; F = female; DA=Double Award, majority of entrants for science sit double award syllabuses
(Source: 1988-95 Inter-Group Statistics, SEG, Surrey)

GCSE performance patterns

Having noted that there are gender difference in the GCSE entry pattern, we must also consider the outcomes. The evidence of differences in boys' and girls' performance is usually drawn from the percentage A-C grades awarded in the GCSE (A*-C from 1994 onwards). While this may be an oversimplified approach and ignores the relative proportion of boys and girls *not* entered for the GCSE, it provides a widely understood yardstick and is used in the presentation of the statistics which follow.

Figure 5.1 presents the percentages of boys and girls gaining grades A(A*)-C across all subjects for the period 1988-95. Presenting the figures in this way highlights the fact that girls at 16 are gaining a higher proportion of the top grades than boys. The gap, in favour of girls, was 4% in 1988 and has increased to 8% in 1995. Both groups have been gaining more top grades generally, but the gap between the two genders has been growing steadily and shows no sign of decreasing.

Figure 5.1

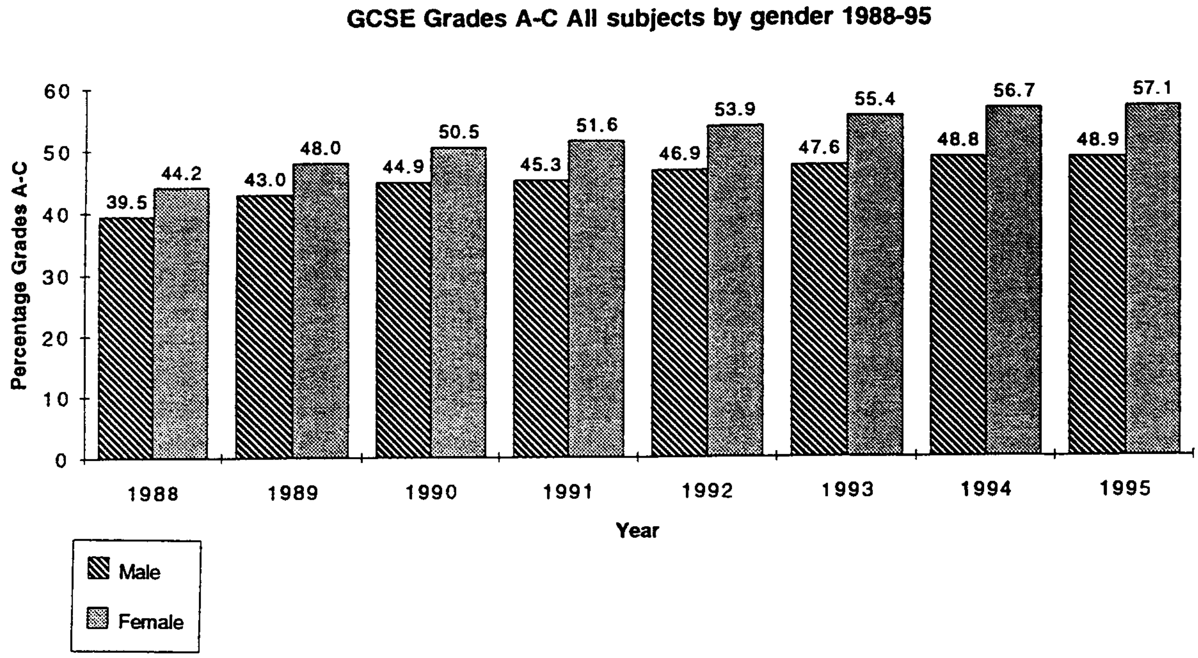


Table 5.2 looks at the differences in the proportions of A(A*)-C grades obtained by males and females for the eleven subjects taken at GCSE across the years 1988 - 1995. From the last column headed 'Mean Difference' in table 5.2, it can be seen that few of the major subjects are producing equal outcomes. Subjects with positive values indicate higher proportions of grades A(A*)-C have been gained by males, negative values indicate better female performance.

The compulsory subjects of English, mathematics and science present interesting results considering that roughly the same cohort take all three subjects. The gender-related differences in English are substantial and show no sign of decreasing. Between 1988 and 1995, girls, on average, gained 15% more A(A*)-C grades than boys; the gap in English has been growing since 1988. The pattern in mathematics is reversed. Over the eight year period, boys, on average, gained 3.3% more A(A*)-C grades than girls, although the gap in mathematics has been decreasing since 1988. The gender-related differences in performance in science are different again. Since its introduction in 1990, boys have gained slightly more A(A*)-C grades than girls, 0.6% between 1990-95. However, this difference in performance between the two genders has been decreasing over the six year period.

Table 5.2
Male/Female Differences in % A(A*)-C Grades
In GCSE 1988-95 All GCSE Groups

Subject	Male-Female (M-F) Difference in %A(A*)-C GCSE Grades All GCSE Groups								Mean Difference
	1988	1989	1990	1991	1992	1993	1994	1995	1988-95
Biology	6.8	7.2	7.1	7.4	8.4	9.6	7.2	7.6	7.7
Chemistry	3.8	3.7	2.4	3.2	1.9	1.5	-2.2	-0.8	3.5
Economics	2.6	3.0	2.4	1.2	1.7	-0.4	-0.6	-3.1	0.9
English	-13.8	-13.3	-13.8	-14.0	-14.7	-14.8	-16.3	-16.9	-14.7
English Literature	-11.8	-11.5	-12.4	-12.5	-13.0	-13.2	-13.2	-13.8	-12.7
French	-5.3	-5.4	-6.3	-8.1	-9.9	-11.3	-13.3	-13.2	-9.1
Geography	-5.3	-5.3	-6.2	-5.4	-5.3	-5.7	-6.6	-5.7	-5.7
History	-6.1	-5.5	-6.1	-5.6	-6.1	-6.9	-6.4	-6.7	-6.2
Maths	7.1	6.0	4.9	2.6	2.1	1.0	1.8	1.2	3.3
Physics	-4.0	-4.0	-4.6	-5.9	-6.6	-5.7	0.4	-0.4	-3.9
Science (DA)	-	-	3.0	0.7	0.8	-0.3	0.0	-0.5	0.5
Total All Subjects	-4.7	-5.0	-5.6	-6.3	-7.0	-7.8	-7.9	-8.2	-6.6

M = male; F = female
(Source: 1988-95 Inter-Group Statistics, SEG, Surrey)

In most other subjects, gender differences in outcomes must be interpreted with reference to the entry patterns. For example, girls outperform boys in physics, showing an average of 4.0% more cumulative grades A(A*)-C for 1988-95. This figure tends to support the idea that girls entries in physics are highly selective, The speculation that girls are more likely to take biology as their compulsory science is supported by the results which show boys gaining 7.7% more A(A*)-C grades on average between 1988-95. Results in English literature and French also support the idea that females make positive choices in selecting these subjects at GCSE. Females outperform males in these two subjects, gaining 13% more A(A*)-C grades in English literature and 9% more top grades in French than boys. In the other subjects which had a higher male entry, chemistry, economics and geography, boys were doing better in chemistry (3.5% more top grades) and economics (0.9% more top grades) than girls. However, the gap in male/female performance in both these subjects has been decreasing over the eight year period.

The male/female results patterns in the latter years of the GCSE (1994 onwards) would seem to indicate is that the examination system for 16 year olds is no longer failing girls, and that the main problem now is the underachievement of boys at this age. Even though both boys and girls have been doing better over the years at GCSE, as figure 5.1 indicates, the statistics presented here give support to a serious consideration of boys underachievement in the GCSE. In their coverage of the underachievement of boys, the media have been quick to suggest that the female advantage is across all levels of assessment and examining (e.g. Judd, 1994). However, as the evidence from national and international surveys like those reviewed in Chapter 2, and the presentation next of differential performance patterns post-16, we see that the patterns of entry and performance are even more complex than is generally assumed and that girls are not ahead at all stages of examining and indeed lose their lead to their male counterparts at A Level.

Patterns of entry and performance at A level

A level entry patterns

One of the main changes in A level examination entry patterns over the last twenty five years is the increase in the number of female entrants. Now more females enter for GCE A level than males. For example, in 1995 they made up 51% of the total entry having been only 39% of the total entry in 1970. In most of the subjects examined at A Level, the increase in candidature can be solely accounted for by the increase in the female entry. Table 5.3 shows these changing female entry patterns for eight major subjects. From the last three columns headed 'Percentage Difference' in table 5.3 we can see that up until 1990 the female entry has continued to increase in all subjects, except English literature. On the other hand, male entries have tended to fluctuate, with any increase in the male entry rarely similar to that in the female entry. After 1990 the rates of entry for both groups tend to fluctuate more with decreases in entry for both genders in chemistry, physics and mathematics, with larger decreases in the entry rate for males compared with females in chemistry and maths but large decreases in entry for both males and females in physics. Increases in candidate entry between 1990 and 1995 were found in biology, English literature, and geography, with greater increases in the male entry in biology and larger increases for females in English literature and geography. Differences in the direction of entry rates for males and females occurred in French (decrease for females and increase for males) and history (decrease for males and increase for females).

Table 5.3
Entry figures for eight major A level subject by gender 1970-95

Subject	Sex	1970	1980	1990	1995	%Diff 1970-1980	%Diff 1980-1990	%Diff 1990-1995
	M	10235	17232	17938	20711	68.4	4.1	15.5
Biology	F	9463	20662	28517	31553	118.3	38.0	10.6
	T	19698	37894	46455	52264	92.4	22.6	12.5
	M	23385	24836	27427	23769	6.2	10.4	-13.3
Chemistry	F	7385	12408	18769	18523	68.0	51.3	-1.3
	T	30770	37244	46196	42292	21.0	24.0	-8.5
	M	21257	20229	14621	17730	-4.8	-27.7	21.3
English Lit.	F	34736	45371	32345	40444	30.6	-28.7	24.0
	T	55993	65600	46966	58174	17.2	-28.4	23.9
	M	9822	7456	7445	8169	-24.1	-0.1	9.7
French	F	16103	18640	19799	19394	15.8	6.2	-2.0
	T	25925	26096	27244	27563	0.7	4.4	1.2
	M	19421	20714	23524	23887	6.7	13.6	1.5
Geography	F	12347	14360	18146	19567	16.3	26.4	7.8
	T	31768	35074	41670	43454	10.4	18.8	4.3
	M	18145	18898	19845	19490	4.1	5.0	-1.8
History	F	16811	21196	23962	24306	26.1	13.0	1.4
	T	34956	40094	43807	43796	14.7	9.3	0.0
	T	52364	50238	47096	41199	-4.1	-6.3	-12.5
Maths	F	12017	15775	23867	22281	31.3	51.3	-6.6
	T	64381	66013	70963	63480	2.5	7.5	-10.5
	M	35045	35752	35300	27231	2.0	-1.3	-22.9
Physics	F	6501	9406	10029	7571	44.7	6.6	-24.5
	T	41546	45158	45329	34802	8.7	0.4	-23.2
Total all	M	189674	195355	193196	182186	3.0	-1.1	-5.7
above	F	115363	157818	175434	183639	36.8	11.2	4.7
subjects	T	305037	353173	368630	365825	15.8	4.4	-0.7

Source: University of Oxford Delagacy of Local Examinations Archive, Willmot 1994
Interboard Statistics 1990, 1995, Associated Examining Board.

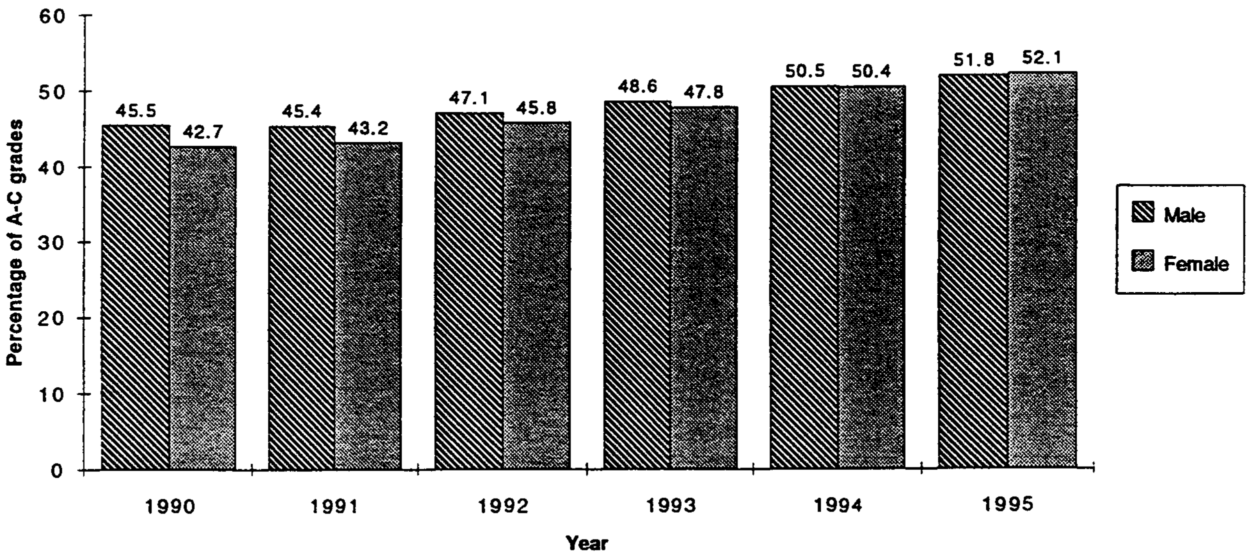
In most of the subjects shown in table 5.3, the entry ratios for males and females are more extreme at 18 than they are at 16. This suggests, not surprisingly, that choices made at 16 are carried through to advanced level but what is more striking is that when choice is introduced, large numbers of pupils are opting out of the compulsory GCSE subjects of English, maths and science with more gendered patterns of entry in these subjects post-16. For example, in mathematics, almost 300,000 girls take this subject at GCSE, yet only 20,000 go on to take maths at A Level. The opposite occurs in English literature, with only 17,000 males going on to this subject post-16 when 200,000 had studied the subject at GCSE. These entry patterns reflect students' personal choices, but with these smaller groups of students who choose to do subjects less traditional for their gender, such choices must also reflect students' abilities.

A level result patterns

Having noted the significant changes in gender-related entry patterns at A level, we must now consider the outcomes. Figure 5.2 presents the percentages of boys and girls obtaining GCE A level grades A-C across all subjects for the period 1990 to 1995.

Figure 5.2

GCE A level Grades A-C All subjects by gender 1990-95



The figures presented in Fig 5.2 show that over this six year period the gap in performance between boys and girls has been decreasing steadily until 1995 which shows girls slightly ahead of boys in the higher grades awarded. The gap in favour of boys in 1990, was 2.8% grades A-C, in 1995 girls were shown to be 0.3% A-C grades ahead of boys. It would seem from these figures that the growing dominance of girls' performance at 16 has started to show itself at 18. However, a closer look at certain subjects will highlight the 'cross-over' in male and female performance that takes place between GCSE and A level. Table 5.4 shows the male/female differences in the percentage of A-C grades obtained in eight A level subjects.

From the last column headed 'Mean Difference' in table 5.4 we can see a cross-over in the patterns of performance at A level, which shows males performing better than females at the higher grades where females had done so at age 16. In all but two of the subjects shown males are outperforming females, and are ahead overall.

Table 5.4
Differences in % A-C Grades in A level Examinations
1990-95
All GCE Groups

Subject	Male-Female (M-F) Difference in % A-C Grades All GCE Groups						Mean Difference
	1990	1991	1992	1993	1994	1995	1990-95
Biology	2.0	1.8	2.4	0.5	-0.6	-2.0	0.7
Chemistry	2.0	1.3	2.0	1.5	1.0	0.7	1.4
English Lit.	2.9	3.5	2.3	1.9	0.9	1.2	2.1
French	4.0	3.5	5.2	4.6	3.8	4.1	4.2
Geography	-0.1	-3.6	-3.5	-2.9	-4.2	-4.4	-3.1
History	5.4	5.0	3.6	3.2	3.0	1.8	3.7
Mathematics	1.8	1.2	0.9	-0.4	-1.4	-2.3	-0.03
Physics	0.4	1.0	-1.1	-0.9	-1.6	-1.4	-0.6
Total All Subjects	2.8	2.3	1.5	0.8	0.1	-0.3	1.2

Source: Inter-Board Statistics 1990-95, AEB, Guildford

The gender differences in outcomes at A level must also be interpreted with reference to the entry patterns. For example, males outperform females in English literature, showing an average of 2.1% more cumulative grades A-C from 1990-95. This is in stark contrast to the gender-related outcomes for the same subject at GCSE where females obtained 13% more A(A*)-C grades. This suggests that the male entry into A level English literature highly selective, indicating a positive choice for males opting for this subject at age 18. The pattern of entry and results found for males in English literature is repeated in history and French with males gaining an average of 3.7% and 4.2% more grades A-C respectively. The selective group of students in the science subjects tend to be female entrants. However the gaps in performance between males and females in these subjects are not as large as at GCSE. For example, females only slightly outperform males in physics, showing an average of 0.6% more cumulative A-C grades for 1990-95, where as they were continually obtaining at least 4% more top grades at GCSE. In chemistry boys continue to outperform girls at A level by 1.4% grades A-C but that gap is smaller than at GCSE were boys on average gained 3.5% more A(A*)-C grades than girls. The pattern in mathematics is again interesting. The gap between boys and girls at GCSE is 3.3% grades A*-C on average in favour of boys yet at A level the figures now show girls taking a slight advantage with 0.03% more A-C grades than boys over the six year period. Females remain ahead in geography but the large gap in favour of males in biology at GCSE (7.7% more A(A*)- C grades) has decreased quite considerably to 0.7% more A-C grades in favour of males at A level. With the more detailed matched data set, it is possible to explore this cross-over in patterns of performance further.

The cross-over in English literature, mathematics and physics

The three subjects, English literature, maths and physics, were of particular interest when exploring the matched data set. Through the analysis of the data, two facts emerged which are of interest to this discussion. Firstly, the mean GCSE grade for those candidates taking these three subjects at A level, showed that girls entered these subjects with higher mean GCSE grades than boys. Table 5.5 illustrates this point. Mean GCSE grades were calculated by allocating point scores to grades; e.g. A=7, B=6, C=5, etc.

Table 5.5
Mean GCSE Grades for males and females taking A level physics, English literature and mathematics

Subject	Mean GCSE Grade Male (M)	Mean GCSE Grade Female (F)	Difference (M-F)
Physics	5.93	6.32	-0.39
English Lit.	5.57	5.64	-0.07
Mathematics	5.98	6.24	-0.26

Source: 16+(1991)/18+(1993) data set, UODLE

Table 5.5 shows that females who enter for GCSE mathematics, physics and English literature all have a higher GCSE mean score than males. This is represented by a minus sign in the 'Difference' column. The difference in mean GCSE score is larger for between males and females who go on to take physics and mathematics than for those who go on to take English literature.

Secondly, males obtain slightly higher mean A level scores than females. A subject pairing analysis was carried out to investigate how candidates performed in A level English literature, physics and mathematics in relation to at least one other subject they had chosen. The data from this analysis is shown in table 5.6. Points were allocated to A level grades to obtain a mean A level score; e.g. A=10, B=8, C=6, etc.

From table 5.6, we see that in both physics and mathematics all candidates are doing better in their other subject than in physics and/or maths. Males have slightly higher mean A level scores in maths and physics than do females; females are doing better in the other subject when it was paired with physics and have a higher mean score in this other subject than males. Table 5.6 shows that overall males are doing slightly better than females at A level in these subjects given their GCSE results (see table 5.5). Other recent research has shown that males tend to make more progress between these two stages of examining than females (Goldstein and Thomas, 1996).

Table 5.6
Gender differences in mean A level grade for physics, English literature and mathematics paired with other subjects

	Male (M)	Male (M)	Female (F)	Female (F)	Diff. (M-F)	Diff. (M-F)
Subject	Main Subject	Other Subject	Main Subject	Other Subject	Main Subject	Other Subject
Physics + Other	5.5	6.0	5.3	6.5	0.2	-0.5
English Lit. + Other	5.7	5.3	5.6	5.0	0.1	0.3
Maths + Other	5.7	6.1	5.6	6.1	0.1	0.0

Source: 16+(1991)/18+(1993) data set, UODLE

Figures 5.3 to 5.8 illustrate these points further. The graphs highlight the grades A, B and C awarded in both GCSE and A level for English Literature, maths and physics. In English Literature it is evident that females are ahead at grades A, B and C at GCSE yet this pattern is reversed at A level with males ahead at grades A and B. In mathematics, males are ahead in grades A and B at GCSE with females ahead at grade C. In A level maths the patterns for grade A remain the same but females obtain more B and C grades. Lastly, in physics, up until 1995 females were ahead at grades A at GCSE, are continuing to be ahead at grades B and males obtain more grade Cs. In A level physics this pattern is reversed with males obtaining more A grades and girls ahead at grades B and C.

Figure 5.3

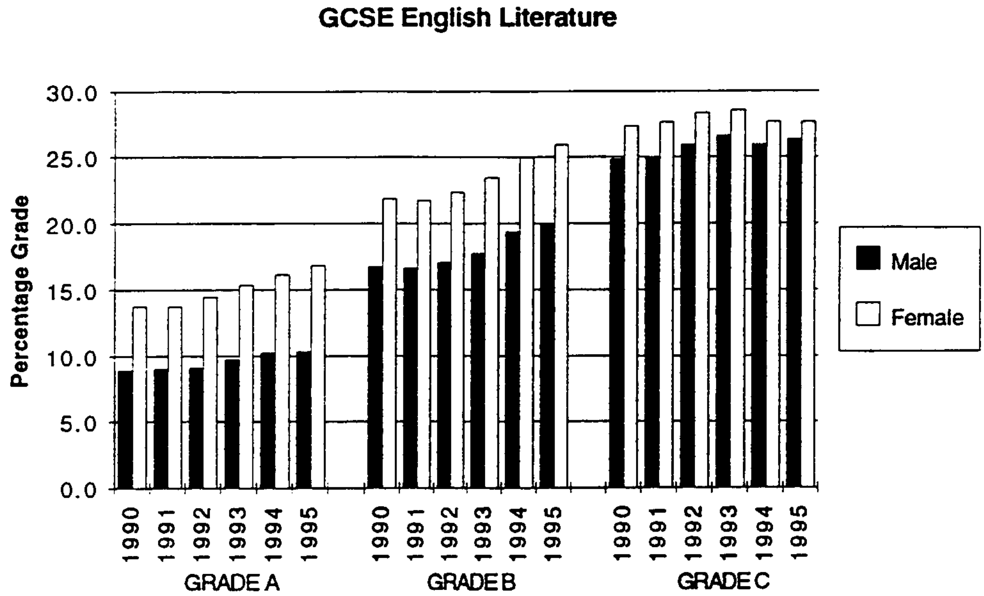


Figure 5.4

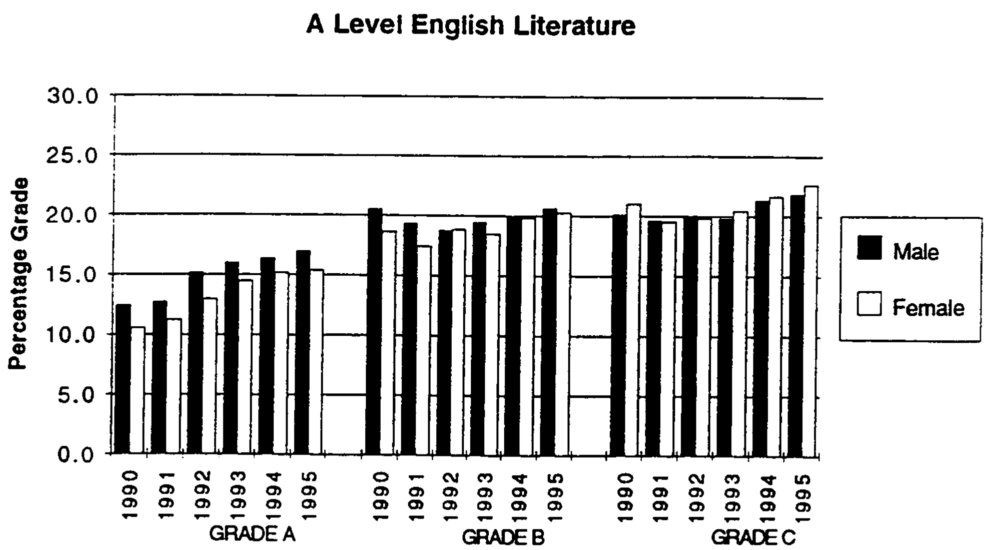


Figure 5.5

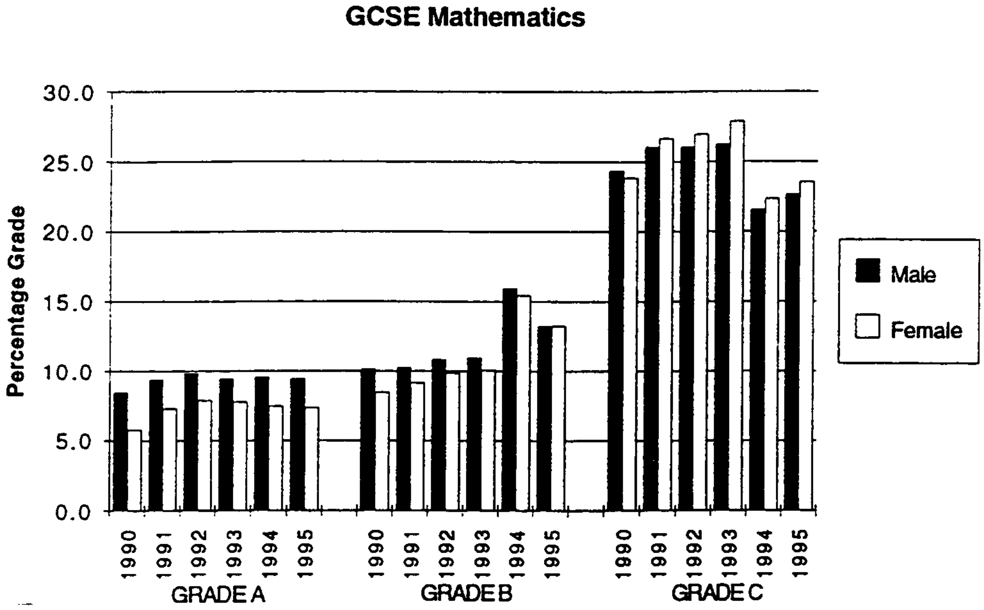


Figure 5.6

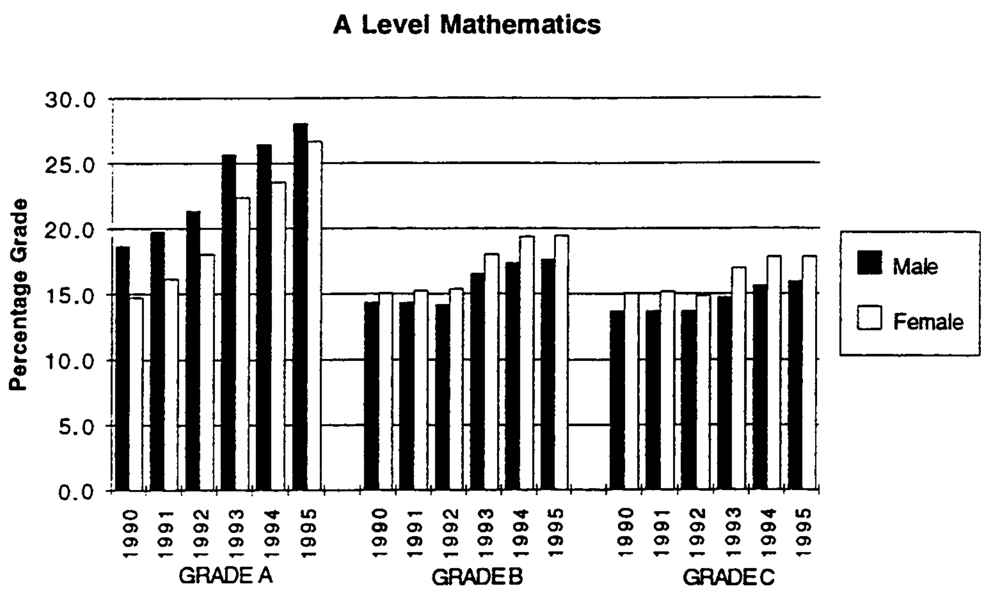


Figure 5.7

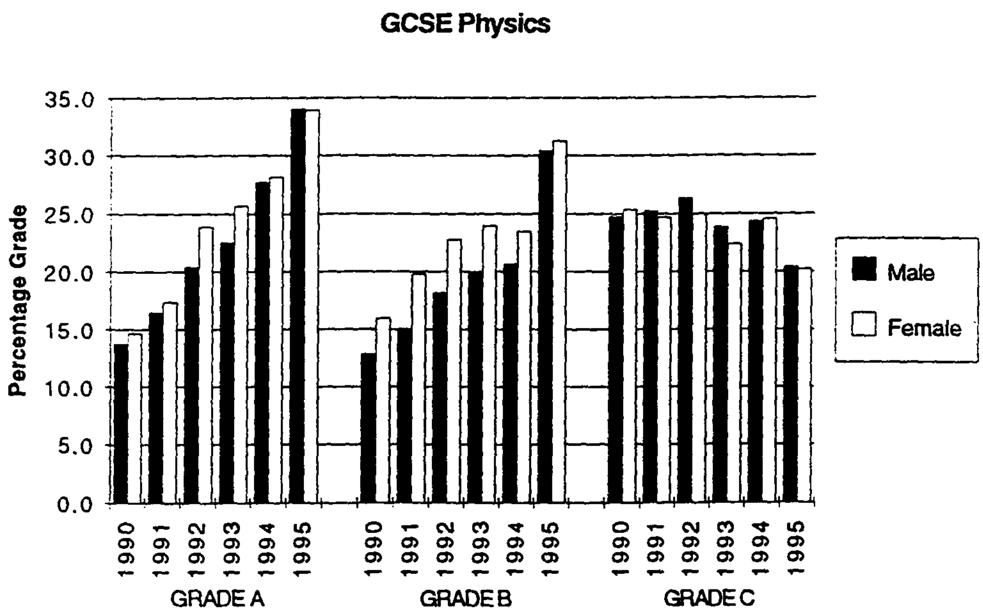
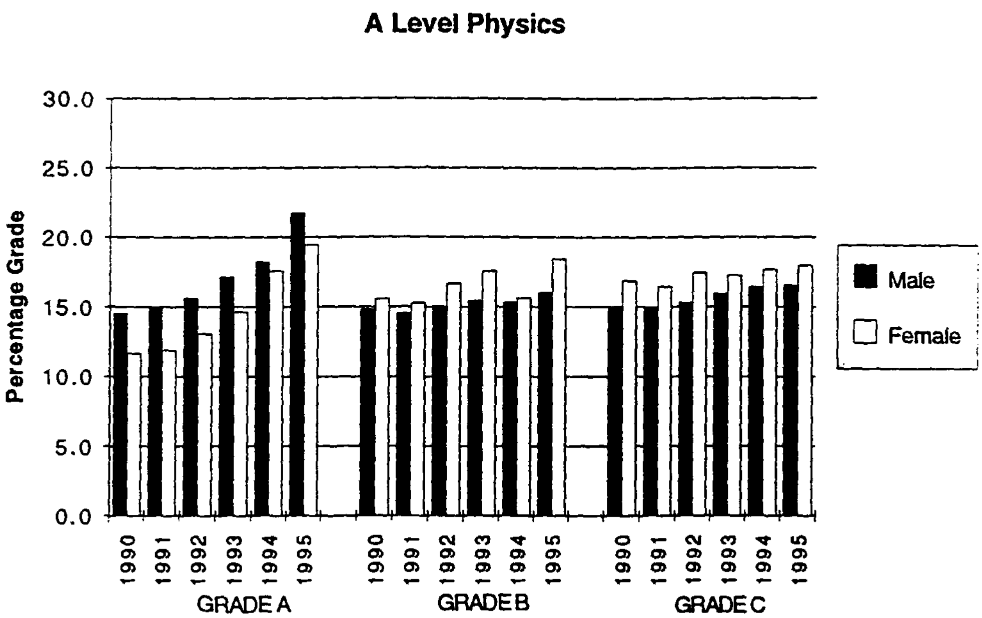


Figure 5.8



Summary

The purpose of this statistical review has been to establish that there are different entries and outcomes by gender between the GCSE and A level. As a result, there is a cross-over that emerges between these two stages of examining. Other recent research has shown that these patterns found at A level are maintained, especially in the three subjects under investigation, well into higher education where there is concern about the differential gap in performance amongst males and females in the higher classifications of degrees (Gender Working Party Report, Feb. 1994; McCrum, 1996).

This chapter has highlighted the complex nature of patterns of performance within these examinations. The scale of the differences observed and their direction fit with similar patterns found from national and international assessment surveys, especially at GCSE (Johnson, 1996; Gipps and Murphy, 1994; Powney, 1996). The A level patterns seem to be less straightforward than those found in similar systems in other countries (Matters, 1997). The acceptable cut-off points (grades A-C) used in the presentation of examination outcomes often obscure more particular patterns. There is an argument that such patterns of performance reflect basic differences in the subject choices made by males and females and that the examinations themselves have a minimal influence. This thesis rejects this argument since it fails to recognise the changes in the relative entries and results of males and females documented here and elsewhere (Arnot *et al.*, 1996; Gipps and Murphy, 1994; Sammons, 1994; Stobart, *et al.* , 1992a & b). The chapters that follow present the main investigations of the reasons why such patterns of performance exist in A level examinations.

Chapter 6

The Classification Of A Level Examination Papers And Analysis Of Student Performance

Introduction

This chapter focuses on the analyses of examination papers and the development of a classification of items for such analyses. In analysing the exam papers, the intention was to gain information about the content sampled and the contexts and types of items used to assess students at this level. The issue here was whether such factors might contribute to differential performance. The analysis of male and female performance on examination items and the overall papers was carried out to address the following research questions as outlined in Chapter 4:

- *are A level examination papers biased in anyway towards one gender more than another?;*
  (Research question (iv), Chapter 4)

- *are there content areas, contexts and task types used in A level questions that benefit one group more than the other and if so, are these similar to those found at GCSE?*
  (Research question (v), Chapter 4)

Previous reviews of examination papers, such as those conducted by the Fawcett Society (see Chapter 3) were more commonly concerned with those characteristics of examination papers which appeared to be biased, such as sexist illustrations and language. These reviews were concerned with issues of 'facial bias' (Cole and Moss, 1993). The analysis of performance carried out for this study attempts to move on from such analyses. To fully understand the demands made on pupils by the subject and syllabus being examined it is essential to investigate the way in which pupils respond to the content sampled on examination papers and to what extent the characteristics of the task interact with the gender of the student.

It was, therefore, necessary to develop a framework with which to analyse performance. As outlined in Chapter 4, the APU-type framework used in the Differential Performance project (Stobart *et al.*, 1992b) was adopted and applied to the A level examination papers. This classification of A level papers and items and the linking of this classification to analysis of performance is particular to this research and has not been carried out before at this level of examining. Along with the classification framework, the APU surveys created a database of gender-related facility scores on items/groups of items which provided information about topic areas, skill areas, task areas and contexts in which one gender consistently outperforms the other. The mapping of the adapted framework onto GCSE papers also provided information about the structure of examination papers and their influence on differential performance.

In this chapter, the structure of the classification and its application to examination items on the 1993 ULEAC A Level papers is reported in detail. Data is also presented at the item and sub-item level of examination performance of male and female students on the A level papers. The mathematics and physics papers were identified as best suited to this exercise. The mark schemes and the particular way in which marks are awarded in these two subjects, at an item level, made such an analysis relatively straight forward. Each sub-item within an item is allocated a number of marks which are indicated on the script and a final mark for the question appears in the margin of the script.

It was not possible, however, to perform a similar classification of the A level English literature examination papers. The style of question, mark schemes and the way marks are awarded in English prevented a detailed breakdown of how candidates obtain their marks at a question level. The mark schemes associated with the English literature papers do not outline the answer that is required for each question. Rather, examiners are guided by general criteria and any differentiation in the allocation of marks is by outcome. Therefore, an holistic approach to marking is practised and candidates are given a single mark which reflects the type of response they have given in relation to the general criteria (style, content, relevance and structure). As a result, it is not possible to see how specific skills are rewarded. In the case of English literature, only the analysis of differences in male and female performance was carried out. A shorter discussion of this analysis appears after the discussion of the mathematics and physics papers.

Classification of examination papers

The APU classification on which the A level (and indeed the GCSE) classification is based is described by Foxman *et al.* (1985) in their review of the APU mathematics surveys. The APU classification framework consisted of nine categories referred to as 'Types'. The first level of the classification was 'Category' (Type 1) that identified the six common sub-divisions of the mathematics curriculum at the time of the surveys: number; measures; algebra; geometry; probability/statistics and calculator skills. Other levels of the classification were concerned with the further sub-divisions of the content area, the context in which the tasks were set, the mode of presentation of the task and any key words that were contained within the task itself. The classification finally used in the GCSE study employed only six 'Types' from the APU study: category of content; sub-category of content; topic covered in the task; the nature of the task; the finer detail (such as key words) used in the item and the context of the item.

In adapting further the APU classification for the purposes of this study, I took into account the complex and integrated tasks used at A Level. The classification, that was eventually used in the A Level study is shown in Figure 6.1 below.

Figure 6.1
Classification of A level papers
based on the APU and GCSE Classifications

Type	Classification
1	Category
2	Topic
3	Task
4	Context
5	Style of Answer
6	Direction
7	Key Words

The process of classifying an item is a hierarchical one. Each Type is linked to the one before (apart from key words). When classifying an item the category of content covered (Type 1) is selected and then the topic (Type 2). The third step is to identify the task (Type 3) within the item and the context (Type 4) in which the item is situated. The style of answer (Type 5) is then selected, then direction given to the candidate such as 'find', 'calculate', 'show', etc. (Type 6). Any key words (Type 7) used within the task are then identified. For the purposes of the research, all questions and question parts of the six mathematics papers and three of the physics papers were classified according to this framework.

The questions on the A Level papers did not lend themselves to simple classification because most of the items did not fall neatly into one category of content. It is also common for items to cover multiple tasks and topic areas. The full classification for each paper and copies of the examination papers used in the analysis appear as appendices to this chapter (Appendix 6(i) to Appendix 6(xviii) inclusive). Clarification of classified items is given in each of these appendices.

There were three main reasons for classifying the papers under this framework:

- the classification of questions and linking them to evidence obtained from the GCSE and APU research would enable the identification of questions which might favour males and females differentially;

- patterns of syllabus coverage on the papers could be highlighted and inform us how the balance of this coverage may favour one group more than another; and

- classification aided in deciphering those features of A Level questions in which gender bias is more likely, if at all, to manifest itself.

The classification developed is not unproblematic. What it does allow, however, is a more detailed picture of the overall make-up of the papers. However, the amount and degree of interaction between the Types is not fully known nor easily identified. These problems will be made clearer in the discussion regarding the analysis of performance on the question papers progresses. The classification may allow for the categorisation of the dominant features of A Level questions, but it can only be used as an approximate measure of those features that contribute to differential performance.

The ULEAC A Level mathematics and physics papers were classified and analyses of male/female performance were carried out on the sample of scripts selected (Chapter 4 and Appendix 6(i)). Any significant differences observed between male and female performance at the item or sub-item level were linked back to the detailed knowledge of the categories of the syllabuses covered.

The analysis of the data for the mathematics, physics and English literature papers are given as appendices to this chapter (Appendix 6(xix) to Appendix 6(xxxiii) inclusive). Questions marked with an '*' are those that behaved in a statistically significant way in favour of males or females. The following sections of the chapter discuss the classification and analysis of the mathematics and physics papers in some detail. The shorter discussion of the analysis of the English literature papers then follows. In the data tables below, for ease of reading and interpretation, the item analysis presents the items at the category (Type 1) and topic (Type 2) level. The contexts of the items are also commented upon (Type 4). Both the style of the answer required (Type 5) and the direction within the questions (Type 6) are also included in later stages of the discussion.

Mathematics papers

The mathematics papers analysed for the purposes of the study were the ULEAC 1993 pure mathematics, mechanics and statistics modules offered under the ULEAC Mathematics Modular Scheme (each module representing one paper); Pure Mathematics 1 (P1), Pure Mathematics 2 (P2), Mechanics 1 (M1), Mechanics 2 (M2), Statistics 1 (S1) and Statistics 2 (S2). P1 and P2 are common to those students taking either pure mathematics and mechanics or pure mathematics and statistics. Pure mathematics and mechanics consists of papers P1, P2, M1 and M2; all are equally weighted at 25% of the total. Pure maths and statistics consists of papers P1, P2, S1 and S2. Again each paper is equally weighted at 25% of the total. Samples of scripts for P1 and P2 were selected from both the mechanics and statistics options. Candidates were instructed to answer all questions on each of the maths papers.

Pure maths papers P1 and P2

Tables 6.1 and 6.2 below show the range of content sampled across the pure mathematics papers, P1 and P2, and the mark allocation for each of the content areas. From this analysis it is evident that for the items of content covered in P1 and P2, no one area of content was awarded more than 15 marks out of a possible 100. Thus no single area of content would seem to be over-represented more than another. Differentiation was the area of content which attracted the most marks (26) across the two papers along with trigonometry (22) and series (18).

Table 6.1
Content sampled for Pure maths paper P1

Category (Type 1) : Topic (Type 2)	Question	Marks (100)
Quadratics: Quadratic inequalities Quadratics: Roots of quadratic equations	1 4a, 4b, 4c	4 8
Indices: rational indices	2	5
Triangles: area of a triangle	3a	3
Circles: circular measure	3b	4
Series: geometric Series: arithmetic	5a 5b	4 5
Trigonometry: trigonometric equation	6	9
Functions: functions	7a, 7b, 7c	12
3D Figures: Mensuration of 3D Shape	8a, 8c	5
Differentiation: differentiation	8b, 8d, 10d	15
Cartesian Co-ordinates: in an x-y plane	9a, 9b, 9c, 9d, 9e	15
Polynomials: factorisation theorem	10a	4
Graphs: cubic polynomial	10b	3
Integration: integration	10c	4

Table 6.2
Content sampled for Pure maths paper P2

Category (Type 1) : Topic (Type 2)	Question	Marks (100)
Differentiation: implicit differentiation	1, 6b	11
Graphs: curve sketching	2a, 2b, 2c	9
Binomial distribution: binomial expansion	3a	5
Approximations: percentage error Approximations: trapezium rule	3b 9d	4 5
Series: partial fractions Series: summation of series	4a 4b	6
Complex numbers: complex numbers Complex numbers: Argand diagram	5a, 5c 5b	8 3
Indices: indices	6a	6
Integration: integration Integration: differential equations	7a, 7b 7c	8 4
Vectors: vectors	8a, 8b, 8c	15
Trigonometry: Trigonometry	9a, 9b, 9c	13

In terms of the contexts used (Type 4) for items on the pure maths papers, the majority of the items were in a mathematical context, i.e. the questions dealt solely with abstract concepts. Only one question on P1 used a context considered to be a domestic context (finding the surface area of a 3D cake-box).

With knowledge from the GCSE research, it was hypothesised that performance on the mathematics papers, especially the pure mathematics papers would possibly show very little difference between male and female performance. This hypothesis was formed based on the evidence from higher level papers at GCSE where very little difference was found between male and female performance. In line with APU findings, the results from the GCSE research showed that 'as the level of the examination paper increases there tends to be fewer items favouring one gender more than another' (Stobart *et al.*, 1992b, p.61). This is because the range of content sampled for examination at the higher levels tends to include content which favours both boys and girls (see Stobart *et al.*, 1992b for more detail).

In analysing the pure mathematics papers very few significant differences in outcomes were found. Tables 6.3, 6.4 and 6.5 show those items on the pure maths papers which showed significant or near significant differences in mean scores between males and females.

Table 6.3
P1 items identified as having significant or near significant differences in male and female performance from candidates offering Pure Mathematics and Mechanics.

Questions Category (Type1) : Topic (Type2)	Sex	No of Candidates Responding‡	Max Poss Mark	Mean Score	Mean %	p< .05
3a Triangles: area of triangles	male female	342 128	3	2.3 2.6	77.3 87.0	0.005(f)
4 Quadratics	male female	342 128	8	5.7 6.4	70.9 79.6	0.005(f)
4a Quadratics: roots of quadratic equation	male female	342 128	2	1.7 1.9	86.5 93.0	0.016(f)
4c Quadratics: roots of quadratic equation	male female	342 128	3	1.6 2.0	53.3 66.0	0.006(f)
5a Series: geometric	male female	342 128	4	3.7 3.9	92.5 96.5	0.025(f)

‡Total number of candidates sampled for this paper - 410 males and 146 females

Table 6.4
P1 items identified as having significant or near significant differences in male and female performance from candidates offering Pure Mathematics and Statistics.

Questions Category (Type1) : Sub-cat (Type2)	Sex	No of Candidates Responding‡	Max. Poss Mark	Mean Score	Mean %	p< .05
3 Triangles/ Circles	male female	148 133	7	4.1 3.5	58.1 50.5	0.070(m)
3b Circles: circular measure	male female	148 133	2	1.8 1.3	91.0 67.0	0.019(m)
4 Quadratics	male female	148 133	8	5.1 5.7	63.9 71.4	0.040(f)
4b Quadratics: roots of quadratic equation	male female	148 133	3	2.1 2.5	70.6 82.3	0.009(f)

‡Total number of candidates sampled for this paper - 164 males and 149 females

Table 6.5
P2 items identified as having significant or near significant differences in male and female performance from candidates offering Pure Mathematics and Mechanics.

Questions Category (Type1) : Sub-cat (Type2)	Sex	No of Candidates Responding‡	Max Poss Mark	Mean Score	Mean %	p< .05
2 Graphs	male female	357 131	9	5.4 4.8	59.9 53.7	0.035(m)
2a Graphs: curve sketching	male female	357 131	3	2.0 1.7	65.3 56.0	0.056(m)
7a Integration: integration	male female	357 131	4	2.4 2.8	58.8 69.0	0.020(f)
9 Trigonometry	male female	357 131	13	7.4 8.3	41.1 46.1	0.070(f)
9a Trigonometry: trigonometry	male female	357 131	5	3.0 3.6	60.6 71.8	0.007(f)

‡Total number of candidates sampled for this paper - 410 males and 146 females.

There were no significant gender differences found for any question or part question for Pure Mathematics 2 for those candidates offering Statistics. From Tables 6.3, 6.4 and 6.5, we can see that there were no discernible patterns of differences between the two groups, either at the question level or across the papers as a whole. On P1, for those candidates also offering mechanics, any significant, or near significant, differences that occurred were in favour of females. These questions dealt with categories of content such as quadratic equations, area of triangles and geometric series. On P1 for those candidates offering statistics, again females did slightly better than males in questions dealing with quadratic equations but males did slightly better in questions covering aspects of triangles and circles. The questions on P1 for candidates offering mechanics were significant differences occurred were only associated with 12 marks out of 100 and for those offering statistics, only 10 marks. On P2 there were only 9 marks associated with questions that registered any significant difference. It was also indicated that those females who opted for pure maths and mechanics, performed better on P1 and P2 than those females who opted for pure mathematics and statistics. Teacher questionnaires and interviews suggested that girls taking mechanics were of a higher ability in mathematics than girls taking statistics (see Chapter 8). The findings from the analysis of performance outlined above would tend to support the direction of the teachers' opinions.

Mechanics papers M1 and M2

Table 6.6 and 6.7 below summarise the range of content that was sampled on the mechanics papers M1 and M2. From the tables we can see that quite a range of content was sampled and that no one single content area seems to be over-represented more than another, with no content area being allocated more than 15 marks out of 100 on M1 and 17 out of 100 on M2.

The mechanics papers used quite a range of contexts (Type 4) that included: scientific apparatus; sports such as jogging and toboggan racing; the use of vehicles such as cars, helicopters and caravans; everyday settings such as fairground games and wooden toys. Mathematical contexts were also used.

Table 6.6
Content sampled for Mechanics M1

Category (Type 1) : Topic (Type2)	Question	Marks (100)
Differentiation: differentiation	1a, 6a, 6b	11
Integration: integration	1b	4
Equilibrium: equilibrium	2	6
Graphs: uniform acceleration	3a	2
ID Kinematics: uniform acceleration	3b, 3c, 10a	8
Vectors: relative motion	4a, 4b	8
Power: power	5a	3
Forces: forces Forces: Newton's 2nd law	5b, 5c 10a	5 4
Centre of Mass: centre of mass	7a	5
Moments: moments	7b	5
Momentum: momentum	8a	3
Energy: kinetic Energy: conservation of energy Energy: work	8b 8c 10c	4 6 4
Projectiles: motion under gravity	9a, 9b, 9c	15
Functions: functions Functions: Newton's 2nd law	10a 10b	3 4

Table 6.7
Content sampled for Mechanics M2

Category (Type 1) :Topic (Type2)	Question	Marks (100)
Differentiation: differentiation	1a	2
Vectors: vectors	1b	4
Experimental laws: Hooke's Law	2a, 2b	8
Momentum: momentum Momentum: restitution	3a 3b	6 3
Simple Harmonic motion: SHM	4a, 4b	9
Centre of mass: centre of mass	5a	8
Stability : stability	5b	3
Vertical circle: circular motion under gravity	6a, 6b	12
Integration: differential equations	7a	10
Exponential functions: exponential functions	7b	2
Horizontal circle: circular motion	8a, 8b, 8c, 8d	16
Energy: elastic, potential and kinetic energy	9a, 9b	17

It was hypothesised that more of the content would favour male candidates on the mechanics papers. Again these hypotheses were based on APU and GCSE research evidence. The type of content sampled in mechanics was linked to mathematics and science content which favours males. Tables 6.8 and 6.9 present those questions from the mechanics papers which indicated a significant or near significant difference in mean score between male and female performance.

Very few significant differences were found on the mechanics papers. Out of the two whole questions showing a significant difference on M1 both were in favour of males and covered differentiation/integration which was in a mathematical context (Q1) and power/force which used the context of a car pulling a caravan. There were 15 marks only associated with these questions. The questions on M2 showing significant or near significant differences in performance were split between males and females. The question that favoured females covered the content of momentum and used a mathematical context. The questions or part-questions that favoured males were concerned with exponential functions and stability and used contexts of helicopters and wooden toys respectively.

Table 6.8
M1 items identified as having significant or near significant differences in male and female performance

Questions Category (Type 1)	Sex	No of Candidates‡ Responding	Max. Poss Mark	Mean Score	Mean %	p< .05
1 Differentiation	male female	371 144	6	4.6 4.0	76.6 66.6	0.004(m)
1b Integration	male female	371 144	4	2.7 2.1	67.5 52.5	0.003(m)
5 Power/Force	male female	363 143	9	5.9 5.2	65.5 57.7	0.009(m)
5b Force	male female	362 143	3	1.7 1.4	56.6 46.6	0.009(m)
5c Force	male female	362 143	3	1.8 1.4	60.0 46.6	0.012(m)

‡Total number of candidates sampled for this paper - 410 males and 146 females

Table 6.9
M2 items identified as having significant or near significant differences in male and female performance

Questions Category (Type 1)	Sex	No of Candidates Responding‡	Max. Poss Mark	Mean Score	Mean %	p< .05
3 Momentum	male female	360 135	9	4.1 4.7	45.5 52.2	0.008(f)
3a Momentum	male female	360 135	6	3.6 4.1	60.0 68.3	0.008(f)
5b Stability	male female	318 127	3	1.2 0.9	40.0 30.0	0.056(m)
7b Exponential Function	male female	305 119	2	0.6 0.4	30.0 21.5	0.034(m)

‡Total number of candidates sampled for this paper - 410 males and 146 females

Statistics papers S1 and S2

Tables 6.10 and 6.11 show the range of content sampled in the statistics papers. On S1, unlike the other papers the content area of the normal distribution tended to be over represented more than any other area, with 27 marks out of 75 (36%) being allocated to this content area. On S2, no content area was allocated more than 18 marks. This was in line with the other maths papers.

Table 6.10
Content sampled for Statistics S1

Category (Type 1) : Topic (Type 2)	Question	Marks (75)
Binomial distribution: binomial distribution	1a	1
Poisson distribution: Poisson distribution	1b, 8a, 8b, 8c	11
Probability: conditional probability Probability: product of independent events Probability: Sum of independent events	2a 2b 2c	1 2 2
Estimation: unbiased estimates	3	5
Discrete Random Variables: discrete RVs	4a, 4b	5
Normal distribution: normal distribution	5a, 5b, 8, 9	27
Permutations and combinations: probability	6a, 6b	9
Continuous random Variables: continuous RV	7a, 7b, 7c, 7d	12

Table 6.11
Content sampled for Statistics S2

Category (Type 1) : Topic (Type 2)	Question	Marks (75)
Chi-Square distribution: chi-square distribution	1	1
Linear regression: linear regression	2	4
Graphs: histograms Graphs: ideas of skewness Graphs: scatter diagram	3a 3b 9a	4 2 3
Measures of location: medians and quartiles Measures of location: means and SDs	4a, 4b 6, 6b	8 10
Sampling: census/survey Sampling: sampling	7a 7b, 7c	4 7
Hypothesis testing: chi-squared distribution	8a, 8b	13
Correlation: correlation	9b, 9c, 9d	11
Estimation: unbiased estimation	5a	2
Confidence intervals: confidence intervals	5b, 5c, 5d	6

There were more items set in context (Type 4) on the statistics papers than either of the two pure maths or mechanics papers. It would seem that more statistics questions perhaps lend themselves to being placed in context. The contexts on the statistics papers included: industrial and vocational contexts such as factory operations and TV repairs; vehicles such as the speed of cars; domestic situations involving curtain material; scientific settings which involved temperature readings and educational contexts such as school examination grades, children's' reading times and school children's weight.

The hypothesis for differences on the statistics papers was that more of the questions would favour females. Again this hypothesis was based on APU and GCSE research evidence. The majority of content sampled for the statistics papers, such as probability and graphical representations of data have been shown to favour females. However, when the candidates' performance was analysed on S1 and S2, there were no significant differences found between male and female performance in either of the statistics papers, nor were there any significant differences in the papers as a whole.

Direction and style of answers

In the light of these outcomes of the analyses of male/female differences in questions and part-questions on all six mathematics papers, the questions were reviewed again with a change of focus on the analysis. This second set of analyses concentrated on two other Types within the classification - style of answer (Type 5) and direction given within the question (Type 6). Marks for questions or part questions were combined for those items were there was a common style of answer required or direction for the candidate within the item. For example, where more than one question required the candidate to carry out an algebraic equation (Type 5: style of answer) marks from these questions were combined for analysis. Similarly where questions required candidates to calculate an answer, these were combined. Table 6.12 below shows the result of these analyses. Again, what these analyses show is that very few differences were found between male/female performance, either in the type of direction indicated to the candidate or the style of answer required. From these analyses, it was found that none of the mathematics papers, and very few of the items, were acting significantly in favour of one gender over another.

Table 6.12
P values for categories of style of answer and direction given on P1, P2, M1, M2, S1 and S2 ($p<0.05$)

Question	P1	P2	M1	M2	S1	S2
Direction	*p*	*p*	*p*	*p*	*p*	*p*
find	0.59	0.85	0.38	0.79	0.79	0.79
calculate	0.12	-	0.49	0.48	0.26	0.55
show	0.90	0.57	-	0.78	-	-
determine	0.45	-	-	0.68	-	-
express	-	0.03	-	-	-	-
Answer	**P1**	**P2**	**M1**	**M2**	**S1**	**S2**
Style	*p*	*p*	*p*	*p*	*p*	*p*
substitution	0.75	0.87	0.62	0.14	0.76	-
label	-	0.01	-	-	-	-
construction	-	-	0.34	0.96	-	-
form	-	-	-	0.45	-	-
algebraic	0.93	0.82	0.67	-	-	-

Physics papers

The physics papers analysed in this study were from the ULEAC 1993 Physics Syllabus. This syllabus consisted of Paper 1- multiple choice, Paper 2 - short and long item response, Paper 3 - passage analysis and topics in physics and Paper 4 - practical paper. The four papers were weighted differently within the syllabus; Paper 1 was worth 25%, Paper 2 was worth 35% and Papers 3 and 4 were both worth 20% each. A choice of questions was available on all three papers which created limitations within the analysis due to the variation in candidate numbers opting for certain questions. For the purpose of the classification, only Papers 2, 3, and 4 were included. Paper 1 (the multiple choice paper) was marked by an optical mark reader and only overall marks on the paper were available, there was no access to question level data.

The classification used for the A Level Physics papers was the same as that for mathematics. Again there were hypotheses regarding which questions on which papers might favour one gender or another. These hypotheses were based on knowledge gained from APU surveys in science which had gathered similar information at an item level as that which had been collated through the mathematics surveys.

Physics - Paper 2

Table 6.13 below shows the range of content (Type 1 and Type 2) was sampled for physics Paper 2. No one area of content was over- represented more than any other area. The highest proportion of marks was allocated to questions which were concerned with energy transfer; a possible 33 marks out of 162 (20% of the total available). The contexts used for the questions on Paper 2 were mostly scientific contexts (Type 4) such as space, bodies travelling at speed, scientific equipment and circuit diagrams. Other contexts used were everyday and domestic settings such as electric kettles and TV sets.

Table 6.13
Content samples on Physics paper 2

Category (Type 1)	Question	Mark (162)
Circular motion	1	8
Forces	2	7
Energy transfer	3, 8a3, 8b, 8c	33
Electrical resistance	4, 8a1, 8a2,	17
Electric fields	5	8
Gravitational fields	6	10
Capacitance	7	7
Nuclear atom	9a, 9c	24
Liquids, solids and gases	9b	12
Mechanical waves	10a1, 10a2	6
Superposition of waves	10a3, 10b, 10c	27
Simple harmonic motion	10a4	3

On paper 2, candidates were requested to answer all questions on the paper; 7 short answer questions and 3 long answer. However within the three long answer questions (questions 8, 9 and 10), candidates were allowed some degree of choice, having to choose either section (a), (b) or (c) of each question to answer. Question 8(a) covered electrical resistance and 8(b) and 8(c) the transfer of energy. The question therefore allowed candidates to reject questions on electrical content if they so wished. Question 9(a) covered the nuclear atom, 9(b) liquids, solids and gases and 9(c) radioactive decay. The question therefore allowed candidates to either reject pressure or radioactivity. Question 10(a) covered mechanical waves, 10(b) the super position of sound waves and 10(c) the super position of light waves. Questions 10(a) and 10(c), demanded the calculation of quantity from a formula which the candidates had been asked to identify where as 10 (b) required no such calculation. Candidates could therefore choose not to do the calculation question. In terms of how males and females might perform on these questions, it was hypothesised that females would be more likely to reject the electrical content and radioactivity. However, the pressure option, question 9 (b), which might prove to be more attractive to female candidates only *appears* to be the easier option. Table 6.14 below shows those questions which indicated a significant or near significant difference in performance on physics paper 2.

Table 6.14
Physics items on Paper 2 indicating a significant or near significant differences in male and female mean scores

Question Category (Type 1)	Sex	No of Candidates Responding‡	Max. Poss Mark	Mean Score	Mean %	P< .05
2 Forces	male female	420 132	7	3.9 3.6	56.9 51.7	0.068(m)
9a Nuclear atom	male female	420 132	12	5.5 6.2	45.8 51.7	0.041(f)
9b Liquids/Solids	male female	202 50	12	4.4 5.4	36.7 45.2	0.024(f)
10a Mechanical waves	male female	420 132	12	6.3 7.1	52.3 59.3	0.003(f)
10b Super position of waves	male female	121 27	12	1.7 3.1	13.8 26.0	0.019(f)
10c Super position of waves	male female	331 108	12	4.1 4.8	34.2 40.0	0.044(f)

‡Total number of candidates sampled for this paper - 465 males and 145 females

From Table 6.14 we can see that there were no clear patterns of performance in favour of one gender or the other on Paper 2. The paper overall did not seem to benefit either male or female candidates disproportionately. Any significant differences which did occur on this paper were found to be generally in favour of females on those items which they were able to choose (questions 9a, 9b, 10a, 10b and 10c). Question 9a required candidates to draw, describe and calculate their answer from a given formulae. Questions 10a, 10b and 10c were also in a physics context which required candidates to either draw, explain or describe physical phenomena. Even though the number of items which showed a difference were small, the fact that the direction of the difference favoured females was the reversal of the direction expected. Females did slightly better on the pressure option (Q9b) although fewer of the female sub-group chose to answer this item.

Physics Paper 3

Table 6.15 below shows the range of content sampled on Paper 3. Again, no one area of content seemed to be over-represented more than any other area. The highest allocation of marks went to items on energy consumption, microscopic particles and amplifiers. The contexts used were again mostly scientific, but there was also the introduction of questions in medical contexts such as question about teeth enamel and ultrasonics for monitoring a foetus. Paper 3 is were students are assessed on topics studied during their course which relate physics to real life situations. The extent to which these contexts are within pupils everyday experiences or belong to 'physics land' is still debatable.

Table 6.15
Content samples on Physics paper P3

Category (Type 1) : Topic (Type2)	Question	Mark (126)
Forces: forces Forces: forces as vector quantity	1a 2a	2 5
Physical quantities	1b	2
Newtons Laws of Motion	1c, 4	6
Liquids and solids	3a, 3b	6
Pressure: rate of air flow Pressure: potential difference	5 6	4 5
Electrical resistance	7a, 7b	4
Energy conversion/consumption	8	18
Microscopic particles	9	18
Radio systems	10a	10
Optical fibre systems	10b	8
Ultrasonics in medicine	11a	11
Radioactive decay in medicine	11b	7
Operational amplifier: voltage	12	18

Section 1 of Paper 3 consists of a passage which candidates are obliged to read and then to answer seven compulsory, associated questions. The passage on the 1993 paper (See Appendix 6(x)) focuses on electromechanical similarities from the perspective of packing cases in a warehouse. The text is dense and has continuous references to physical quantities, terms and equations. The diagram that is presented to explain the function of air bearings is two dimensional. Most of the questions ask the candidates to draw, explain, discuss and sketch. It was hypothesised that such a passage would be more accessible to males than to females.

Section 2 of Paper 3 is the 'Topics' section of the paper with candidates required to answer questions on two topics out of a possible five (questions 8-12). The topics offered in the examination paper vary in their content. Topic A (Q8) is concerned with energy and its uses with a solar power station as the main stimulus. Topic D (Q11) is concerned with medical physics using as stimuli ultrasonics in the monitoring of the foetus and radioactive sodium for medical purposes. These two topics have a more non-physics, everyday content which is more likely favoured by females. Topic D, however, could be perceived as more difficult than other topics because of the amount of data, formula and diagrams included in the text. Topic A is notably different to the other topics as it does not require as many calculations within the questions as do questions set. This makes it more accessible to many students. The diagrams and style of response nevertheless were identified as those which appear to favour males and disadvantage females.

Topic B (Q9), is concerned with solid materials. It also requires fewer calculations and is more dependent on the application of physics concepts than use of mathematics. The question includes more data than Topic A, and focuses on the enamel of the tooth as a solid material. Success relies, in part, on the understanding of graphical representations. From the content, demands and styles of responses required for Topic C (Telecommunications, Q10, no diagram) and Topic E (Amplifiers and Analogue Electronics, Q12, circuit diagram) it was predicted that these two topic areas would perhaps favour males more than females. All questions on topics A to E carried equal marks. Table 6.16 below shows those questions from Paper 3 which were identified as having significant or near significant differences between males and females.

Table 6.16
Physics items on Paper 3 indicating a significant or near significant difference in male and female mean scores.

Question Category (Type1)	Sex	No of Candidates Responding‡	Max Poss Mark	Mean Score	Mean %	P< .05
4 Newton's laws of motion	male female	440 137	4	1.8 2.1	43.8 52.9	0.006(f)
7 Electrical resistance	male female	435 135	6	1.9 1.5	32.8 25.8	0.001(m)
9b Microscope particles	male female	211 83	6	1.7 2.4	28.3 39.4	0.000(f)
10a Radio systems	male female	117 32	10	4.5 3.5	44.9 35.0	0.034(m)

‡Total number of candidates sampled for this paper - 465 males and 145 females

As with the Paper 2, there were very few items showing significant differences in outcomes on Paper 3. The four questions/question parts which showed any significant differences were split equally between favouring females and males. Those questions favouring females dealt with content concerning Newton's laws of motion (Q4) which asked candidates to explain in their own words the stages by which equilibrium is re-established after changes in load, and concerning microscopic particles (Q9b) which used tooth enamel as it stimulus material. Candidates who opted for this question were asked to explain what they understood specific terms to mean. Those questions that favoured males considered electrical resistance via a electric circuit diagram (Q7) and radio systems (Q10a), again using a circuit diagram to illustrate the question.

Paper 4 of the physics syllabus is the practical paper. The examination board offers three versions of the paper to accommodate choice of practical experiments by centres. Not all centres do the same practical papers due to equipment and resource considerations. Also not all candidates within the same centres can sit the practical at the same time due to large numbers or limited resources. Alternative versions of the practical paper are, therefore, available for more than one sitting of the paper and for security reasons. A similar analysis of differences in mean score on practical tasks was carried out for the practical paper. This resulted in no significant differences occurring for any of the three versions of the practical paper.

As a result, the data on the physics papers were analysed in as much detail as those on the mathematics papers. From these analyses it was not found that any of the physics papers were favouring one gender or the other. Also it was not possible to isolate any one characteristic of the questions that might have been acting in favour of males or females. However, some of the items on which significant differences were found were in the same direction as that suggested through the review of the papers. For example, a few of the items which were concerned with electrical content and the use or drawing of circuit diagrams were shown to be in favour of males. This content area has been identified by teachers as an area where girls might have more difficulty than boys (see Chapter 8).

English literature papers

As mentioned at the beginning of the chapter, the English literature papers did not lend themselves to a similar type of analysis as the mathematics and physics papers due to the way that marks are holistically awarded. As such the English papers were reviewed qualitatively and an analysis of performance at a question level was conducted.

The English literature examination is made up of three papers; Paper 1 - Comprehension and Appreciation; Paper 3 - Major Authors and Paper 4 - Topics in literature, can be assessed either by final examination or by coursework. All questions on Paper 1 are compulsory and are related to the two pieces of text (prose and poetry) which are unseen and have to be critiqued by the candidate. The other two papers (Paper 3 and Paper 4) have 24 questions each, two questions on each of the 12 set texts from which candidates have to chose four questions (at least three have to be from separate texts). This means, in terms of the analysis, some questions were only answered by one or two candidates while other questions were answered by hundreds of candidates. It was interesting to note that even though a wide range of texts were available for study, the majority of candidates tended to answer questions associated with a narrow selection of texts. Tables 6.17, 6.18 and 6.19 below present a summary the analyses of results of males and females from the English literature papers. For Papers 1 and 3, the tables show those questions of interest for the coursework and non-coursework option groups.

Table 6.17
Analysis of gender differences in mean scores*
on Paper 1 - Comprehension/Appreciation

Question No	Non-Coursework Group			Coursework Group		
	Mean Score M (n‡)	Mean Score F (n‡)	p< 0.05	Mean Score M (n‡)	Mean Score F (n‡)	p< 0.05
Whole paper	10.77 (52)	10.55 (163)	0.66(f)	9.99 (149)	10.61 (344)	0.07(f)
Q1	5.25 (52)	5.01 (163)	0.41(m)	4.69 (149)	5.09 (344)	0.03(f)
Q2	5.52 (52)	5.52 (163)	0.99 (-)	5.30 (149)	5.52 (344)	0.23(f)

* Maximum mark on each question = 10; maximum for the paper = 20
‡Total number of candidates sampled for non-coursework option - 55 males and 165 females; for the coursework option - 155 males and 352 males

Table 6.18
Analysis of gender differences in mean scores* for particular questions on Paper 3 - Major Authors

Question No	Non-Coursework Group			Coursework Group		
	Mean Score M (n‡)	Mean Score F (n‡)	p< 0.05	Mean Score M (n‡)	Mean Score F (n‡)	p< 0.05
Whole paper	15.59 (51)	20.21 (160)	0.58(f)	19.07 (149)	20.35 (339)	0.07(f)
4b	6.50 (4)	4.92 (12)	0.06(m)	5.35 (20)	6.11 (28)	0.09(f)
5a	6.11 (9)	5.38 (24)	0.43(m)	4.48 (21)	5.49 (41)	0.06(f)
9b	6.50 (2)	4.06 (18)	0.90(m)	3.44 (16)	5.00 (39)	0.00(f)
10b	3.94 (10)	4.53 (38)	0.39(f)	3.48 (21)	4.61 (74)	0.04(f)

* Maximum mark on each question = 10; maximum for the whole paper = 40.
‡Total number of candidates sampled for non-coursework option - 55 males and 165 females; for the coursework option - 155 males and 352 males

Table 6.19
Questions producing significant or near significant gender differences in mean scores* in Paper 4 - Topics in Literature

Question No	Non-Coursework Group		
	Mean Score M (n‡)	Mean Score F (n‡)	p< 0.05
10b	7.25 (8)	6.10 (42)	0.06(m)
15a	5.8 (8)	4.0 (25)	0.02(m)

* Maximum mark on each question = 10; maximum for the whole paper = 40.
‡Total number of candidates sampled for non-coursework option - 55 males and 165 females; for the coursework option - 155 males and 352 males

There were very few differences in performance noted between males and females on the English literature items. This reflected the pattern of results from the maths and physics papers. Any differences that were found tended to favour females. This advantage was only slight and never at the level of the paper as a whole. Again some of the differences identified were linked to those texts were teachers felt that males might have more problems with than females such as works by Brontë and Shaw (Q10b and Q9b on Paper 3 respectively, see chapter 8 for a fuller discussion). There is little evidence to support a view that there was any inherent gender bias in the English literature papers investigated through this project.

Discussion

Given the patterns of performance at the subject level which were reviewed in Chapter 5, the differences in grades obtained by males and females, and the relationship identified in previous research between certain types of content and differential performance, greater differences in performance were expected to be found between males and females on the examination papers. However, as this chapter demonstrates, this was not the case. The number of differences which did arise were extremely small and less striking than had been anticipated. However, some of the differences that did occur, were in the direction which was expected from the reviews of the examination papers. In the mathematics papers, mechanics items showed significant differences generally in favour of males. In physics, items relating to electricity and electronics showed an advantage for males. Many of these outcomes were supported by teachers' perceptions of male and female performance in their subject via the questionnaires and case study interviews (see Chapter 8). Maths teachers tended to agree that males found mechanics less problematic than females and this pattern was reversed for statistics. Physics teachers were inclined to agree that electronics and electricity would be an area where females might have more problems than males. In trying to find explanations for the result patterns obtained in the analysis of examination papers in the light of the identified differences in grades shown in Chapter 5, two factors need to be considered. Firstly, the populations who take A Level examinations and secondly, the restricted number of similar types of items used in the analysis.

A level populations

The populations who take A Level examinations are not totally representative of the 18 year old cohort and neither are they of mixed ability (this is more a characteristic of the populations who take the GCSE). As Chapter 5 has suggested, entry patterns in A level subjects show majority and minority groupings by gender depending on the subject. In physics and mathematics the majority grouping is male (70-80% of the entry) and the minority grouping is female (20-30% of the entry). In English literature the groupings are reversed with females making up 70% of the entry in English Literature and males accounting for the other 30%. The minority groups in these subjects represent small groups of able, self-selecting students who, having chosen subjects less typical in relation to their gender, perform relatively well in relation to the majority entry group.

The issue of small, able groupings is also important. Tobin (1996) describes such minorities who do well in subjects that are less traditional for their gender as "voluntary minorities" (Tobin, *op. cit.* p. 119). Ogbu (1992), suggests that in terms of society in general, voluntary minorities are those groups of people who adopt the mainstream culture and who eventually succeed academically within the host culture. Tobin (*op. cit.*), applies these ideas to the culture of subjects and to the culture of science in particular. For Tobin, the culture of science is particularly male. He argues that in compulsory schooling, some females participate minimally in science (or particular areas of science), for the minimum amount of time possible. Many females see the culture of science as inappropriate for them and hence reject taking the subject any further post-16.

Some females, however, choose to study science through compulsory and post-compulsory schooling. Such females might be seen as voluntary minorities. They construct themselves as having an interest in science and are committed to learning and understanding the subject. Females electing to study science, in this case physics, are very capable academically and have selected to study the subject for a number of reasons, but mainly as a prerequisite for university (see Chapter 9). Tobin suggests that these females accept science as it is and despite the forces that exclude many females, they take on the culture of the subject and its associated curriculum and assessment preferences. They engage with the subject in such a way that they learn the cues and respond in ways that are dictated by the subject in order to be successful. Males who study English literature can also be viewed as voluntary minorities in this subject since they too must convince others of their place in the subject. In fact, males may be doing better in English literature at A level because they are academically able and have accepted the subject and its associated culture, curriculum and assessment.

Number of items analysed

The study only used one or two syllabuses in each subject. Hence, only a small number of papers were considered and as a result, only a small numbers of questions of a similar type. This made it difficult to obtain any clear patterns of sub-effects due to gender. In the APU surveys, established differences between the genders were accumulated through the testing of numerous items of a similar content or task type, given to children over a number of different occasions and in different orders on the test. With this current study, even though thousands of scripts were used, the number of similar items across the papers were few and the items too complex to obtain any systematic, measurable differences between the two genders.

If the analysis carried out for this research were to be repeated then it would be best carried out with a specific set of items and test population. Such a procedure would provide better and perhaps more conclusive evidence as to the impact of item characteristics on differential performance.

The data presented in this chapter shows very clearly the complex nature of performance at this phase of schooling. In trying to account for the gender differences in performance we have seen that we need to look beyond the examination papers for explanations. Differential performance is as much about the interaction of selective entries, self-selecting groups and the characteristics of the candidates who sit the examination, as the choice of subject combinations that students make, and the curriculum and assessment structure within the A level examination system.

Chapter 7

The Contribution Of Examination Components To Differential Performance

Introduction

This chapter addresses the relative contribution of the different examination components, especially coursework, to male and female performance. The following research question (vi) proposed in Chapter 4 is considered:

- *is there a differences between coursework and examination components within the A level examination in terms of the contribution that each makes to the overall award, if so does this contribute to differential performance?*

(Research question (vi), Chapter 4)

The analysis of the contribution that coursework and other components make to the final overall grade is not straightforward. As the chapter outlines, it involves the following: a consideration of how the component operates in the actual examination setting; how the candidates perform on the component (often indicated by the mean mark on the component), the spread of marks across the component, and how the marks awarded on the component correlate with the overall marks awarded for the whole examination. How we calculate the contribution of each component to the overall award, its 'achieved weight', is discussed in detail in this chapter.

In most educational examinations the final marks obtained by a candidate are simply the aggregated marks from each of the components of the examination. The final marks determine the final rank order of the candidates and hence the grades that they receive. All of the examination components will contribute in some way to the final result, but rarely will they all contribute to the same extent (Adams and Murphy, 1982). Where the distribution of marks on an examination component is small, the contribution that the component makes to the overall grade is less than that of a component where the distribution is bigger. The aim of the 'achieved weights' analysis presented in this chapter is to indicate which of the examination components have more influence on the final rank order, and hence the grade, and whether these components operate differentially for males and females.

The analysis presented in this chapter is concerned with whether females do better than males on coursework components and if so, is their better performance on coursework components the sole reason why they are doing well in examinations generally. Cresswell (1990) has shown that on coursework components, the spread of marks is generally smaller than the spread of marks on examination papers. This would suggest that coursework generally contributes less to the final grades of examination candidates than examination papers. This chapter will illustrate that even though females may actually be obtaining higher mean marks on coursework components than males, the smaller spread of marks on these components results in them making less contribution to the overall grade for both females and males. If females are doing better than males it is more likely to be the result of better performance on the examination papers.

I will argue that in considering whether examination components contribute differentially to the final rank order of males females, we need to consider both male/female differences in mean marks and mark distributions on components. Significant differences in mean marks between males and females will influence their final marks, as well as, the differences in the spread of their marks within examination components. Before the 'achieved weights' analysis is discussed in detail, the chapter outlines some of the broader issues surrounding coursework in relation to differential performance and the 'weightings' of examination components in general.

Coursework issues

Much of the research on coursework and its relationship to differential performance was reviewed in Chapter 3. I presented an official definition of coursework as a set of tasks administered and assessed (against national criteria) by the teacher and moderated by the examining body (SCAA 1995). The inclusion of coursework within high-status public examinations has had a chequered history (Tattersall, 1994) and its introduction into A level examination has been no less problematic. Prior to 1994, A level examinations had a mixture of coursework and non-coursework syllabuses; in English literature, syllabuses with as least 60% of the assessment given over to coursework were an attractive continuation to the 100% coursework assessment at GCSE. The introduction of modular A level syllabuses brought about the inclusion of larger proportions of coursework assessment. As well as reducing the amount of coursework available in syllabuses at GCSE, the majority of A level syllabuses are now restricted to coursework components worth a maximum of 20% of the total marks, with concessions of 30% in English literature and 40% in more practical subjects (e.g. design and technology, music and home economics, etc.).

There seems to continue to be a widespread perception that girls benefit most from coursework components in examinations (TES 1991a, 1991b). This perception was expressed by those teachers and students who were involved in the case studies in this research (see Chapters 8 and 9). Chapter 3 reviews the initial work carried out by Quinlan (1990) which showed some empirical support for this perception. His work demonstrated that there was a direct relationship between the improvement in girls' grades between 1985 and 1988 (between the GCE O level and the introduction of the GCSE) and the type and weighting of coursework in the GCSE syllabuses. Further investigation suggested that this was an over-simplification. Furthermore, the Differential Performance project showed, using an 'achieved weights' analysis, that girls' success in the GCSE was not solely based on their success in the coursework elements of the examination (Stobart *et al.* , 1992b).

The following questions regarding gender, coursework and performance on different components have been asked with regard to differential performance at A level:

- do females do relatively better in coursework than in examination papers?
- does coursework contribute disproportionately to the final grade?

The first question can be answered in terms of the differences in mean marks between males and females on coursework relative to the differences on the examination papers. If there is a large difference in mean marks between the two groups in coursework and not on the examinations then coursework may explain the difference in outcomes.
The contribution that coursework makes to the overall grade distribution of males and females is more complex. This issue needs to take into account the fact that males' and females' mean scores obscure very different patterns of mark distributions. As reviewed in Chapter 3, Cresswell's (1990) work shows that girls' coursework marks tend to be more bunched than boys. For example, two identical mean scores could be the result of very different spreads of marks (e.g. both 4, 4, 4 and 1, 2, 9 give a mean of 4). If coursework marks are bunched and examination marks spread more widely then as research has shown, it is the examination that is likely to determine pupils' rank order and their overall grade (Fowles, 1974; Hayden, 1991). Cresswell (*op. cit.*) found that examiners were less likely to use the full mark range when marking coursework than when marking examination papers. This, therefore, restricts the range of marks awarded on the coursework component as there is little discrimination between the marks of candidates. As the next section will illustrate, the smaller range (or spread) of marks effects the contribution that coursework components make to the overall grades. Rather, they generally contribute less to the overall rank order than was intended.

Issues of weighting

To add clarity to the data discussion that follows, a brief overview of the issues of weighting is given.

Hayden (1991) and Hayden, Richards and Thompson (1992) review the work carried out by different researchers in different contexts into the influence of different components on the final rank order of candidates. Hayden *et al.*, suggest that researchers have come to agree that the extent of the influence of one component on an aggregated total is determined "... by the spread of marks of that component with respect to others contributing to the same total, as well as the intercorrelation between various component distributions" (Hayden *et al.,* 1992, p. 3).

In order to arrive at the aggregated total on which examination grade boundaries are fixed, marks from various components are added together according to the specified 'weighting' of each component, i.e. "... the percentage of marks allocated to it as an indication of the relative importance in the overall framework of knowledge and skills being assessed" (Hayden, 1992, p. 3). These weightings have been built into components through the allocation of specified numbers of marks are referred to as the 'intended', (Adams and Murphy, 1982; Cresswell, 1987), 'planned' (Fowles, 1974) or 'nominal' (Wilmott and Hall, 1975) weights (or weightings). The extent to which the component actually influences the final result in practice is referred to as the 'achieved' (Adams and Murphy, *op. cit.*, Cresswell, *op. cit.*) or 'effective' (Fowles, *op. cit.* and Wilmott and Hall, *op. cit.*) weights (or weightings). Hayden (1991) suggests that:

> weightings apparently built into the components of an examination by the allocation to them of specified numbers of marks, will not necessarily be reflected in the extent to which each component affects the overall result.
>
> (Hayden, 1991; p. 126)

For the purposes of my discussion, I have adopted the use of 'intended' and 'achieved' weights as these tend to be the more common terms used in present practice (D'Arcy, 1997, personal communication).

When an examination is designed, each component receives an allocation of marks (its **intended** weight). If one paper is thought to be more important than another paper it will be allocated more marks. For example, a theory paper might be allocated 100 marks and practical paper 50 marks, making a total of 150 marks for the whole examination. The theory paper is seen as being twice as important as the practical paper by the allocation of twice as many marks and its intended weight is two-thirds of the overall marks (100/150) or 66.7%. The assumption here is that overall outcome will reflect this weighting by the theory paper contributing twice as much to the final rank order of candidates and hence their grades In practice, however, this is not the case. The above example is explored further in Figure 7.1 below to illustrate this point.

Figure 7.1
Example of a component's influence on the overall rank order of candidates.

Consider a theory paper (Paper 1) which has been allocated 100 marks and a practical paper (Paper 2) 50 marks (intended weightings are 66.7% and 33.3% respectively. Five candidates A, B, C, D and E obtain marks on Papers 1 and 2 as follows (the rank order of candidates are given in brackets):

Candidate	Paper 1(100)	Paper 2(50)	Total (150)
A	47 (5)	23 (1)	70 (1)
B	48 (4)	20 (2)	68 (2
C	49 (3)	17 (3)	66 (3)
D	50 (2)	14 (4)	64 (4)
E	51 (1)	11 (5)	62 (5)

In the above figure, the final rank order agrees exactly with that for Paper 2. Despite the fact that twice as many marks were available for Paper 1 and that the mark awarded on this paper were higher than on Paper 2. Paper 1 marks do not have an influence on the final rank order of candidates; the results on Paper 2 are in fact more influential in determining the final rank order of results. Paper 2, despite its smaller mark allocation, has the greater weight in practice. In figure 7.1, the rankings do not depend on the **magnitude** of the marks but on the gaps between successive candidates' marks, and thus the **dispersion** of the marks for each component. Consideration of the marks awarded above shows that the range of marks on Paper 1 is 5 (51-47) and on Paper 2 is 13 (23-11). The range of marks awarded did not reflect the relative mark allocations of the two papers. It is acknowledged that the above example is an extreme one, with the rank orders on the two papers completely inverted, but it serves to demonstrate the point that the intended weightings of examination components will not necessarily be reflected in the extent to which each component affects the overall results. The range of marks awarded on each component will also have an influence on the extent to which each component affects the overall outcome.

Hayden (1991) suggests that one implication of components not operating as intended in the actual examination, is that the validity of the examination is reduced; that is, the intended (and published) weightings of the various components do not operate as specified in the syllabuses. This may be misleading for teachers and students (and even examiners) who are guided by the intended weightings of components in their preparations for examinations yet the components do not operate as such in practice. One of the concerns of this present study is that not only may the validity of examinations be affected by components operating differently between their intended and the actual weighting in the overall result, but that this effect is differential for males and females: the various components of the examination actually operate differently for different groups of students, affecting their final rank order. It is in this respect that different components contribute to differential performance.

Comparing weights of examination components

The issue of the contribution of coursework and other components to the overall mark can be addressed through a comparison of the 'intended' and the 'achieved' weights of components. There have been a variety of methods put forward for calculating the achieved weights of examination components (see Hayden, 1991 for a review). Hayden suggests that from the variety of methods put forward there is clear evidence that the standard deviation (as a measure of spread) of any distribution is a main factor in determining the achieved weight of a component in an aggregated total. However various authors (referred to by Adams and Murphy, 1982) recognise that using the standard deviation as the only factor in calculating the achieved weight of a component is bound to lead to inaccuracies. The suggestion here, is that another factor, the correlation between the distributions contributing to the total mark must also be taken into consideration.

Fowles (1974), Adams and Murphy (1982) and Cresswell (1987) tend to share the view that not only should the spread of marks in each component be included in any calculation of the achieved weights of examination components but also the intercorrelations between individual component distributions and the total score. In her review of the intended and achieved weights of a selection of CSE examinations from nine different examination boards, Fowles (1974) suggests that a more accurate calculation of the achieved weights of components would include the intercorrelations between the individual component distributions. These intercorrelations are important in showing the extent to which components might be measuring similar skills and/or knowledge. Furthermore, a high correlation of a component with an overall score suggests that a candidate doing well on that component will do well in the subject overall.

The expression of the achieved weight of a component therefore, represents the proportion of the variance of the total marks attributable to that component:

> ... each component contributes to the variance of the total scores by an amount which is proportional to the standard deviation of its scores, modified by the degree of its correlation between those scores and the total scores. The achieved weight of each component is actually obtained directly from the product of its correlation with the total scores and the standard deviation of the component scores. The latter measure is scaled in accordance with the [intended] weight of the component.
>
> (Fowles, 1974, quoted in Hayden, 1991, p. 135).

This is the same calculation as put forward by Adams and Murphy (1982) who themselves refute the view that a definition of weighting based on standard deviation alone is acceptable; ignoring the effects of correlations between components will provide misleading results. The calculation put forward by Fowles (1974) and Adams and Murphy (1982), and the one used in this study, is shown in figure 7.2 below.

Figure 7.2
Formula to calculate the achieved weight of an examination component

$$W = \frac{SD(\text{paper}) * r(\text{paper score and total score})}{SD(\text{total score})}$$

W = weight of paper
SD = standard deviation
r = part-with-whole correlation (product moment)

This formula for achieved weights takes account of the spread of marks (the standard deviation, SD) and the correlation between component marks and the overall subject marks.

Achieved weights analysis on the 1993 ULEAC A level examinations

Prior to the Differential Performance project, the application of the achieved weights analysis had not previously been applied to male and female sub-groups in examinations (Stobart *et al.*, 1992b; Elwood, 1995). The use of it here with male and female sub-group performance at A level is again a new application of the method which complements that carried out at GCSE. It has highlighted some interesting results, particularly that the achieved weightings of components (the coursework component in particular) actually operated differently than intended for males and females. In the achieved weights analysis for this study the 1993 ULEAC English literature and physics syllabuses have been used. It is important to note that when considering the results given in this chapter, that since the achieved weights for any examination must total 100%, the achieved weight of any one component must be affected by, and affect that, of every other component in the same examination.

Achieved weights analysis: English literature

Table 7.1 shows the results of the achieved weights calculation for the A level English literature examination. In 1993, coursework had an intended weighting of 33.3% within this syllabus.

Table 7.1
Achieved weights of components in 1993 ULEAC A level English

Sex	Paper	Intended Weight	Max. Mark	Mean Mark	S.D.	r	Weight	Achieved Weight
Male	P1	33.3	40	20.4	6.62	0.79	0.331	33
	P3	33.3	40	20.0	7.05	0.83	0.370	37
	P4(C/W)	33.3	40	28.9	5.73	0.81	0.295	30
	Total	100	120	69.4	15.81			(100)
Female	P1	33.3	40	21.6	6.58	0.80	0.345	35
	P3	33.3	40	20.6	6.76	0.84	0.372	37
	P4(C/W)	33.3	40	29.6	5.39	0.80	0.283	28
	Total	100	120	71.8	15.25			(100)

weight = (SD(paper)*r)/SD(total); achieved weight = weight*100
SD = standard deviation; r = part-with-whole correlation (product moment)

From table 7.1 we can see that the difference between males' and females' mean marks on the coursework component was less than one mark (0.7 marks). A similar difference was found between the mean marks on Paper 3 and a difference of 1.6 marks on Paper 1. Both males and females scored mean marks on coursework that were roughly nine marks higher than the mean marks obtained on both examination papers. The standard deviations indicated that the marks for both written papers were well spread (a mean : standard deviation ratio of 3:1 would normally indicate good discrimination in an examination component). Both males' and females' marks on the coursework were bunched with females' marks slightly more so than males'. As noted above, this bunching of marks in coursework components is quite common (Cresswell, 1990; Hayden, 1991). This 'bunching' effect is likely to cause, through the resultingly low standard deviation, a reduced influence on the overall distributions with respect to that intended.

In this respect the achieved weights of the English literature examination suggested that the examination paper components contributed more to the overall subject rank order for males and for females than did the coursework component. For both genders the pattern of achieved weights was mainly similar: Paper 3 had a higher achieved weight for males and for females than the intended weight. This suggests that this paper has higher discrimination and accounted for more of the variance (37%) of the total marks for both groups than either Paper 1 or the coursework component (Paper 4). For males, the achieved weighting on Paper 1 was as the intended weight (33%) and the coursework component accounted for the smallest proportion of the variance of the total marks and was less than its intended weight (30% compared with an intended weight of 33.3%,). This pattern tended to repeat itself with the female group. The achieved weighting on Paper 1 for females is slightly higher than the intended weighting (35% compared to an intended weight of 33.3%) and again, the achieved weight on the coursework component was slightly less than intended and contributed the least to the overall grade, with an achieved weight of 28% as opposed to an intended 33%. It is interesting to note that the achieved weight for coursework was slightly less for females than for males (28% and 30% respectively), and as a result, contributed less to the females' overall grade. However these differences are extremely small and caution should be taken in drawing any comparisons between the groups.

From table 7.1 we can conclude that coursework for both males and females accounted for less of the variance in total scores than either of the examination papers, this is in line with other studies of the achieved weights of examination components (see Hayden 1991 for a full discussion). From this analysis there seems to be no compelling evidence that coursework contributes disproportionately to either males' or females' overall subject marks; candidates achieve higher mean marks on the coursework component but the discrimination is lower. In fact, for both genders, coursework does not contribute as much as was intended. In English literature, it is the students' performance on traditionally styled A level papers that has the greater influence on their overall grade.

Achieved weights analysis: physics

This finding was more evident in the A level physics achieved weights analysis. Table 7.2 illustrates the results of the achieved weights analysis for the A level physics examination. Table 7.2 shows that there was very little difference between mean marks on the components obtained by males and females. The largest difference between the mean marks of the two groups is on Paper 3 (the topics paper), which was roughly only 2 marks (in favour of males). Males had a slightly higher mean mark than females on Paper 1 (the multiple-choice paper), by just over one mark and the differences between the two groups on Paper 2 (the short and long item response paper) and on Paper 4 (the practical paper) were extremely small. The standard deviations indicate that marks on Papers 1 and 2 were well spread. Both males' and females' marks on Papers 3 and 4 were more bunched with those marks obtained by males being slightly more bunched than females.

Table 7.2
Achieved weights of components in 1993 ULEAC A level Physics

Sex	Paper	Intended Weight	Max. Mark	Mean Mark	S.D.	r	Weight	Achieved Weight
Male	P1 (M/C)	25	50	28.76	9.15	0.92	0.277	28
	P2	35	70	34.23	12.89	0.96	0.408	41
	P3	20	40	19.15	5.75	0.88	0.167	17
	P4(Prac)	20	40	21.62	5.83	0.79	0.152	15
	Total	100	200	103.99	30.29			(101)
Female	P1 (M/C)	25	50	27.48	8.42	0.91	0.260	26
	P2	35	70	34.66	12.44	0.96	0.406	41
	P3	20	40	19.39	5.83	0.89	0.177	18
	P4(Prac)	20	40	21.57	5.88	0.78	0.156	16
	Total	100	200	103.13	29.36			(101)

weight = (SD(paper)*r)/SD(total); achieved weight = weight*100
SD = standard deviation; r = part-with-whole correlation (product moment)

The above achieved weights analyses for physics suggests, again, that the more traditional-styled papers, the multiple-choice paper and the short and long item response paper were contributing more to the overall grades for both groups. All the achieved weightings for males and females on the four components showed the same pattern in comparison to the intended weightings. For both males and females 41% of the variance of the overall marks was accounted for by the short and long item response paper. The next most important paper was the multiple choice paper with achieved weightings for males and females of 28% and 26% respectively. Both these papers contributed more to the overall subject marks than was intended (25%). For both males and females the passage analysis/topics paper and the practical paper both contributed less to the overall grade than was intended; even slightly less in the case of males than in that of females.

Discussion

Applying the achieved weights analysis to the A level examinations has brought to the fore a number of interesting findings. The most important of these being that the achieved weightings of components, the coursework component in particular, operate differently for males and females.

These findings are critical, especially given the existing evidence relating to multiple-choice papers and differential performance (e.g. Newbold & Scanlon 1981, Murphy 1982, see Chapter 3 for a review) as well as the differential attention paid by males and females to different components such as coursework. In practice, the component parts of examinations showed achieved weightings that were not in line with those intended, thereby affecting their validity. Findings from the questionnaire survey of teachers (see Chapter 8) show a widespread perception that project work favours females more than males. There appears to be some dissonance between the contribution that coursework makes to the overall rank order of males and females and its intended contribution as perceived by teachers and students. From this analysis it is possible to conclude that the more traditionally styled A level papers are more likely to act as powerful discriminators at the subject level. The contribution of coursework is below that intended for both males and females and hence does not appear to contribute disproportionately to the final grade.

In reviewing teachers' questionnaire and interview responses (see Chapter 8), teachers tended to express a distinct view that females have more difficulty with examinations than do males. Reasons given by teachers to explain why females might find examinations more difficult were based on teachers' perceived anxieties of females towards failure and examination pressures. If teachers perceptions were to hold true, then such perceptions about female emotional characteristics would be likely to show erratic female performances on examination papers. However, the achieved weights analysis does not support these views. This suggests that there is some contradiction between how teachers perceive the possible performance of females in final examinations and how females actually perform.

Although, Adams and Murphy (1982) suggest that the above definition of achieved weights is "... an extremely satisfactory definition of achieved weights of examinations components and should now be adopted for general use..." (*ibid.*, p. 20) it lacks operational clarity. One objection is that such a definition of achieved weights only provides a measure of the contribution of the component mark to the variance in the aggregated marks. It does not record how many marks have been contributed to the aggregated marks, but merely records how much the marks that have been added from the component have contributed to the spread of the aggregated marks. For example, Adams and Murphy suggest that a component where all of the candidates have obtained the same mark will be said to have no weight because it will add no discrimination to the aggregated marks. However, it can be argued that the number of marks which candidates receive on such a component would be influential in determining the final grade.

Wiliam (1996, memo) has made a similar point in relation to the debate about gender and achieved weighting of coursework. Wiliam suggests that it is crucial to take account of the mean mark on the component in interpreting achieved weights of components for males and females separately. He illustrates his point succinctly by the use of an extreme case in which all girls achieve the maximum coursework mark and thus the achieved weight of that component for girls is zero (no discrimination, thus no achieved weight). Here we would have a paradoxical situation in which the component can be said to have no weight for girls (in that sense it is not important for them) but at the same time it would have an extremely important effect on their overall result. In this situation every single girl would be disadvantaged (in terms of her total score) more than every single boy by the removal of coursework, even though the achieved weight analysis would show a lack of importance of the component to the girls' overall rank order. Wiliam argues then, that the weight of the component should always be referred to in terms of its discriminatory weighting **and** its mark loading (the simplest measure of this being its mean mark).

The result of these suggestions is that any consideration of the contribution of the component to the final result of the examination should take account of both these measures. Adams and Murphy (1982) however suggest that the inclusion of mark loadings (i.e. the mean mark) in descriptions of the weighting of examination components may in most real situations be inappropriate. They suggest that mark loadings tell us very little on their own since they must be considered in relation to the maximum marks available and whether any mark adjustments had been carried out in the awarding procedure.

My perspective, in terms of applying an achieved weights analysis by gender to examination components, adopts a middle ground between that of Adams and Murphy (1982) and Wiliam (1996). While acknowledging the importance of Wiliam's point about zero weighted components having influence, it is never likely to happen in practice. Moreover, the slightest discrimination will render the component less influential in determining the candidate's rank order. In terms of considering the achieved weights of components by gender and based on the results of the above analysis, I argue that acknowledging the mean marks along with the spread of the marks is extremely helpful in assessing the contribution that components make to the final overall grades of males and females. Any significant differences in the mean marks obtained by males and females on the various components will have an influence on the final overall grade. However, if there are not large differences in the mean marks then it will be the spread of marks that becomes the important indicator. It is the differences in mean scores and the differences in spread of marks for males and females which compounds the situation.

From the discussions presented in this chapter, I would argue that an achieved weights analysis by gender contributes significantly to the debate concerning the influence of examination components on differential performance. Areas that require further explanation will need to focus on exactly **how** this may be the case. The achieved weights analysis has much to recommend itself, although it is not at first easily understood. It provides reliable information about how examination papers actually perform in practice and can perhaps help dispel misconceptions of how coursework operates within the syllabus. The strength of these findings opens the possibility for future discussions on how both teachers and students understand the real and perceived role of examination components.

Chapter 8

Teachers: Perceptions and Attitudes

Introduction

This chapter is concerned with data collected from teachers regarding male and female performance in A levels. The data collected comes from approximately 200 Heads of Department who responded to the subject questionnaires (Strand II of the research) and from those teachers who were interviewed in the case study visits (Strand III). In surveying a national sample of teachers and in talking in depth to a smaller sub-sample of them, the aim was to collect evidence which attempted to address those research questions concerned with teachers' attitudes to, and perceptions of, male and female ability in A level examinations and the relationship of these attitudes to performance.

The specific research questions were as follows:

- *what are the attitudes of teachers towards male and female performance and how do they perceive male/female ability at 18+?*
  (Research question (vii), see Chapter 4).
- *what are the school- /college -specific factors which serve to minimise gender related differences in performance while at the same time maximise individual pupils' achievements?*
  (Research question (ix), see Chapter 4)

The questionnaire was sent to a sample of schools/colleges who had opted to take a ULEAC syllabus in either English literature, mathematics and/or physics for the 1994 summer session. The questionnaire was in three parts. Part 1 was concerned with obtaining background information about the schools/colleges who responded to the questionnaire. Questions investigating school/college practice in A level provision and entry decisions asked respondents for information on how departments recruit A level candidates and whether or not positive discrimination is encouraged in gender-stereotyped subjects. Teachers were asked whether they were aware of gender-related differences in performance and, if so, did they analyse their results by gender. They were also asked whether or not their school/college is proactive about matters of equity in post-compulsory education.

Part 2 of the questionnaire was concerned with how teachers perceive students' attainment and participation in the subjects they choose. Respondents were asked to indicate their agreement or disagreement with a set of comparative statements. Teachers were presented with stereotypical notions about male and female performance and attitudes to gauge how teachers' own opinions might reflect these notions and whether their practice is influenced by them. Further questions in this section asked teachers to indicate areas of subject content with which males and females might experience some difficulty. The aim of this set of questions was to determine teachers' opinions on how they gauge students' attainment in the different content areas of their subjects and where they believe the problem/success areas lie for males and females.

Part 3 of the questionnaire asked teachers to supply A level examination entry and performance data for males and females in their school/college for a three year period. This section of the questionnaire was not always successfully completed. Hindsight suggests that too much information was being asked for that perhaps respondents did not have access to. Some schools/colleges attached photocopies of examination board printouts of results. In the end, this data was used as only one of several indicators in choosing appropriate schools for case study visits. The whole questionnaire was structured to gain information on whether or not teachers of A level students are aware of equity issues, in general, and gender differences in performance in their subjects in particular.

As part of the case study visits, semi-structured interviews were conducted with Heads of department. Nine such interviews were carried out - three in each subject. The interviews enabled teachers to expand on comments that they had made on the questionnaires. Teachers were also encouraged to comment freely on other aspects of the topic that were of interest to them; for example, the syllabuses they were using, approaches to teaching and learning, and their general opinions of male and female achievement at 18+. The range of data collected from the teachers through the survey and case study interviews provided information which complemented that collected through the examination scripts and national performance data.

This chapter deals with the main themes that emerged from both the questionnaire and interview data . Teachers' responses from these two research activities are integrated to illustrate the factors which teachers perceive as significant in explaining differential performance and participation at A level. In the first part of the chapter a general discussion of the background issues of the various institutions surveyed is presented. Then teachers' general attitudes and perceptions of differential performance at A level are examined. Following this, teachers' attitudes to gender differences in performance across various content areas of the three subjects are considered. Finally, the chapter concludes with a discussion of the general comments on these issues made by teachers in interview and on open-ended questions on the survey.

Throughout the discussions in this chapter it is essential to keep in mind that the data from the questionnaire allows for some degree of generalisability. However, similar assumptions cannot be made about the interview data, What is provided by the interview data is, however, a richness and clarity to teachers' views of the issues under discussion.

Background data

Centre and teacher sample

A total of 200 questionnaires were sent to Heads of Department for English Literature, Mathematics and Physics, 600 questionnaires in total. A response rate of 30% was obtained - 182 questionnaires; 52 English literature, 61 mathematics and 69 physics. Table 8.1 below outlines the distribution of centre types who responded to the questionnaire.

Table 8.1 Distribution of Proportion of each Centre Type in the Respondent Sample*

Subject	Secondary Comp. %	Secondary Selective %	Secondary Indep. %	6th Form College %	FE College %	Other‡ %
Eng. Lit. (n=52)	39	14	26	6	13	2
Maths (n=61)	33	18	29	17	3	-
Physics (n=69)	24	14	24	17	11	10

* Percentages are rounded to the nearest whole number, therefore they do not sum to 100.
‡ Other types of centre include tertiary colleges, secondary modern schools, FEFC funded institutions

The distribution of centre types who responded to the questionnaire was relatively similar to the actual distribution of centres who were offering ULEAC syllabuses in three subjects in 1994. English literature schools were the closest fit to the actual distribution of centres. The maths and physics samples had a slightly higher proportion of secondary comprehensives and independent schools in the respondent sample than are represented in the actual ULEAC population. The majority of schools who responded in maths and physics were LEA maintained schools whereas for English literature they were grant maintained schools. It was felt that the distribution of centres within the respondent sample was sufficiently representative of the random sample of schools/college initially surveyed.

In all three subjects, the majority of centres that responded were co-education centres. Table 8.2 below shows the proportion of centres by type of institution. The larger proportion of single-sex girls school for English literature reflects ULEAC's historical centre profile, with a large proportion of the centres who choose ULEAC syllabuses in this subject coming from selective and independent girls schools.

Table 8.2
Proportion (%) of centres within respondent sample by type of school

Subject	Co-ed %	Single-Sex Girls %	Single -Sex Boys %
Eng. Lit. (n=52)	61	27	12
Maths (n=61)	67	13	20
Physics (n=69)	67	16	16

Within the departments which responded to the questionnaire, there were clear gender differences in the ratio of male to female teachers employed and in the hierarchies of management within the departments. Table 8.3 below presents this data for each subject. The majority (85%) of those who responded classified themselves as Head of department. English departments had a higher proportion of female staff (68%) than either of the other two subjects. However, in terms of management of English departments, the ratio of male to female Heads of department was slightly more balanced than in maths or physics. Maths departments were predominantly male, with 58% of the departments overall being staffed by men, and a similar proportion responsible for teaching A level maths. Physics departments had the highest proportion of teachers who were male (69%) and the highest proportion of male teachers teaching the subject at A level (73%).

Table 8.3: Proportion of male and female teachers

Subject	Respondents* (%)		Department (%)		Teach A Level (%)	
	Male	Female	Male	Female	Male	Female
Eng. Lit.	40	60	32	68	28	71
Maths	73	27	58	42	59	41
Physics	77	23	69	31	73	27

*Number of respondents - Eng. Lit = 52; Maths = 61; Physics = 69

Centre-based issues

As outlined above, the first part of the questionnaire was concerned with obtaining school/college-level data regarding various issues such as whether schools/colleges analysed their public examination results by gender, whether institutions were actively engaged with equal opportunity issues and whether teachers used strategies within their own subjects to redress issues of gender imbalance in up-take and performance. The following sections outline some of the respondents' views on such issues.

Analysis of examination results

The majority of schools and colleges which responded to the questionnaire reported that their institution analysed examination results by gender (60%). These analyses were carried out both for A level and GCSE results. These institutions were less likely, however, to analyse their results either by age of student (16%) or by ethnic group (2%). Few schools reported analysing GNVQs by any of the categories outlined above. Heads of department commented that generally these analyses were carried out by senior management and that Heads of department were supplied with the information for departmental reviews. Many schools reported that the examination boards now supplied examination data broken down by gender as a matter of course. It was not clear from respondents what use they made of these analyses and whether receiving information on examination performance by gender influenced their departmental planning. In interview, teachers again raised doubts as to whether they felt that such data was useful, or how they would use it and indeed whether their school actually analysed data in this way:

> I don't actually know how I would use them. We tend to think all the way through of the boys and girls as individuals and I think the key about this subject is confidence and it really doesn't matter, it seems to me, whether they are boys or girls.
>
> (Male maths teacher)

> We've not done any of it in physics, it is not something that we're particularly interested in. I don't know whether other departments do it...I don't know how helpful that would be...I'm aware of the fact that there are fewer girls than boys opting to do physics, but I don't really know why that is...they [girls] are somehow attracted to the other subjects, or perceive physics in a slightly different way to the boys for some reason.
>
> (Male physics teacher)

Equal opportunities policies

Departmental and school commitment to policies of equal opportunities seemed to vary enormously from centre to centre. Not only did schools and colleges vary in their approach and involvement in the analyses of examination data and how this data might inform institutional or departmental development plans, they also showed wide variation in responding to questions about whether their school or college actively promoted equal opportunities at department or whole-school level. A few centres returned a copy of their school or departmental equal opportunities policies with their questionnaires. However other respondents acknowledged that their department or school was 'producing a document' or had 'not yet' formulated a policy on equal opportunities. Certain teachers elaborated on this point in interview:

> We don't have anything written down. Over the last few years however, everybody has agreed procedures but we haven't got them written down in hard and fast rules. We do have regular staff meetings and the thing is organic, it changes, gets modified from year to year...Gender issues is something that has cropped up...We are aware that girls do have to be encouraged.
>
> (Male maths teacher)

It was interesting to observe, however, that even though equal opportunities policies are written and circulated as official school or college literature, this did not necessarily mean the active implementation of such policies or the monitoring of such issues . Of those teachers who responded to the questionnaire, 88% of English literature teachers, 79% of physics teachers and 65% of maths teachers reported that their subject had never been the focus of a specific review in relation to gender. Also a number of teachers responded that they felt gender issues were not relevant to them, that they treated males and females as individuals and did not see gender necessarily as a factor in differences in performance. In a few cases in single-sex schools, teachers felt that addressing gender issues was simply " not applicable as the pupils are all girls [boys]", although such comments were counteracted by other teachers in such institutions through creating awareness of such issues amongst girls and boys.

Entry requirements and participation in A level study

The majority of teachers reported that they required a minimum of 5 A*-C passes at GCSE (occasionally four) for entry into the sixth form, with at least a grade C in the subjects to be studied at A level. For entry into maths or physics at A level, departments usually required that a student's A*-C pass at GCSE in either maths an/or double science should come from the higher tier.

Most departments tended to operate within whole school/college policies on entry requirements. This was certainly true of English literature departments who generally requested a grade C in English at GCSE. However, many English teachers noted that most of the students who study the subject at A level usually have higher GCSE grades. Also FE colleges were more likely to have open access policies across subjects, although these policies tended to be driven by funding issues rather than whether a minimum grade C was suitable for the study of A level. In several cases, however, maths and physics departments expressed a preference for B or A (even A*) grades, even if this was not the whole-school policy. The majority of departments who operated in this way were within grant maintained and independent schools. Teachers who operated such policies felt that proper advice to students should include discouraging C-grade students from taking the subject at A level as they were likely to encounter problems later on. These sentiments were expressed again in interview:

> We have actually said now that we recommend that they have an A or B at GCSE and preferably from the highest level. We discourage people from the intermediate level.
>
> (Female maths teacher)

> I make it very plain to any potential candidates that the wastage rates (with two Cs) would be high and I show them examples of what they would be expected to do
>
> (Male physics teacher)

Teachers may be giving such advice to help students make appropriate choices benefiting them in the long run. However, teachers' perceptions of what students can do may influence the advice that they give and the messages they convey about whether certain subjects are suitable for certain groups of students and whether students are likely to be successful in the subjects they wish to study. Teachers' perceptions of male and female performance have already been seen to influence decisions about entry into certain subjects and levels of examination (Stobart *et al.,* 1992b, reviewed in Chapter 3) which has negative consequences for students taking the subjects further.

Teachers were also asked whether they had considered taking (or had taken) any steps to ensure a gender balanced entry for their subject. In many instances teachers had declined to comment but clearly for some, these issues had been discussed and thought about within their departments. It is interesting to note that only 25% of English literature respondents commented on any such steps taken, whereas 50% of mathematics respondents and 63% of physics respondents commented positively.

Several teachers commented that they had thought about positive discrimination policies in their subjects but that such policies were not realistic and indeed, in one case, that such an approach would be "patronising towards women". Teachers commented that students were more likely to have chosen their subjects for A level well in advance and that the advice given to students was generally to take a balanced course of study in the 6th form. Teachers did talk of targeting students lower down the school and of presenting their subjects in a neutral light.

Teachers did suggest however, that a balance of male and female teachers within a department and the gender of the teacher teaching a particular course might well contribute to the image that a subject has and how students perceive this subject. In interview, physics teachers suggested that many female students might be discouraged by what was perceived to be a 'male' subject and that in English, male students might be put of by the 'touchy-feely' image that the subject has. The difficulty of recruiting same-sex teachers for females in physics and maths and for males in English was acknowledged as possibly being a problem area and one where teachers might consider positive discrimination:

> Yes I think in this school they do perceive [English] as a female thing...I felt that the department of six staff with one man...and five women, that there is something in this for kids, you know the maths department is not entirely female, the science department isn't, so the actual teaching staff, in terms of gender, do make a difference.
>
> (Female English teacher)

A number of English literature teachers voiced concern about all-female departments putting male students off doing the subject at A level and were conscious of maintaining interest among the boys in GCSE classes. In maths, teachers were conscious of the gender imbalances in the choice of maths A level studied, with fewer girls inclined to take mechanics. In a few cases, schools had introduced statistics courses to attract more females to take A level maths and had made sure that female staff were involved in the teaching of all types of maths at the higher levels. However, certain teachers were still convinced that maths at A level was not as appealing to girls as to boys.

In physics, teachers seemed to have taken seriously the low numbers of females opting for this subject and had made considerable efforts to encourage girls to take physics. Many teachers mentioned early intervention, the targeting of girls in the top set science at GCSE and giving girls extra encouragement when thinking about their A level choices. Teachers had used 'taster courses' for Y10 and Y11 girls. However, teachers were not fully convinced of the success of these activities in making girls opt for physics.

Teachers were also asked to comment on any personal teaching or classroom strategies which they used to address gender issues within the subject or the classroom. Of those who did comment, a variety of approaches emerged which were common across the three subjects. There was a general concern that text books and teaching materials should promote non-sexist language and illustrations and that examples used in the teaching of subject content included both males and females in various non-stereotypical roles and activities. Teachers also actively reviewed seating arrangements aiming to have boys and girls evenly distributed around the classroom, used mixed groups in practicals or discussion sessions and questioning techniques which targeted all students in the group. Teachers were aware of the possibility of boys dominating discussion and were keen to give both genders equal time and opportunity to contribute.

In English literature, some teachers commented on the use of a balanced series of texts both from male and female authors and with male and female protagonists, the use of feminist critiques as discussion material and whole class discussion of gender issues within the texts. Teachers also commented that they had introduced the use of IT and had changed the nature of some of the coursework tasks to help encourage boys in English. In maths and physics, the perceived relative lack of confidence of girls was addressed and a number of teachers reported that they actively sought to encourage girls in these subjects by introducing co-operative forms of learning and extra tutorial support which, in physics, often took the form of making sure that girls came into contact with apparatus and machinery such as car jacks and electronic circuits. Introducing coursework into the subject was seen as a way to encourage girls as well as offering a choice of study topics which related maths and physics to social and historical contexts.

Even with a number of teachers reporting these very positive strategies to address gender issues and improve the imbalance of male and female participation within their subject, there were still many teachers who did not comment at all or who felt that gender differences did not need to be addressed either amongst their students or within their subject. For example, one teacher commented that " in my view, physics is not a gender based subject so attempting to address these issues is irrelevant".

Teachers' perceptions of, and attitudes to, differential performance at A level

Part 2 of the questionnaire was separated into two sections. The first section (A(i)) was concerned with collecting information regarding teachers' perceptions of, and attitudes to, male and female participation and performance at A level. The questions used in this section were common to all three subjects and allowed for cross-subject comparisons to be made.

Respondents on Section A(i) of the questionnaire were presented with 18 attitudinal statements which covered four areas of interest: general attitudes; assessment and examinations; approaches to learning and general subject issues. Respondents were asked to what extent they agreed or disagreed with the statements presented. The rating scale used was a common Lickert scale (Oppenheim, 1992) with 5 points ranging from 1= 'strongly disagree' to 5 = 'strongly agree', etc. In the tables below the categories 'strongly agree' and 'agree' have been conflated as have those of 'strongly disagree' and 'disagree'. Also the percentage of respondents in each category presented, is rounded to the nearest whole number, hence not all percentages will sum to 100. For reasons of presentation, the statements in the tables which follow have been summarised. It is important to note that they are comparative statements which compare one gender with the other.

From the responses given it was seen that there were certain items on which teachers from all three subjects had similar attitudes. Where there were differences of opinion, however, between teachers it was the **degree** of the difference which was of interest. For example, teachers from all three subjects disagreed that males were more enthusiastic about their subject, but this was felt more strongly by English teachers and maths teachers than it was by physics teachers. The following sections discuss the findings from the three subjects across the four areas of interest outlined above.

General attitudes

Table 8.4 presents the data on teachers' general attitudes to male and female involvement in their subject. Teachers across the three subjects tended to disagree that females are more confident of succeeding than males, with physics and maths teachers disagreeing more strongly than English teachers. Teachers from all three subjects disagreed, to the same extent, that males were more anxious about failure than females. Opinion varied as to whether males were more enthusiastic about the subjects. English teachers overwhelmingly disagreed with this statement, whereas maths and physics teachers disagreed to a lesser extent. In fact physics teachers tended to agree quite strongly that males were more enthusiastic about their subject. English teachers were neutral about whether they thought females enjoyed their subject more than males (only a 4% difference between those who agreed or disagreed). Maths and physics teachers seemed more decided on this point with 52% of maths teachers and 41% of physics teachers disagreeing that females enjoy their subject more than males.

Teachers across all three subjects tended to disagree that males might find the subject more difficult as the course progresses; maths and English teachers disagreed more than physics teachers. The majority of teachers across all three subjects rejected the statement that females were more likely to lose interest in the subject; the degree of rejection being strongest amongst English teachers.

Table 8.4
Percentage ratings* of teachers' perceptions of students general attitudes

Statement	% Agree			% Disagree			Difference %(Agree-Disagree)		
	E	M	P	E	M	P.	E	M	P
Females more confident of succeeding	21	2	2	56	71	78	-35	-69	-76
Males more anxious about failure	10	5	3	71	72	71	-61	-67	-68
Males more enthusiastic about (subject)	2	14	47	71	43	29	-69	-29	18
Females enjoy (subject) more	41	7	2	37	52	41	4	-45	-39
Males more likely to find (subject) increases in difficulty	16	3	6	59	59	46	-43	-56	-40
Females more likely to lose interest	2	5	9	87	66	52	-85	-61	-43

*Ratings may not necessarily sum 100 due to rounding up
E = English literature; M= maths; P = physics

Assessment and examinations

In all three subjects teachers similarly disagreed that males more than females were adversely affected by final examinations. The strongest rejection came from English teachers with 83% of respondents disagreeing with this statement (see table 8.5 below). More maths and physics teachers than English teachers disagreed that females would get higher exam grades. Even though females who choose to do maths and physics at A level have been shown to be very able students, they were not seen as more likely to do better than their male counterparts. In terms of more class-based assessment teachers from all three subjects seemed to agree that project work favours females, especially in maths and English literature, and that males were less likely to do well in class-based assessments. This data suggests that teachers perceive examinations and class-based assessments to affect males and females differently with males more likely to do better in the final examinations and females more likely to do better in coursework. However, this perception is only marginally supported by the achieved weights analysis outlined in Chapter 7.

Table 8.5
Percentage ratings* of teachers' perceptions of assessment and examinations

Statement	% Agree			% Disagree			Difference % (Agree-Disagree)		
	E	M	P	E	M	P	E	M	P
Males more adversely affected by exams	4	2	8	83	69	60	-79	-67	-52
Females more likely to get higher exam grades	41	18	15	29	46	36	12	-28	-21
Males more likely to get higher test scores	4	7	11	58	54	46	-54	-47	-35
Project work favours females	52	64	33	20	12	21	32	52	12

*Ratings may not necessarily sum 100 due to rounding up
E = English literature; M= maths; P = physics

Approaches to learning

More physics teachers than maths or English teachers agreed that males were more likely to join in class discussions (see table 8.6 below). This response may be influenced by the fact that many of the departments surveyed had small numbers of girls in the A level physics groups, often only 2 or 3 girls per group. However, English teachers often had similar small numbers of males in their classes but they were seen to be more likely to join in discussions. More than a third of all teachers agreed that females preferred working with others, although in the case of English literature as many teachers disagreed with this statement as agreed with it. An overwhelming majority of teachers disagreed that males were more concerned with presentation than were females. In fact no maths teachers agreed with this statement at all. Opinion was similarly skewed as to whether males were more conscientious than females. No English teachers or maths teachers agreed with this statement at all and the majority of teachers from all three subjects tended to disagree with the statement.

Table 8.6
Percentage ratings* of teachers' perceptions of approaches to learning

Statement	% Agree			% Disagree			Difference %(Agree-Disagree)		
	E	M	P	E	M	P	E	M	P
Males are more likely to join discussions	48	48	62	37	32	15	11	16	47
Females are more confident verbally	14	7	11	50	53	65	-36	-46	-54
Females are better at working with others	39	34	36	37	17	21	2	17	15
Males more concerned with presentation	2	-	3	87	98	88	-85	-98	-85
Males are more conscientious	-	-	2	85	82	76	-85	-82	-74

*Ratings may not necessarily sum 100 due to rounding up
E = English literature; M= maths; P = physics

General subject issues

The majority of English teachers (44%) agreed that females were more likely to consider the social relevance of the subject whereas the majority of maths teachers disagreed with this statement (see table 8.7 below). Physics teachers were more neutral about this aspect of the subject. In physics and maths, teachers strongly agreed that males were more likely to study these subjects in higher education and that females were less likely to pursue careers were these subjects are an important element. The opposite was true for English for both these statements. These responses tend to reflect quite common, if not stereotypical, beliefs about subjects and gender participation and would seem to conflict with teachers' efforts to redress gender imbalances in their subject as indicated from early comments.

Table 8.7
Percentage ratings* of teachers' perceptions of general subject issues

Statement	% Agree			% Disagree			Difference %(Agree-Disagree)		
	E	M	P	E	M	P	E	M	P
Females more likely to consider social relevance of (subject)	44	-	19	15	35	28	29	-35	-9
Males more likely to study subject in HE	4	60	70	65	21	16	-61	39	54
Females more likely to consider a career where (subject) is important	58	2	2	14	69	76	44	-67	-74

*Ratings may not necessarily sum 100 due to rounding up
E = English literature; M= maths; P = physics

Summary: individual subjects

English

The data presented in the above tables seems to represent the English teachers as more balanced in their perceptions of male and female ability. However, there were certain items on which they offered traditional opinions of gender differences in students' attitudes, abilities and performance. They tended to suggest that males were more confident of succeeding in English than were females, and in expressing themselves verbally within classroom discussion. Males were also more likely to take part in classroom discussions, find the subject less difficult as the course progresses and were perceived to be less anxious about failure. English teachers also suggested that males were less negatively affected by external examinations but that females would get higher grades in final examinations. Teachers also perceived females to be better at project work and to have the edge in classroom-based assessments. Females were also perceived to enjoy the subject more, be more enthusiastic about English and to be less likely to lose interest as the course progresses. Females were more conscientious and neater in the presentation of work as well seeing the social relevance of English. Females were perceived as more likely to go on and study English further.

Maths

Maths teachers tended to show more negative perceptions of female involvement in mathematics. Maths teachers tended to perceive females as less confident of succeeding in maths than males, as not enjoying the subject more than males, more likely to lose interest as the course progresses and less likely to consider a career where maths was an important element. Females were also seen as less likely to get higher grades in examinations, less confident of expressing their ideas verbally and less likely than males to consider the social relevance of the subject. In terms of any positive perceptions of females in A level maths, teachers did perceived them to have the edge when it came to working in groups, performance in class tests and the neat and conscientious presentation of work. They were also seen to benefit more from project work.

Males on the other hand were perceived in a much more positive light by their teachers. They were overwhelmingly perceived as less anxious about failure in maths, unlikely to find the course more difficult as it progresses and less adversely affected by final examinations. Males were also perceived as more likely to join in classroom discussions and more likely to study the subject beyond A level. However, they were not seen as necessarily being more enthusiastic about the subject than females.

Physics

Physics teachers were also, like their maths counterparts, more likely to perceive the involvement of females in physics in a negative way. Teachers in this subject were much more inclined to see females as less confident of succeeding in physics than males. They were also seen to be less likely to enjoy the subject more and less likely to get higher grades in examinations than males. Females were also perceived as less confident in verbally expressing their ideas yet more likely to keep interest in the subject than their male counterparts. Males were again perceived as less anxious about failure, less likely to find the subject more difficult as it progresses and expected to be less affected by final examinations. They were also seen to be more inclined to contribute to discussions and to study the subject beyond A level. Physics was the only subject, out of the three, in which teachers thought that males enjoyed the subject more than females. They also rejected, along with the teachers of maths and English literature, that males were more concerned with presentation and neatness or were more conscientious than females about their work.

Teachers' attitudes to gender differences in performance on subject content

The second section of Part 2 of the questionnaire (A(ii)) was concerned with teachers' perceptions of male and female attributes in certain areas of the syllabus. In the first set of questions in this section, teachers were asked to indicate whether they felt there was any difference between the levels of confidence, ability, motivation and enjoyment in the different content areas amongst males and females. They were presented with a five point scale which asked them, across a continuum, whether they felt that males or females were more or less confident, motivated, able, etc. The second set of questions asked respondents if there where any areas of the syllabus were they felt that either males or females might have more or less difficulty. The five point scale used here ranged from 'much more difficult for males' through to 'much more difficult for females'. The final set of questions in this section asked respondents to rate whether they felt that males or females do better on the various assessment objectives and techniques which were part of the syllabus. Again a five point scale was used which ranged from 'males do much better' on a particular assessment/objective through to 'females do much better'.

Teachers' responses to these questions identified few differences between males and females in the various content areas or assessment objectives of the syllabus. In comparison with the differences indicated on the general attitude section outlined above, teachers were more likely to opt for a neutral response to the specific questions regarding the more detailed areas of the syllabus. However, what is interesting from the data obtained, is that in the few cases where teachers within a subject did indicate a difference between males and females, these differences were in the same direction.
For example, even though the majority of maths teachers were neutral about whether there were differences in motivation between males and females across the different areas syllabuses, those that indicated a difference tended to agree that males were more motivated in mechanics and females more motivated in statistics. The responses to section A(ii) of the questionnaire are explored below. Each subject is presented individually.

English literature: general attributes

Table 8.8 presents the data relating to teachers' perceptions of male and female attributes in the different areas of the English literature syllabus: Comprehension/Appreciation; Major Authors, Topics in Literature (examination paper) and Topics in Literature (coursework).

Table 8.8
Percentage ratings (%) of teachers' perceptions of male and female attributes in the different syllabus areas (n=52)

Attribute	Compre-hension/ Appreciation			Major Authors			Topics in Literature (Exam)			Topics in Literature (Coursework)		
	M	No diff	F	M	No diff	F	M	No diff	F	M	No diff	F
Confidence	47	35	18	32	48	20	31	54	15	19	60	21
Ability	8	80	12	-	76	24	-	78	22	-	57	43
Motivation	4	52	44	-	53	47	-	64	36	-	43	57
Enjoyment	12	68	20	-	74	26	2	74	24	-	66	34

M=males more confident, able, etc; F=females more confident, able, etc.;
No diff = teachers' perceptions that there were no differences in the attributes between males and females

Table 8.8 shows that those teachers who indicated a difference between males and females in the different attributes, tended to agree that males were more confident than females across three elements of the syllabus. The only exception to this was teachers' belief that females were slightly more confident in the coursework element. However, in this instance the difference in percentage ratings was small.

This finding reflects those more general attitudes among English literature teachers outlined above which indicated that they felt males to be more confident in the subject than females. However, confidence was the only attribute were English literature teachers felt that males had an advantage. Teachers indicated that girls were more motivated, able and showed more enjoyment in all four areas of the syllabus. The differences of opinion in ability and enjoyment in Comprehension/Appreciation were only slight but they tended to be in favour of females (4% and 8% respectively). Again, coursework was shown to be an area were teachers felt that females had a definite advantage. No teachers felt that males were more able, motivated or showed more enjoyment than females in this area; this pattern was repeated in the Major Authors category.

English literature: authors and texts

Teachers were asked to indicate whether they felt that certain authors or particular texts, set as part of the syllabus, might be more difficult for males or for females. On this set of questions teachers were also generally inclined to take a neutral stance, indicating that most authors or texts were neither more nor less difficult for males or females(see table 8.9). However, on certain texts, teachers did indicate that some differences might occur; the majority of the differences tending to show that males might have more difficulty with certain texts than females. Teachers felt very strongly that women poets posed more difficulty for males than for females with 63% of respondents indicating this opinion and no respondents indicating that this type of poetry might be more difficult for females. Other works in which teachers perceived males to have some difficulty were novels by Brontë and Woolf, poetry by Keats and Shakespearean comedies. Similar thoughts were expressed by teachers in interview:

> There are some female authors who write for everybody. I think that everybody likes Wuthering Heights, but not everybody can take Jane Eyre. It's totally female in its thought patterns...goes down like a ton of bricks with the boys.
>
> (Female English teacher)

> ...the prescribed texts...have caused more problems for the boys...because reading Jane Eyre or Tess of the D'Urbevilles is probably going to be less accessible than reading Of Mice and Men, which at least has male protagonists
>
> (Female English teacher)

Only on Shakespearean histories did teachers feel strongly that females might find these texts more difficult with 34% of teachers indicating this opinion. On other texts, such as Shakespearean tragedies, poetry by Chaucer or Heaney and other works by Shaw and Naipaul, the differences between males and females indicated were small.

Table 8.9
Percentage ratings of teachers' perceptions of male and female difficulty with authors and texts (n=52)

Authors/Texts	More Difficult for Males %	No Difference %	More Difficult for Females %
Shakespeare: Comedies	27	73	-
Shakespeare: Tragedies	4	90	6
Shakespeare: Histories	2	64	34
Poetry: Chaucer	6	90	4
Poetry: Keats	27	73	-
Poetry: Women Poets	63	37	-
Poetry: Heaney	4	83	13
Plays: Shaw	2	89	9
Novels: Brontë	43	57	-
Novels: Woolf	42	58	-
Novels: Naipaul	2	93	5

English literature: types of coursework

Table 8.10
Percentage ratings of teachers' perceptions of male and female ability in elements of coursework assessment (n=52)

Types of Coursework	Males do better %	No Difference %	Females do better %
Sustained study (4,000 words max.)	-	44	56
Short pieces (2,000 words max.)	18	49	33
Short Stories	-	72	28
Scripts (TV or Radio)	4	85	11

Teachers generally felt that females were better at the majority of coursework elements (see table 8.10). They especially agreed that females were better at sustained writing (56%) and short story writing (28%). The differences between males and females in writing short pieces and radio or TV scripts were smaller but still in favour of females. This data is supported by that in table 8.8, were teachers indicated generally that females were more confident, motivated, able and showed more enjoyment in English literature coursework.

English literature: assessment objectives

While teachers felt that there was no difference in male and female performance in relation to many of the assessment objectives outlined in table 8.11 below, the level of decisiveness varied from 90% agreement that 'understanding differences between literary genres' presented few differential problems, to 43% who were of the opinion that neither males or females found 'participating in drama and/or role play' difficult. However, on this latter objective, 40% of respondents indicated that 'participating in drama and role play' was more difficult for males as was 'expressing personal responses to texts'.

Table 8.11
Percentage ratings of teachers' perceptions of male and female difficulty in areas of the syllabus (n=52)

Assessment objectives	More Difficult for Males %	No Difference %	More Difficult for Females %
Expressing personal responses to texts	38	58	6
Appropriate punctuation, spelling and/or grammar	26	72	2
Participating in drama and/or role play	40	43	17
Essay writing	18	78	4
Understanding differences between literary genres	10	90	-
Ability to sustain and marshal a coherent argument	8	76	16
Appreciation of literary form and content	14	80	6
Comprehension and appreciation of unseen poetry/prose	15	77	8
Writing under timed conditions	14	54	32
Participating in group discussions about texts	20	44	36
Analysis of literary texts	10	86	4

Of those teachers who did express opinions about differences between females and males on these areas of the syllabus, more assessment objectives were seen to be difficult for males: for example, 'use of appropriate punctuation, spelling and grammar'; 'essay writing' and 'understanding differences between literary genres'. The two areas which were shown to be of greater difficulty for girls were 'writing under timed conditions' and 'participating in group discussion about texts' with almost a third of teachers indicating this in each case.

Maths: general attributes

Maths teachers were also asked to indicate on a five point scale whether they felt that males or females were more confident, motivated and able in maths and which group tended to enjoy the subject more. Table 8.12 below shows the percentage ratings of teachers under each of the syllabus areas.

Table 8.12
Percentage ratings (%) of teachers' perceptions of male and female attributes in the different syllabus areas (n=61)

Attribute	Pure Maths			Mechanics			Statistics		
	M	No diff	F	M	No diff	F	M	No diff	F
Confidence	29	69	2	73	27	-	6	67	27
Ability	-	96	4	33	65	2	-	78	22
Motivation	6	71	23	39	53	8	2	66	42
Enjoyment	8	84	8	56	44	-	4	56	40

M=males more confident, able, etc; F=females more confident, able, etc.;
No diff = teachers' perceptions that there were no differences in the attributes between males and females

Teachers were reluctant to ascribe differences to males and females in the different areas of the maths syllabus. However, from those teachers who did indicate differences some interesting patterns emerged. In pure maths, teachers were of the opinion that there was little difference between males and females in enjoyment of this area of maths or in their abilities, although 4% of teachers did feel that females were perhaps slightly better in pure maths than their male counterparts. Also, over a quarter of teachers thought that males were more confident in this area whereas almost a quarter felt that females were more motivated. In mechanics and statistics, however, the differences indicated were more polarised. In mechanics, males were seen as decidedly more confident (73% of respondents), more able (33% of respondents) and more motivated (39% of respondents). They were also perceived to enjoy this area of the syllabus more (56%). In statistics, on the other hand, females were perceived to be slightly more confident (27%), more motivated (42%), more able (22%) and to enjoy statistics more (40%). These ratings may reflect the fact that in most schools surveyed, teaching groups in statistics and mechanics were predominantly female and male respectively. The pattern amongst maths teachers then, was one in which they perceived different elements within the syllabus as affecting male and female students in different ways.

Maths: syllabus areas

The majority of maths teachers felt that there were no differences in many of the syllabus area outlined in table 8.13 below. However, mechanics and statistics were again highlighted as extremes, with over 50% of teachers indicating that they think mechanics to be more difficult for girls and 35% of teachers thinking the same for males in statistics. In interview, one maths teacher expanded as to why males were perceived to be doing better than females in mechanics:

> There is quite a bit of visualising it and having a feel for it in mechanics...and they've [boys] got a feel for it... for what is going on with a body if it is spinning or...accelerating, or a mixture of the two...that goes an awful long way.
>
> (Male maths teacher)

These perceptions would seem to be important given the skewed entry patterns for males and females in these areas of mathematics.

Table 8.13
Percentage ratings of teachers perceptions of male and female difficulty in areas of the syllabus (n=61)

Area of Syllabus	More Difficult for Males %	No Difference %	More Difficult for Females %
Mechanics	-	43	57
Descriptive statistics	35	65	-
Vectors	2	76	22
Functions and Cartesian geometry	2	92	6
Further algebra	6	86	8
Trigonometry	-	98	2
Calculus	4	94	2
Probability	12	84	4
Complex numbers	2	98	-
Sequences, series and limits	2	96	2

Maths: assessment objectives

Table 8.14
Percentage ratings of teachers' perceptions of male and female achievement in the syllabus assessment objectives (n=61)

Assessment Objectives	Males do better %	No Difference %	Females do better %
Setting out work in clear and logical form	4	23	73
Organisation and presentation of information	2	18	80
Interpretation and evaluation of data	6	64	30
Applying and interpreting knowledge	28	62	10
Making logical deductions	26	67	7
Generalisation	20	74	6

From the data presented in table 8.14 above teachers were shown to agree that the 'setting out of work in clear and logical form' as well as the 'organisation and presentation of information' were areas in which females did better. This finding supports teachers' more general attitudes to male and female participation in maths (see table 8.6 above). Teachers were also inclined to suggest that 'interpretation and evaluation of data' is another assessment objective in which females were likely to do better, although to a lesser extent. Males were perceived to be more likely to do better on those higher order objectives of 'applying and interpreting knowledge', 'making logical deductions' and 'generalisation'.

Physics: general attributes

The physics syllabus was not categorised into separate components like that of English literature and mathematics. There were a number of topics covered in the syllabus which were assessed across the four papers simultaneously. Therefore, in this part of the questionnaire, teachers were asked about their perceptions of students' attributes in the subject as a whole. The findings, presented in table 8.15 below, reflect those obtained from responses to the more general attitude questions outlined in tables 8.4 to 8.7 above.

Table 8.15
Percentage ratings (%) of teachers' perceptions of
male and female attributes in physics (n=69)

in Attribute	Males Greater	No Difference	Females Greater
Confidence	74	24	2
Ability	14	84	2
Motivation	6	56	38
Enjoyment	15	76	9

M=males more confident, able, etc; F=females more confident, able, etc.;
No diff = teachers' perceptions that there were no differences in the attributes between males and females

Physics teachers agreed quite strongly that males had much greater confidence in the subject than females. However, 38% of teachers felt that females were better motivated in physics. There was very little difference identified by teachers in students' ability and enjoyment of the subject.

Physics: syllabus areas

Table 8.16
Percentage ratings of teachers perceptions of male and female difficulty
in areas of the syllabus (n=69)

Area of Syllabus	More Difficult for Males %	No Difference %	More Difficult for Females %
Electric circuits	8	45	47
Electromagnetism	2	61	37
Mechanics	10	63	27
Thermal phenomena	10	88	2
Optics/light	8	90	2
Nuclear physics/radioactivity	10	85	5
Wave phenomena	7	90	3
Energy	5	93	2
Material and matter	7	86	7

From the data presented in table 8.16 above, teachers indicated that generally there were no real differences in the difficulty of the different areas of the syllabus for males and females, with the majority of respondents opting for the no difference category. However, teachers did indicate that both electric circuits (47% of responses) and electromagnetism (37% of responses) may be areas were females have more difficulty than males. One teacher, however, suggested that it might be the **approach** to these topics which is the problem not the topics themselves:

> Within physics, I don't think that it is the topics as such but the approach to each topic that is the problem. I think that examining boards could make all the topics more appealing to girls as subjects if they were approached differently. If electric circuits was less about drawing circuit diagrams and internal resistance of a cell, if it were less dry, more to do about using these things. There is none of that.
>
> (Male physics teacher)

Teachers also identified mechanics as a possible area of difficulty for females, which reflected maths teachers' perceptions of female performance in this area within maths. This data also reflects the direction of the small number of differences found in items assessing this area of content in the examination papers (see Chapter 6).

Physics: assessment objectives

The majority of physics teachers indicated a neutral stance when asked whether they felt if any of the assessment objectives within the physics syllabus were more difficult for males or for females (see table 8.17 below). However, over a quarter of teachers did suggest that 'application of knowledge and understanding' was more difficult for females, which was similar to the opinions of maths teachers about similar objectives in their subject. Also, over a quarter of physics teachers felt that females had more difficulty with 'designing and planning experiments'. All other cases showed no real differences between males and females.

Table 8.17
Percentage ratings of teachers' perceptions of male and female achievement in the syllabus assessment objectives (n=69)

Assessment Objectives	More Difficult for Males %	Neutral %	More Difficult for Females %
Application of knowledge and understanding	3	68	29
Design and planning of experiments	8	63	29
Understanding of concepts and principles	5	84	11
Analysis and evaluation of information and data	8	86	6

Teachers' general comments

At the end of the survey, teachers were invited to make any additional comments regarding the issues explored in the questionnaire. The comments given by teachers provided valuable insight into those factors which might influence differential performance at A level in general and in the three subjects in particular. Many of the issues raised in the questionnaire were explored further as part of the case studies. Through these in-depth interviews it was possible to consider further those explanations which teachers had suggested might create male and female differences in performance.

General characteristics

Overall, teachers seemed to identify general characteristics of males and females which were common across subjects. These general characteristics were different to those which teachers suggested might be course- or syllabus- specific and were seen to be more about general confidence, motivation and approaches to learning and examinations.
In general, teachers thought that males were more confident, less anxious and affected less by the prospect of final examinations, whereas females were gauged to be more conscientious and more motivated. Confidence was an attribute that was mentioned by many teachers and suggested as one of the main factors which might cause differential participation and performance. One teacher referred to it as "the confidence factor", suggesting that "males seemed over-confident" and "females under-confident." Teachers suggested that females lacked confidence in many aspects of their learning and assessment which tended to have a negative influence on how they engaged with the subject and perceived their own success:

> More girls lack confidence than boys....They seem unable to progress until they really understand things. Girls need reassurance and coaxing.
>
> (Male physics teacher)

> I think the key thing about this subject is confidence. It seems to me for some reason, girls seem to worry more about walking into the unknown. All that you can do at this stage is encourage them to take a chance, to play down the negative effects of getting anything wrong. It is partly to do with them setting themselves higher standards than the boys. I think it is rooted in self-perceptions...All we are doing is working towards not having them worry about getting things wrong, to encourage them to learn from mistakes.
>
> (Maths teacher)

However, teachers did point out that the greater confidence shown by males did not necessarily mean that they were more able than girl. Males were perhaps "less concerned with their shortcomings [and] more capable of self-delusion" (male physics teacher). This belief in their own ability and success perhaps helps males overcome any short-falls in their acquisition of knowledge or skill. Teachers felt that females did better when it came to specific areas of the syllabus and participation and performance in coursework. The evidence collected about teachers' perceptions of general male and female attitudes would tend to support the work of Dweck *et al.*, (see Chapter 3). The maladaptive patterns which Dweck (1986) describes as being prevalent in bright girls would seem to reflect those patterns of attribution which these teachers have perceived in their female students.

Styles and approaches to A level study

Teachers tended to suggest that there were two aspects of the style and approach to A level study which might have an effect on differential performance. Firstly, teachers suggested that the A level tends to have an overall style which differs markedly from that of the GCSE and which, therefore, might affect males and females differently. A level was seen as having a much more difficult structure (more examinations papers of different types), restrictive syllabuses in terms of texts and choice and requiring a more abstract and analytical way of working. Teachers felt that perhaps the style of A level might reward certain attributes and approaches more than others and that if this were so, the A level was more likely to suit the attributes and approaches of males more than females:

> I think that A level syllabuses suit the boys better than they do the girls. They [the girls] have found that the structure of A level is very difficult...They have found the restrictions quite difficult because with 100% [coursework at GCSE] there is a lot of creative writing, creative responses to texts. There isn't the same scope in A level.
>
> (Female English teacher)

> GCSE at the highest level is high level science. It is fully integrated...I think that this is valuable and much more relevant. If it is relevant then they [girls] really like it. At A level, opportunities for self-expression, creativity, imagination are limited - even discouraged.
>
> (Male physics teacher)

Secondly, students themselves might show different styles and approaches to A level study, coursework and examinations which may or may not complement the style of the examination. Teachers felt that these differences might benefit males and females differentially. Teachers suggested that males were more likely to take risks, were more willing to sound stupid in front of their peers, and more likely to go blindly on, with understanding not necessarily being a priority. Females, on the other hand were perceived as taking less chances, keen to understand things before moving on and generally more circumspect:

> Boys are more likely to "jump in" to a practical situation and to hell with the consequences - An attitude of "if all else fails, consult the instruction manual", whereas...girls are still prone, even when starting on the same footing, to exercise great care and lack the "I wonder what happens if" approach.
>
> (Male physics teacher)

> There is a tendency for boys to muck about with the apparatus, to see apparatus as a toy...we have lasers and they get excited by it. They talk about that sort of stuff too...and some of the things that they talk about and watch [on TV] are linked to the things that we do like forces...At A level it is different for girls they see it as a thing that they just have to know and understand and they are keen to get to grips with understanding it but they are not that bothered about the instruments as a toy, its not fascinating, its more something to understand.
>
> (Male physics teacher)

Teachers also indicated that males and females tended to show differences in their styles of expression. This was most noticeable, not surprisingly, in English literature where it was felt that the style of expression which tended to be more valued at A level was more commonly shown by male students. Males tended to write less, keep more ruthlessly to the point and have more confidence in their views. Females were considered to write at length, lack the courage to discard irrelevant material and to perform less well in traditional A level examinations. Comments from English teachers on this issue are very revealing:

> The boys go through it like a Panzer division...you know just cut through and that's an advantage that technique...Their writing is very clinical and clean, you know, point, point, point. Girls are much more 'if this then that and I might think this and I might think that'. The girls tend to like to take a lot of time, in that sense there is a difference.
>
> (Female English teacher)

> I think the boy's approach is much more effective at A level, far more effective. He will write you a side-and-a-half where others are writing four or five pages...it's like a knife through butter - almost notes but not quite, a very sparse style of writing. I've never seen a girl do that. Never.
>
> (Female English teacher)

> He combines a flair for literature with an analytical instinct, whereas she empathises more but is less analytical and I would argue that the boards will still respond to analytical ability. That's what distinguishes the very best candidates from the rest.
>
> (Male English teacher)

In considering the research evidence cited in Chapter 3 regarding the styles of expression and communication which is valued at GCSE, there would tend to be a shift in how students are expected to express themselves in the written form the two examination stages. It is possible to argue that the cross-over in examination performance between males and females, may be partly due to the change in style of the examinations and also in what is perceived as the right way in which students should express themselves and communicate with the examiner.

Achievement at A level

Teachers seem to perceive the attitudes of their male and female students as quite different when it comes to general approaches, participation and success at A level. Even if males were perceived to be somewhat over confident, teachers still tend to perceive them as having a more positive outlook on their potential success and faith in their own ability. Females, on the other hand, were perceived as being more reticent and less positive about their potential success. Even though females enter A level study generally better qualified than their male counterparts, the tendency for teachers to perceive them as lacking in confidence and having less faith in their own ability may result in them being judged to have less command of the subject and thus restrict their performance.

Teachers' perceptions of girls' success and ability at GCSE and their subsequent participation and performance at A level were of interest here. It was not untypical for teachers to ascribe girls' achievement to diligence rather than ability. Teachers' comments regarding the differing success of males and females in the three subjects would tend to highlight a shift in the way achievement and success are defined between GCSE and A level:

> The girl who came top of the GCSE's, seven A*s, the rest all As, I said, 'I hope she doesn't crack up doing A levels', as soon as the results came out. I then heard it said by two other teachers, so I suppose our expectations are that that particular girl over-performed because she worked so hard. Because she is not brilliant, she's very, very good.
>
> (Female English teacher)

Maths teachers tended to agree in identifying the main characteristics of a successful A level candidate:

> Maybe the girl who presents herself well and has everything organised and revised and does well at GCSE has then 'peaked' more and is precisely the person who will come unstuck on the 'flair' for A level...Whereas you're boys will have a bash, you know, 'blow it, have a go' and some will come off [laughs] with the right degree of flair.
>
> (Male maths teacher)

> [I]t's the boys who will come up with something absolutely unique, that I'd never thought of. They suddenly say 'What about this?', while the girls will listen to every single word and do it exactly along those lines and they won't take risks. They will produce a very competent, good piece of work but it hasn't got that sparkle.
>
> (Female maths teacher)

Assessment techniques

Teachers from all three subjects suggested that a difference existed between the way in which males and females approached and dealt with examinations and coursework. Teachers' perceptions were similar to widespread perceptions that boys were better at examinations and girls better at coursework. Teachers did not go as far as to say that coursework might be the critical factor in females' better performance, but they were inclined to suggest that girls had a certain advantage in this type of assessment. Males were perceived to panic less and perform better in examinations, preferring the 'one-hit' of the final examination at the end of the A level course:

> We were unhappy about the shift away from coursework...although ...that's one of the factors that mitigated against boys in the past. The exam suits boys better than it does girls. I think there will be a closing of the gap now it has gone back to mainly an exam system.
>
> (Female English teacher)

> As far as writing is concerned the boys are much more 'one draft and I've finished'...I think that's why boys do better in examinations, because it is a one-write hit. You do it then it is over... I think the move away from coursework is designed to let the boys do better.
>
> (Female English teacher)

> I have noticed that the girls seem to panic a lot more, and to get more in a tizzy about the exam beforehand, 'I'm not going to do very well', whereas you hardly ever hear that from the boys.
>
> (Female maths teacher)

These perceptions that females panicked more in examination situations and were better at coursework was not reflected to any extreme degree in their examination performance (see Chapters 6 and 7). The quote from the maths teacher above illustrates that males and females seem to have different ways of communicating within learning situations which may lead to different interpretations, by adults, of their capabilities. Also, it may well be the case that the style of learning and working that is preferred by females is better suited to the more personal, discursive, research-based approach that coursework demands and which is more typically found at GCSE.

The subject's image

Many teachers commented on the 'image' that their subject might have and how this image might be perceived differently by males and females. Teachers of maths and physics tended to suggest that these subjects were seen as difficult and challenging A levels; an image which was identified as possibly putting off more females than males from studying these subjects. Also some teachers suggested that other staff tended to classify these subjects as difficult and may consciously or unconsciously pass these perceptions on to their pupils. The traditional notion that these subjects were more 'masculine' was still in evidence, although less so in maths than in physics. Indeed one teacher was particularly concerned with the image associated with physics and how this might effect gender differences in participation and performance. He suggested that examiners perhaps continue to court a more masculine image of physics through a resistance to change how the subject is taught and examined at A level:

> The real issue for gender and physics is the construction of the subject itself. The whole reductionist approach and issue-less, non-discursive syllabi leads to sterile teaching and teachers - 'Physics is boring'

The very strong links between physics and maths and the tendency of schools to make this combination compulsory if pupils choose A level physics was also seen as potentially discouraging females from taking these subjects. Students are discouraged from taking physics without maths and are often advised to take mechanics to help support the work in physics.

In relation to this, maths has been shown to be split along a mechanics/statistics divide in terms of male and female entry; mechanics options (those opting for a pure maths and mechanics A level) are dominated by males, and statistics options (those opting for a pure maths and statistics A level) are dominated by females. The status of these two options would also seem to differ within schools, with many teachers indicating that students in the mechanics options were more likely to obtain higher grades and to be the more able mathematicians. The social relevance of statistics and the acceptance of pure maths and statistics as one of the A levels suitable for entry into medicine were suggested as reasons for the larger female uptake of this option.

English literature, on the other hand was, seen to be a more female sort of subject, with a more 'touchy-feely' sort of approach and a 'softer option'. English teachers suggested that they may lose male students to other subjects at A level because boys are "physically and emotionally uncomfortable and because a lot of their peer groups would not value it" (male English teacher). English also has a reputation for being accessible for students, being seen as something that everybody can have a crack at and departments were less likely to close their doors to students in the way that perhaps science and maths departments do:

> In other words...mathematicians are born not made, if you can't do it you'll reach a plateau beyond which you cannot get. In English if you don't mind working hard and you can read, you can write, someone, somewhere, if you are well taught, can bring you through A level.
>
> (Male English teacher)

A level student populations

One of the issues that has run through this thesis is that groups of A level students are quite particular. For the majority of subjects, the male/female entry ratio is generally skewed towards one gender or the other. Teachers across all three subjects were very aware of these skewed entries and indeed, as already discussed, some were involved in trying to redress these patterns of up-take.

One of the concerns of teachers was the relatively large numbers of students who were not choosing to do certain subjects in the first place. An example to illustrate this point comes from a female physics teacher in a single-sex girls school. She commented that even the cleverest girls perceived physics as being too difficult. From a group of 12 A* Double Award science candidates at GCSE only three went on to continue to study sciences at A level despite the absence of direct competition from males and positive female role models in the science department.

Teachers indicated that students had made decisions about their A level study very early on and even trying to encourage females into science and maths and males into English lower down the school did not seem to have much of an impact. Teachers again reiterated that males and females, although equally able, are still attracted to traditional subjects and perceive the subjects in slightly different ways. Some teachers did comment that they were unsure what their role should really be in trying to get students to choose less traditional subjects for their gender. One teacher in particular was concerned that even though he could perceive a problem in the numbers of males and females opting out of certain subjects, he was not sure how far he should go to counteract this pattern:

> I think there is an ethical problem here...how far is it my job, as a professional educator, to impose my beliefs and values. If it appears to be that boys are opting out of English for reasons which suit them on a personal level, to what extent is it my job to try and counteract that?
>
> (Male English teacher)

Teachers also suggested that there might be certain 'types' of females who would opt to do science and maths and certain types of males who opt to do English; perceptions which reflect the 'voluntary minority' discussion of Tobin (1996) outlined in Chapter 6. Teachers perceived quite differently the bright able girl who chooses to do physics and the bright able boy who opts to do English literature:

> There is definitely quite a big difference between girls who choose to do A level physics and those who don't...If you compare the girls who do physics with those who don't they are much more mainstream. Some girls don't like going into an area where they feel they don't belong. Also some girls who do physics don't perceive themselves as physics students, they enjoy the subject but their main interest is somewhere else.
>
> (Male physics teacher)

> The calibre of boys that do English is, on average, usually higher than the average girl, the boys are more ambitious and want to know that they can definitely get the grade. The boy who chooses to do English is often choosing it as his first choice, rather than his third choice, which is more often the case with girls.
>
> (Female English teacher)

Conclusion

This chapter has presented in detail the data collected, via questionnaires and interviews, from teachers of A level English literature, mathematics and physics. The aim of involving teachers in discussions about these issues was to better understand their perceptions of male and female participation and performance and to look for wider sources of evidence to account for differential performance in A level.

Interestingly enough, the teachers provided considerable insight as to why males and females might perform differently at this stage of examining. There were many issues on which teachers tended to agree and which went across subjects, such as females lacking confidence and males being less anxious about failure in general and in final examination in particular. However, there were also instances when even though the general direction of the teachers' responses were the same, the degree of these responses differed between subjects. What is clear from the data analysed, is that at a general level, teachers' perceptions of male and female attitudes still tend to be quite traditional. These findings were surprising given that some teachers had discussed strategies they had personally used to redress gender differences in their subject. Many of the findings indicate the continuation of the traditional relationship between subject and gender, with students still opting for traditional male- and female-type subjects. Many teachers also suggested that it was the image of the subject and the actual structure of the subject itself that needs to be changed if students are going to be attracted into these subjects.

Chapter 9

Students: Perceptions and Attitudes

Introduction

This chapter is concerned with the student data collected as part of the case studies. In collecting this data the intention was to answer the research question specifically related to students' opinions about A level study:

- *what are students' perceptions of their abilities/attainment in the subjects they have chosen at A level and why do they choose the subjects they do?*

(Research question (viii), Chapter 4)

During the case study visits, students from years 12 and 13 were asked to complete a questionnaire and small groups were interviewed to explore issues raised in the survey. Interview groups were generally made up of six students (3 male and 3 female). Students were asked about their attitudes to, and perceptions of, A level examinations and how they judge their potential success and attainment in these examinations. Questions were also concerned with issues such as: how students rated the difficulty or ease of the various content areas within their subject; how students rated their confidence, motivation, aptitude and enjoyment in the subjects and how they rated themselves in these categories compared to their same- and opposite-sex peers. In addition, the survey collected information about students' GCSE backgrounds (grades and subjects entered) and their choice of subjects at A level.

The student questionnaire was developed from the teacher questionnaire (see Chapter 8). The aim was to compare students' perceptions of, and attitudes to, their abilities and attainment at A level with those put forward by their teachers. This comparison was important in highlighting to what extent teachers and students agreed or disagreed on certain characteristics and factors. Of particular interest were any disagreements between students and teachers and how these might suggest a lowering of expectations by teachers, of students, and how this might impact on differential performance.

The important issue here is whether or not teachers' assumptions about male and female performance are valid or whether they are stereotypical perceptions and expectations which conflict with students' own participation and achievement.

Whereas the sample of teachers was randomly selected from a national population of schools offering the ULEAC syllabuses, the student sample was located within the nine case study schools. Moreover, some of the teachers in the case study schools took the completion of the student questionnaire as a formal activity and circulated the questionnaire to the whole of the 6th form in their subject area. Others were less formal in asking students to complete the survey, circulating it only to those who they themselves taught. This resulted in some schools being over represented in the data, and different response rates for the three subjects. The make-up of the student sample, therefore, will have implications for the interpretation the data. The student questionnaire and interview schedule appear as appendices to this chapter (Appendix 9(i) and 9(ii) respectively).

The student sample and background data

A total of 247 A level students responded to the survey: 54 in English literature (16 males, 38 females); 126 in maths (89 males, 37 females) and 67 in physics (49 males, 18 females). Many students seemed to have chosen their A level options on the basis of their GCSE results (a fact which was confirmed during interviews). It was not surprising, therefore, to find most having done well in English (both literature and language), maths and science (double award) at GCSE. Table 9.1 over shows the major subjects taken at GCSE by each A level subject student group. This data is further categorised by gender, the proportion of students who entered each GCSE subject and their mean grade obtained.

GCSE profiles

As shown in table 9.1, gender differences in subject choice were minimal. In addition to the three core subjects of English, maths and science, the majority of students took 5 extra subjects at GCSE; most opted for a similar combination of subjects including history, geography, French, business studies, art and English literature. The GCSE grades achieved by male and female students in the English literature and maths subject groupings were similar, with differences of half a grade occurring in French (in favour of females in the English literature group) and business studies (again in favour of females in the maths group). In the majority of cases where slight differences did exist, these were also in favour of females. Within the physics group, the variation in mean GCSE grade obtained by males and females was greater. This group indicated five subjects (English language, science, French, geography and art) in which differences of more than half a grade were obtained, with females doing better in each case. This data reflect national GCSE figures of performance which show girls ahead of boys in the proportion of A*-C GCSE grades attained in most subjects (Elwood, 1995 and see Chapter 5). It also reflects the academic calibre of the students sampled.

Table 9.1
GCSE Subjects taken by sample students -
% entry and mean grade by gender and A level subject group

GCSE Subjs	Eng. Literature				Maths				Physics			
	% entry		mean grade		% entry		mean grade		% entry		mean grade	
	m	f	m	f	m	f	m	f	m	f	m	f
Eng.	100	97	2.1	2.1	92	97	2.8	2.4	88	88	3.2	2.6
Math	100	97	3.1	2.8	98	100	2.4	2.6	100	58	3.2	3.1
Sci	100	95	3.2	3.0	89	100	2.6	2.5	86	72	3.1	2.5
E.Lit	100	97	2.6	2.5	88	100	2.7	2.7	47	50	3.3	3.0
Hist	81	66	2.7	2.9	57	65	2.9	2.7	67	67	2.8	2.8
Fren	88	74	3.4	2.9	73	84	3.0	2.7	29	33	4.6	2.8
Geog	38	42	3.0	3.0	56	35	2.8	2.8	22	33	3.5	3.0
Bus.	44	26	3.0	3.5	17	23	3.2	1.8	44	50	3.6	3.5
Art	44	50	2.7	2.5	15	19	2.9	3.3	39	50	4.1	3.0

* Scoring for grades : 1=A*, 2=A, 3=B, 4=C, 5=D
m = male, f = female

A Level profiles

Variations in the overall profile were noted in relation to gender for each of the three A level subjects under investigation. The English literature group of students had generally opted for arts-related subjects, with the exception of a small number of females who had taken biology. The most popular choices of A level subjects within the maths group were the science subjects. Almost half of all the maths students surveyed opted for chemistry as their second choice with more males in this group opting for physics and more females opting for biology as their third choices. Alongside the common combination of maths and science subjects, other students offered maths with a broader range of subjects showing the use of maths as a bridge in the arts/science divide.

Male and female students in the physics group tended to combine this subject with a more narrow range of subjects at A level. Physics with maths and chemistry was the most popular combination. Both teachers and students identified maths as an essential component of physics and thus an inevitable choice when taking physics. Physics was also usually taken as one of three science subjects required to study medicine and/or engineering at university.

Students' attitudes and motivation

Section B of the questionnaire asked students about their attitudes to, and perceptions of, general and specific elements of their subject. In common with the teachers' survey, students were asked to indicate their level of agreement or disagreement with 18 attitudinal statements presented to them. The rating scale used was a common Lickert scale (Oppenheim, 1992) with 5 points, ranging from 1= 'strongly disagree' to 5 = 'strongly agree'. While on the teachers' questionnaire, respondents were presented with comparative statements between boys and girls, students were asked to respond in the first-person and were therefore presented with statements such as *"I am confident of succeeding in maths"*. Their responses were analysed for significant gender differences. All the tables presented in this chapter show the mean scores for each item by gender. The higher the mean score, the more strongly the groups of students agreed with the statements. T-tests were conducted on each item in the questionnaire, and where significant differences were found, these are indicated.

The attitudinal statements fall into the same four general areas as those identified on the teacher survey: general attitudes, assessment and examinations, approaches to learning and general subject issues. The following discussion examines these areas across each of the three subjects then draws out some common themes between the three subjects. Issues from the student interviews are then presented which provide supporting evidence. The chapter concludes with a discussion about the comparison between teachers' and students' responses

General attitudes

Generally, students showed themselves to be very positive about their participation in their subjects at A level; the majority of students from each subject indicating a very high degree of confidence, motivation, enthusiasm and enjoyment. If patterns of response deviated from positive ratings, they were more likely to be neutral than negative. Any differences which did occur, therefore, tended to be between degrees of agreement rather than between agreeing and disagreeing.

Table 9.2 shows that students in the English literature group responded in very similar ways, although females tended to be slightly more enthusiastic about studying English literature than males, seemed to enjoy the subject more and were significantly more sure than males that they had not lost interest in the subject over the course. Both males and females, however, did indicate some anxiety about failure even though neither group thought the subject was difficult for them.

Table 9.2 : General attitudes : male and female mean scores

Statement	English			Maths			Physics		
	m	f	*p*	m	f	*p*	m	f	*p*
I am confident of succeeding in (subject)	3.81	3.68	--	3.94	3.47	*	3.55	3.29	--
I am anxious about failure in (subject)	3.43	3.45	--	2.93	3.39	*	3.27	3.39	--
I have found (subject) increasingly difficult	2.94	3.00	--	3.22	3.50	-	2.65	2.72	--
I have lost interest in (subject)	2.63	2.02	*	2.07	2.52	*	2.18	2.00	--
I enjoy studying (subject)	3.62	4.08	--	3.72	3.50	--	3.68	4.00	*
I am not enthusiastic about (subject)	2.38	1.89	--	2.17	2.55	--	2.18	2.22	--

1 = strongly disagree, 3= neutral , 5= strongly agree, etc. * = $p < .05$
m= male, f= female

Maths students were also generally positive about the subject. However, they indicated that the A level mathematics course had got more difficult as it progressed with female students finding the subject slightly more difficult than male students. In line with trends found in other studies (e.g. Johnson, 1996) male maths students were significantly more confident about their success and less anxious about failure than their female counterparts. Males were also significantly less likely to lose interest in the course.

Physics students tended to be the least confident of the three groups of students with both male and female physics students expressing a degree of anxiety about failure. However, both genders also indicated that they did not think that the course had increased in difficulty and that they had retained their interest in it, with female students enjoying the subject significantly more so than males. This finding seems to reflect the positive choices of females who opt to take physics at this level.

Assessment and examinations

Table 9.3 shows no significant difference between male and female students' opinions of how they perform in assessment and examinations. In English literature, both male and female students were positive about their performance in examinations and class-based tests. Males were less positive about their ability to do well in project work but showed slightly more certainty about their chances of getting good A level grades in the subject. For male and female maths students the pattern of results were similar, although females were less positive about performance in class-based tests and doing well in project work.

Table 9.3: Assessment : male and female mean scores.

Statement	English			Maths			Physics		
	m	f	*p*	m	f	*p*	m	f	*p*
I generally do well in examinations	3.69	3.63	--	3.71	3.63	--	3.41	3.12	--
I expect to get good exam grades	3.62	3.47	--	3.69	3.37	--	3.51	2.94	*
I usually get good test marks	3.47	3.50	--	3.38	3.10	--	3.18	3.28	--
I am good at project work in (subject)	3.47	3.63	--	3.46	3.41	--	3.47	3.47	--

1 = strongly disagree, 3= neutral , 5= strongly agree, etc.
* $= p < .05$. $** = p < .01$
m = male, f = female

Physics students were also generally positive about their abilities in examination and class-based tests, although slightly less positive overall than English and maths students. Both male and female physics students were similarly positive of their abilities in project work. However, females were less certain about their performance in examinations and were significantly less positive than males about obtaining good grades in A level physics.

Approaches to learning

Table 9.4 shows male and female mean scores calculated for the statements regarding students' approaches to learning. English literature students were generally positive about their involvement in the course when working collaboratively with others. Both males and females indicated being at ease in class discussions and showed no preference for expressing themselves verbally or in writing. Females seemed to be significantly more attentive than males to the presentation of their work.

Table 9.4: Approaches to learning : male and female mean scores.

Statement	English			Maths			Physics		
	m	f	*p*	m	f	*p*	m	f	*p*
I make efforts with presentation	3.06	4.00	* *	3.34	3.58	--	3.59	3.67	--
I am conscientious in my work	3.44	3.74	--	3.53	3.57	--	3.48	3.83	--
I enjoy working with others	3.81	4.16	--	3.63	3.97	--	3.98	4.11	--
I feel comfortable in class discussions	3.75	3.84	--	3.55	3.70		3.61	3.18	*
I prefer verbal to written expression	3.00	2.95	--	2.64	2.97	--	3.18	2.56	--

1 = strongly disagree, 3= neutral , 5= strongly agree, etc.
* = $p < .05$. **= $p < .01$
m = male, f = female

Maths students were somewhat less positive than English students in their approaches to learning. Female maths students were slightly more positive than male students about presentation, effort, collaboration and class discussions but none of these differences were significant. Both males and females were neutral about preferring either verbal or written expression.

With physics students, again females were slightly more positive about presentation, effort and collaboration but again these differences were not significant. However, these same female students were significantly less positive about speaking out in class and about verbally expressing their ideas. This counteracts the pattern of females studying maths and English literature.

General subject issues

The data shown in Table 9.5, indicates no significant gender differences in this category. English literature students felt that their subject was socially relevant, but less likely to be important in a future career; this was particularly true of females. Both males and females showed little inclination to pursue their subject into higher education. Maths was also seen to be socially relevant, although female maths students were slightly less certain of this than their male counterparts. Males were more likely to continue studying maths beyond A level but both groups were fairly negative about this statement. Female physics students tended to agree more than male students that physics had some social relevance and were more inclined to suggest that physics would be relevant in their future careers. Both males and females were less positive about studying physics further than A level.

Table 9.5: General subject issues: male and female mean scores

Statement	English			Maths			Physics		
	m	f	*p*	m	f	*p*	m	f	*p*
I think (subject) is socially relevant	3.38	3.5	--	3.46	3.27	--	3.76	4.11	--
(Subject) is likely to be important in my job	3.19	2.63	--	3.58	3.29	--	3.53	3.72	--
I would like to study (subject) at HE	2.38	2.63	--	2.3	1.92	--	2.29	2.44	--

1 = strongly disagree, 3= neutral , 5= strongly agree, etc.
* $=p < .05$. $**=p <.01$

Many of the attitudes expressed in the previous section by students in all three subjects reflect those differences in pupils' attitudes reviewed in Chapter 3. Even though the students in this sample were mostly positive about their choices of subjects, their attitudes to these subjects and to A level study in general, there was still some degree of difference between males and females in their approaches to learning, the different assessment modes and their future career concerns.

Syllabus content and comparison with peers

The survey was also concerned with students' attitudes to the different content areas of the subjects they were studying. Again, this part of the questionnaire replicated a similar section given on the teachers' survey. The first set of questions in this part of the questionnaire asked respondents to rate their confidence, motivation, aptitude and enjoyment of the various elements of the syllabuses they were studying. The rating was again based on a 5 point scale, ranging from 1 = 'not at all confident, motivated, etc.', to 5 = 'very confident, motivated, etc.' The second set of questions asked students to rate the relative difficulty or ease of various categories of the syllabus, again on a 5 point scale ranging from 1 = 'very difficult' to 5 = 'very easy'. The third set of questions was an addition to the student questionnaire. Students were asked to rate themselves, across the four attributes - confidence, motivation, ability and enjoyment - against their same- and opposite-sex peers on a 5 point scale ranging from 1 = 'much less confident, motivated, etc.', to 5 = 'much more confident, motivated, etc.' In all the tables below, a high mean score indicates a more positive response.

As discussed in Chapter 8, teachers were less inclined to identify gender differences in the ease or difficulty of certain content areas than they were general attitudes between males and females. Similar patterns were found amongst students on similar items of their questionnaire. In fact, students were even less inclined to identify differences in attitudes or ability between themselves and their peers. In the following sections each of the subjects, English literature, mathematics and physics are discussed separately.

English literature: attitudes towards the syllabus

English literature students were asked to rate their confidence, motivation, aptitude and enjoyment in the various elements of the syllabus: comprehension and appreciation, the novel, poetry, drama and coursework. Table 9.6 shows the mean scores for males and females across the items. There were no significant differences in mean score between male and female students. In general, males and females rated themselves as equally positive about the elements of the English literature syllabus, with females slightly more positive across the enjoyment attribute in relation to novels, poetry and coursework. As discussed in Chapter 8, teachers tended to rate females as having the edge over males in relation to performance in coursework, but students tended only to differ in relation to enjoyment of this component. Males tended to rate themselves more positively than females in drama, expressing slightly more confidence, motivation and aptitude.

Table 9.6 Male and Female attitudes to different areas of the syllabus : mean scores.

Area of syllabus	Confidence			Motivation			Ability			Enjoyment		
	m	f	*p*	m	f	*p*	m	f	*p*	m	f	*p*
compre-hension & appreciation	3.56	3.61		3.69	3.71	–	3.94	3.95	–	3.25	3.34	–
novel	4.00	4.11	–	3.87	4.16	–	4.19	3.97	–	3.94	4.32	–
poetry	3.69	3.50	–	3.69	3.84	–	3.81	3.84	–	3.44	3.93	–
drama	3.87	3.60	–	4.19	3.95	–	3.87	3.78	–	4.00	4.06	–
coursework	4.00	3.97	–	3.8	4.19	–	4.07	4.03	–	3.40	3.86	--

1=much less confident, motivated, etc., 3=neutral 5=much more confident, motivated, etc.
m = male, f = female * = $p < .05$

English literature: assessment objectives

Table 9.7 presents the various assessment objectives and the mean ratings obtained from male and female students. There was very little difference between how male and female students rated themselves on the various categories and none of the differences were significant. The largest difference was obtained in 'expressing a personal response to text' with females indicating that they found this activity relatively easy whereas males were more neutral. This was an area identified by teachers as more difficult for males. Teachers had also indicated that they thought drama work and 'spelling, punctuation and grammar' easier for females. Female students tended to indicate a more positive response in these categories but again the differences were extremely small. Another area identified by teachers as favourable to males was that of writing under timed conditions. Student responses show that even though both genders seemed to find this activity more difficult than others, males indicated a slightly more positive response; the differences in responses were in the same direction as teachers had indicated.

Table 9.7
Relative difficulty of different assessment objectives: mean scores*.

Area of syllabus	m	f	*p*
group discussions about texts	3.63	3.63	--
writing under timed conditions	2.63	2.50	--
participating in drama	3.56	3.43	--
appreciation of literary form/content	3.25	3.37	--
punctuation/grammatical structure/spelling	3.13	3.53	--
analysis of literary works	3.44	3.47	--
understanding differences between genres	3.00	3.47	--
comprehension/appreciation of unseen text	2.69	2.55	--
expressing personal response to text	3.25	3.79	--

1 = very difficult 3= neutral 5= very easy
* = $p < .05$. m = male, f = female

English literature: comparison with peers

Table 9.8 below shows that generally both males and females rated themselves positively against both their same- and opposite-sex peers. Males rated themselves marginally higher than females did in ability, but slightly lower in terms of motivation and enjoyment of the subject. Females rated themselves slightly less confident and able than males but more motivated and more likely to enjoy the subject. Again no statistically significant differences were obtained.

Table 9.8 Student self-ratings against same-/opposite-sex peers: mean scores by gender

Self-rating	Confidence			Motivation			Ability			Enjoyment		
	m	f	*p*	m	f	*p*	m	f	*p*	m	f	*p*
compared with male peers	3.06	3.03	--	3.25	3.66	--	3.44	3.18	--	3.19	3.34	--
compared with female peers	3.19	2.84	--	2.94	3.14	--	3.12	2.86	--	2.87	3.08	--

1=much less confident, motivated, etc., 3-neutral 5= much more confident, motivated, etc.; m = male, f = female * = p< .05.

Maths: attitudes towards the syllabus

Maths students were asked to rate their confidence, motivation, etc., in three areas of the syllabus - pure mathematics, mechanics and statistics. Table 9.9 shows that in general male maths students were slightly, but not significantly, ahead of females across the four attributes, with females showing only slightly more positive ratings of their ability in statistics. Even though both groups of students rated themselves quite positively, males were significantly more positive about their confidence and ability in pure maths than females were. These patterns, although not all significant, were in the same direction as the differences in performance found on the examination papers (see Chapter 6) and teachers' perceptions of male and female attainment in the various categories of maths (see Chapter 8).

Tables 9.9 Male and Female attitudes to different areas of the syllabus : mean scores.

Area of syllabus	Confidence			Motivation			Ability			Enjoyment		
	m	f	*p*	m	f	*p*	m	f	*p*	m	f	*p*
pure maths	3.74	3.28	*	3.93	3.61	--	4.12	3.67	*	3.62	3.24	--
mechanics	3.86	3.33	--	4.08	3.58	--	4.07	3.75	--	4.02	3.75	--
statistics	4.19	4.00	--	4.12	4.08	--	4.00	4.12	--	4.00	3.88	--

1 = not at all confident, motivated etc., 3= neutral , 5= very confident, motivated, etc.; m = male, f = female * = p< .05.

Maths: syllabus content

Table 9.10 illustrates that in trigonometry, and mechanics significant differences were found between male and female ratings, with females indicating these areas to be areas of difficulty. These two categories had been identified by teachers as causing some difficulty for females. Males generally rated most areas of the syllabus as easier than females did, even in probability which is an area that females are known to do well in (Foxman *et al.*, 1991; Stobart *et al.* ,1992b) and which showed a slight female advantage in the analysis of examination papers discussed in Chapter 6.

Table 9.10 Relative difficulty of different syllabus content: male and female mean scores.

Area of syllabus	m	f	*p*
further algebra	3.62	3.44	--
functions/Cartesian geometry	3.25	3.00	--
trigonometry	3.50	3.03	*
calculus	3.58	3.26	--
vectors	3.49	3.08	--
sequences, series and limits	3.46	3.19	--
complex numbers	3.25	3.20	--
mechanics	3.26	2.63	*
probability	3.40	2.97	--
descriptive statistics	3.64	3.29	--

1=very difficult 3=neutral 5= very easy * = $p < .05$

Maths: comparison with peers

Male maths students tended to rate themselves more highly than their female counterparts (see Table 9.11 below) and in a number of these instances, these differences were statistically significant. Males were significantly more likely to rate themselves as more confident and able in maths than other females in their class. Females rated themselves as slightly more motivated than their male counterparts. Both male and female maths students, rated themselves positively overall in comparison with their peers, both same- and opposite-sex. However, the differences in maths indicated that males generally rated themselves more positively against their peers than did females.

Table 9.11 Student self-ratings against same-/opposite-sex peers: mean scores by gender

Self--rating	Confidence			Motivation			Ability			Enjoyment		
	m	f	*p*	m	f	*p*	m	f	*p*	m	f	*p*
compared with male peers	3.35	2.97	*	3.44	3.14	--	3.52	3.03	* *	3.44	3.03	* *
compared with female peers	3.49	3.22	--	3.17	3.19	--	3.62	3.19	* *	3.44	3.17	--

1=much less confident, motivated, etc., 3-neutral 5= much more confident, motivated, etc.; m = male, f = female * = $p < .05$, **= $p < .01$

Physics: attitudes towards the syllabus

Physics students were asked to rate their general level of confidence, motivation, etc., towards the subject in general. As with the other two subjects, physics students were generally positive in their attitudes towards the subject. Table 9.12 shows that females rated themselves slightly less confident and able than male physics students, but as more motivated and enjoying the subject more. None of these differences were statistically significant.

Tables 9.12 Male and Female attitudes to the syllabus : mean scores.

Area of syllabus	Confidence			Motivation			Ability			Enjoyment		
	m	f	*p*	m	f	*p*	m	f	*p*	m	f	*p*
General attitudes to physics	3.59	3.17	--	3.88	4.06	--	4.00	3.61	--	3.80	4.11	--

1 = not at all confident, motivated etc., 3= neutral 5= very confident, motivated, etc.; m = male, f = female * = $p < .05$.

Physics: syllabus content

Overall, physics students showed little difference in how they viewed the ease or difficulty of the various syllabus elements (see table 9.13 below). Both males and females, however, suggested that electric circuits and electromagnetism were areas of the syllabus that were more difficult than others, with females slightly less certain than males. These areas were viewed by teachers as those in which females might find more difficulty and indeed they showed slight under performance in relation to males on these topics in the examination papers (see Chapter 6).

Table 9.13 : Relative difficulty of different tasks/activities : male and female mean scores.

Area of syllabus	m	f	*p*
materials and matter	3.33	3.33	--
mechanics	3.08	3.06	--
electric circuits	2.92	2.76	--
wave phenomena	3.15	3.13	--
nuclear physics/radioactivity	3.16	2.93	--
energy	3.41	3.08	--
optics/light	3.14	2.78	--
electromagnetism	2.60	2.67	--
thermal phenomena	3.28	2.92	--

1=very difficult, 3=neutral, 5= very easy *= $p<.05$.

Physics: comparison with peers

Table 9.14 below shows physics students as generally positive when comparing themselves with their male and female peers. In comparing themselves with male students, females rated themselves higher on motivation but lower on confidence. As with male maths students, male physics students were more likely than females students to regard themselves as more confident than their male peers. These findings reflect those of the teachers who perceive male physics students as the more confident group and females as the more motivated.

Table 9.14 Student self-ratings against same-/opposite-sex peers: mean scores by gender

Self-rating	Confidence			Motivation			Ability			Enjoyment		
	m	f	*p*	m	f	*p*	m	f	*p*	m	f	*p*
compared with male peers	3.09	2.61	*	3.15	3.61	* *	3.27	2.94	-	3.17	3.33	-
compared with female peers	3.12	2.89	-	3.08	3.18	--	3.11	3.12	-	3.24	3.06	--

1=much less confident, motivated, etc., 3-neutral 5= much more confident, motivated, etc. m = male, f = female * = $p< .05$, **= $p <.01$

Overview of students' perceptions

From the analysis of the student questionnaires, there are two main points to consider, which are common to the three subjects.

Firstly, the number of significant differences between male and female mean scores was minimal and many of the differences which did exist were very small. In English literature, where females are perceived to be better at the subject there were no instances of females rating themselves as significantly more confident or able than their male counterparts. Also, in physics, which is traditionally seen as a highly gendered subject and in which teachers acknowledged differences between male and female students, very few statistically significant differences were found. Maths was the only subject to reveal a number of significant differences between male and female students. These differences were also in the same direction as those identified by teachers. For example, mechanics was an area of the syllabus which female students acknowledged they found quite difficult. This was one of the areas acknowledged by teachers as being quite difficult for females (see Chapter 8).

Secondly, both males and females were generally quite positive about their attitudes and abilities in the three subjects. Any gender-related differences that did occur were generally differences in the **degree** of how positive males and females felt towards their own participation and attainment to that of their peers; if there was any movement away from a positive response, students were more likely to be neutral about their attitudes than negative. The overall picture suggests a highly motivated group of students who enjoy these subjects and who are confident in their attitudes and about their abilities. Both males and females compared themselves very favourably with their peers, in nearly every case, whether they were of the same or the opposite sex. In maths, self-ratings of males were slightly more positive than their female counterparts, less so in physics and no differences were found in English.

Student interviews

In each of the nine case study schools, groups of A level students were interviewed to explore in more detail some of the issues generated by the questionnaire. Certain themes emerged from the interviews which are discussed below.

The subject's image

Students were asked whether they felt that their subject had a particular image and whether they thought that this image might put certain groups of students off studying the subject. Both male and female students in all three subjects felt that their subject was perceived by others as difficult but that perhaps maths and physics were seen as especially difficult:

> ...when you tell people you are doing maths they say 'oh no, not maths' it is a really hard A level. One of the reasons I did it was because I thought it would be a challenge, I thought universities would respect it as an A level...
>
> (Male maths student)

> [physics has] a hard image, I think that's what puts most people off, but also because I think girls tend to do English, history and those kinds of subjects, rather than sciences when they've got the choice.
>
> (Female physics student)

In terms of subjects having gendered images such as English being 'feminine' and physics being 'masculine', students were less inclined to suggest that such images still hold true. Many maths and physics students felt that such gendered images were old images which have changed to some degree. They suggested that if such images still existed they would be connected to the types of careers associated with these subjects which still had masculine images.

English literature was perceived as more subjective in nature in contrast with the more 'right or wrong' of maths and physics. These different perceptions were cited as possibly responsible for the low participation of female students in science and maths subjects:

> Its a sort of clash between fact and fiction, science is all facts, but in English, it's your own views ... I think girls are more into that than boys.
>
> (Male physics student)

Approaches to learning

Students from a number of schools suggested that there was a gender-related difference in approaches to learning which had changed for males and females as they had progressed from GCSE to A level. One such difference identified by the students was the differential attentiveness to presentation and neatness with female students being more conscientious:

> I think girls tend to be more conscientious. Boys seem to get away with doing less work, especially at GCSE...I think at A level it is different, boys realise they have to do a lot more work.
>
> (Female maths student)

> Girls are definitely more conscientious at GCSE, so they work in all their 9 (sic) subjects, and want to get good grades in all of them, whereas the boys only seem to want to do well in subjects that they like.
>
> (Female English student)

A number of students did suggest that they thought there was a difference between males and females in terms of organisation of work and meeting deadlines:

> In our class the girls get their work in roughly on time ... but the blokes come in like two weeks late with their essays, or doing it that morning. Two of them do it most of the time that morning. You see them [doing their work] in the lesson [laughter].
>
> (Female English literature student)

Students suggested that this might be seen as boys taking more risks; a learnt approach which might actually benefit them in the long run.

General comments

Students were also asked to comment on a number of areas where their teachers and/or previous research had identified gender differences: the interaction between teachers and students and the dynamics of the classroom; whether students saw teachers as role models and if so, had this had any effect on their involvement in certain subjects, and how students felt about being taught in groups which were dominated by one gender or the other.

In terms of classroom dynamics, students were reluctant to suggest that either gender were treated differently by their teachers in their small A level groups. They thought that differential treatment was more a concern at GCSE where the number of students was larger and classes were mixed ability. Students suggested that A level differences were more about individual personalities than gender.

Students suggested that they were happy with their A level subject groups even though these groups are smaller than they were used to and were dominated by one gender. However, some female physics students did feel that being in a minority in the class, often of one or two, could be a bit intimidating:

> I went to a class....where there was only two girls and you know we got the rib taken out of us.
> Some of the girls would feel inferior coming into a class that was mainly boys
>
> (Female physics students)

Males in a similar positions in English literature groups did not see their minority status as a disadvantage, indeed some suggested that it was beneficial

Similar ideas were expressed with regard to the notion of teachers acting as role-models. Both male and female students from all three subjects suggested that the quality of the teaching, rather than the sex of the teacher, encouraged their participation post-GCSE. Few girls saw any advantage in recruiting female teachers in science subjects as a strategy for increasing their participation.

Comparison of teachers' and students' perceptions

In summary, it is useful to reflect on the extent to which students' views expressed of their own abilities and attitudes compare with that of the teachers'. This is important in relation to differential performance in terms of whether there is dissonance between teachers' beliefs about the ability and attainment of their male and female students and students' own perceptions of their attainment. Teachers' perceptions may influence their judgements of who they see as capable of doing well in final examinations and how they prepare students for these examination. .

The results of the students' survey support, to a limited extent, the differing views of teachers in each domain. From the students' comments there was some evidence to suggest that maths tended to favour males more than females. This was also suggested by teachers. However, this was not found to be the case in physics nor in English literature. Moreover, both male and female students rated themselves as equally confident in these subjects. These ratings did not coincide with teachers' perceptions.

Teachers across the three subjects were united in perceiving females as more diligent than males in the areas of presentation and neatness of work, . This finding, however, was only supported by students in English literature. Girls, in general, saw themselves as more concerned with neatness and presentation than boys. Neither physics or maths students thought there was any significant differences between males and females in this category.

Teachers were also fairly clear in identifying gender differences in general conscientiousness and performance in final examinations. English, maths and physics teachers all agreed that females were more conscientious in their work and that males were less adversely affected by final exams. However, students from all three subjects, were sure that both males and females were conscientious about their work, more so at A level than at GCSE, and that they were both capable of getting good examination grades.

Most of the student data demonstrates that any differences found, are differences between two very positive groups of students . The data presented in Chapter 5 suggests that the gender-related gap in performance still exists, especially at the higher grades at A level. Evidence collected from this student sample to explain why this might be so, still shows females slightly under confident and anxious in certain subjects compared with males. Even though these differences are differences in degrees of positive responses they still show a difference which could affect performance in final examinations and how students prepare for them.

By the time male students reach A level they begin to show a conscientiousness about their work and are highly motivated. Teachers see male students as risk takers and female students less so. Students do not perceive such a difference to the same extent as their teachers. In recognising the academic capabilities of this sample of students, an important point to consider is that still most of those entering maths and physics at A level are males, and most of those choosing English literature are females. This issue is not unimportant and must impact on any conclusions drawn about differential performance.

Chapter 10

Main Findings, Reflections and Conclusions

Introduction

The purpose of this study was two fold; firstly, to investigate differential performance in A Level examinations and secondly, to account for the cross-over in gender-related patterns of performance between 16+ and 18+. The GCE A level examination was analysed in a number of ways to locate those features that contribute to the gender-related differences in performance. To acquire a fuller picture of those factors that influence male and female outcomes in public examinations at 18+, the examinations data were triangulated with teachers' and students' perceptions of, and attitudes to, attainment at this phase of schooling. The critical research question was how do we account for the change in performance patterns between the GCSE and A level examinations. The research findings indicate that there is no simple answer to this question. Rather, there is a complex interaction of many factors that create these patterns of performance.

Three subjects - English literature, mathematics and physics - were used to illustrate the issues in this thesis. These three subjects show distinctive patterns of male and female performance and bring to the forefront traditional gendered assumptions and dimensions (Chapters 2 and 3). In terms of the teachers' attitudes to, and perceptions of, male and female attainment and success at this stage of examining, this research has shown, that many similarities exist across the three subjects. There are common features in the way that the subjects are structured and assessed at A level that demand particular styles and approaches to learning to ensure success.

The aim of this chapter is to synthesise the multiple complex strands of the research. The main findings of the research are presented and evaluated. Firstly, in relation to the research questions posed and secondly, in relation to how they support the various theoretical aspects of other research in the field. The specific contributions this study has generated will be outlined. Within this chapter I also reflect on the merits and shortcomings of this study. I conclude with a discussion of where possible future research might focus.

Main research findings

Gender-related differences in performance

The data presented in Chapter 5, established the current profile of gender related differences at GCSE and A level. The review of the GCSE and GCE A Level statistical data showed that outcomes between the two stages are very different. Girls gain some 8% more A*-C GCSE grades than do boys. Considering that the same cohort take all three of the core subjects at this stage, the differences in gender-related outcomes in GCSE English, mathematics and science are striking. In contrast, patterns at A level indicate a 'cross-over' in performance that shows boys ahead at the higher grades, when they had been behind at 16. At A level, although girls enter their courses better qualified, they make less progress than their male counterparts given their GCSE results. The effect of entry patterns on the interpretation of the statistics is important for assessing differential performance.

The complex nature of the patterns of performance are obscured by current methods of statistical reporting. The common benchmark at A level is the A-E pass rate that indicates more females are succeeding at A level than males. For example, in 1995 females obtained 1.3% more A-E passes than males. However, these figures do not draw attention to the more extreme patterns of performance at the top end of the grades. More males than females obtain these top grades across a majority of the subjects at A level. In looking for explanations for this shift in performance between the two stages of examining, this research has highlighted fundamental differences in demand, structure and approaches to learning and assessment between the GCSE and A level. The findings of this study suggest that these differences must influence the change in the patterns of performance between the two examination stages.

The patterns of performance identified in GCSE and A level examinations are not unique. They reflect similar patterns identified in other countries with high stakes assessment and testing systems. Many countries are now beginning to note the superior performance of girls to boys at 16, particularly Australia, The Caribbean, Europe and the USA (see Arizpe and Arnot, 1997; Matters, 1997; Parry, 1996; Willingham and Cole, 1997). In fact, in the UK at age 18, the patterns observed within the A level examination are beginning to reflect those found in other countries. What distinguishes A level students in the UK from other international contexts is the choice of subject specialisation at this stage. The populations that go on to study A level examinations are quite particular and therefore have a bearing on the patterns of performance obtained.

This study has demonstrated that there are a series of complex factors that contribute to these patterns that need to be considered in evaluation of differential performance. The contribution of students' perceptions of subjects, their previous educational experiences and the type of demands that a subject makes are particularly important. As this research has illustrated, the task of determining how much differential performance is related to pupils' perceptions and outside experiences and how much to the structure and assessment of the subject is that much more complicated.

Examination papers and differential performance

This study analysed the performance of candidates on the 1993 ULEAC examination papers in English literature, mathematics and physics. Techniques for classifying items on question papers were used to obtain insight into those content areas, task types and contexts which may favour one group more than another. No such framework for classifying examination items has been used before in the UK to attempt to isolate those features of A level examination items which might have an effect on performance.

Research questions were linked to findings from previous research (specifically that carried out in the APU surveys and the Differential Performance project) that suggested the need to move beyond qualitative reviews of examination scripts and assessment items to look at actual performance on examinations. On the basis of APU findings and results from the Differential Performance project, hypotheses were formed about performance of males and females on particular items. Statistical tests were used to compare the differences in mean scores between males and females and outcomes were reviewed in the light of previous research. From the classification framework developed it was only possible to obtain a useful approximation of which features of the examination items might interact with gender.

Analysis of the examination papers (see Chapter 6) did not indicate that the examination papers were biased in any particular way towards males or females. At an item level, the direction of the small number of statistically significant differences observed were unexpectedly reinforced by teacher opinion. Subject-specific areas identified by teachers as difficult for males or females were exactly those areas in which the significant gender differences in performance occurred.

To explain the patterns of performance derived from the analyses of the examination papers, the number of items used in the analyses and the type of populations who sit these examinations were considered. By using only one syllabus in each subject, the range of items of a similar type that were analysed was limited. It was not possible, therefore, to observe any systematic, measurable differences between the two genders in relation to item characteristics. Moreover, the skewed populations who opt for A level have a qualitative effect on the performance patterns. Important considerations when looking at these differences in performance are the changes due to minority/majority student groups at this stage and the expectations that the minority groups bring to the study of the subjects. As argued in Chapter 6, minority groups of students in A level subjects have learnt to respond in ways that are demanded by the subject in order to be successful, to conform both to the culture of the subject they are studying and its associated curriculum and assessment structures.

Examination components and differential performance

An investigation of the issues regarding examination components and differential performance was carried out through an achieved weights analysis. Previous research (see Chapter 7) suggests that in practice the achieved weights of examination components do not reflect the intended weights as specified in the syllabus. The consequence of this is a reduction in the validity of the examination components. The present study considered whether this reduction in validity might have a differential effect for males and females. The concern was whether females benefit disproportionately from the inclusion of coursework components within the examination since girls are perceived to be better at coursework and are therefore likely to gain advantage from it.

The achieved weights analysis in English literature showed that females did gain slightly more marks on the coursework component than did males. However, the difference was small. For both groups, coursework tended to account for less of the variance in the total scores than did either of the examination papers. In physics a similar analysis showed that the more traditional style examination papers tended to account more for the final rank order of candidates than the less traditional papers. There was no compelling evidence that coursework contributes disproportionately to either males' or females' overall subject marks and hence, final grades.

It is these findings that are important, given the differential attention paid to coursework by females, and teachers' perceptions of the role that coursework plays in the final success of A level candidates. These findings conflict with teachers' perceptions that coursework favours females disproportionately in the examination process. Although females may benefit from coursework in curriculum terms, it is not the sole factor that explains better female performance.

Teachers' perceptions of, and attitudes to, differential performance

Much of the previous research (see Chapter 3) suggests that teachers' perceptions of how male and female students participate and perform in the various subjects influences their judgement of students' actual performance. These judgements are fed back to students in ways that influence students' beliefs about their own performance. Taking into account some of the suggestions from this previous research, this study was concerned with whether teachers' attitudes towards male and female performance and success at A level contributes in some way to differential performance.

The investigation was also interested in those institutional policies that could minimise gender-related differences in performance. Although equal opportunities policies existed, they were not always properly implemented or monitored. Awareness of gender issues and the importance attached to addressing them varied considerably. Policies of positive discrimination to redress gendered entry patterns in subjects were rejected. Teachers suggested that subject choices are already made well before students reached the sixth form. Moreover, departmental entry requirements for A level study tended to differ widely from whole-school policies. For example, more maths and physics departments required a GCSE grade A or B for A level study, even though a GCSE grade C was stated in institutional literature as the minimum requirement. The underlying rationale for such variations in entry requirements was to help students make appropriate A level choices. However, teachers' perceptions of what students are capable of may influence the advice they give and the messages they convey.

The style of the A level and the gender-related approaches to learning exhibited by students were identified as important factors in relation to differential performance. Teachers suggested that the A level requires a particular style of response and way of communicating with the examiner that is markedly different from GCSE. Teachers felt that A level rewards certain attributes and approaches (e.g. risking taking, analytical styles) more than others (e.g. empathy, discursive styles) and that this is likely to benefit males more than females. Based on these findings, it is possible to argue, therefore, that differential performance at A level is related to the particular style of assessing that this examination values. As a result, a greater awareness of the correspondence between style of learning and style of assessment is needed. This is important for assessment in general but of paramount importance for considerations of equity in assessment at this stage, where there is a heavy emphasis on selection for higher education. If, as these findings indicate, a particular style of response is valued at a particular level, then it must be explicitly taught.

Teachers' specific attitudes and perceptions

The most striking findings from the questionnaire and case study interviews were those that identified cross-subject similarities in teachers' perceptions of general male and female characteristics. In all three subjects boys were seen as more confident, less anxious and less affected by final examinations than girls. On the other hand, girls were perceived as more motivated and conscientious. Teachers identified confidence as one of the important differences between males and females. They suggested that girls lacked confidence in many aspects of their learning and assessment. This then negatively affects their engagement with the subject and how they perceive their own success. Teachers' comments regarding the differing success of boys and girls in the three subjects represented a shift in the way achievement or success is defined between GCSE and A level.

This was illustrated by teachers' comments about what constituted a good A level response. Words such as 'flair', 'sparkle', 'unique' characterised descriptions of good A level performance, often attributed more to males than to females. It was not uncommon for teachers to describe girls' performance as diligent and competent -"not brilliant but very very good." Males were seen to be risk takers, girls as more cautious. Such attitudes mean that boys' positive self-perceptions of their own ability to succeed may eliminate any shortcomings they have in relation to lack of content knowledge or skill . Girls who are seen as generally less confident and more circumspect may be judged as having less command of a subject, this can then restrict their overall achievement.

Students' perceptions of, and attitudes to, differential performance

In this research study I was also interested in hearing the students' voice regarding their ideas about differential performance. As such, students' own perceptions of, and attitudes to, performance were considered important in the interpretation of the outcomes obtained.

The sample of students drawn from the case study schools showed themselves to be a very positive group of students. Male students rated themselves as confident, not particularly anxious and experiencing little difficulty with their A Level subjects while female students, on the other hand, considered themselves conscientious and concerned with presentation. When asked to rate themselves against their male/female peers both genders rated themselves as confident and as able as their opposite- and same-sex peers, although females saw themselves as generally more motivated.

These comments on students' perceptions and experiences in relation to themselves and their peers was invaluable, especially in relation to the teachers' comments. While some of the teachers' perceptions were shared by the students, results from the student survey showed few significant differences between the two genders. Teachers had been fairly clear in identifying male and female differences in confidence, conscientiousness and final examination success. Students were sure that both males and females were conscientious about work and able to get good examination grades. Females, however, did appear slightly less confident than their male counterparts. The extent of the divergence between students' views and those expressed by their teachers is important in relation to differential performance. There appears to be some dissonance between what teachers perceive male and female attainment to be and what students actually perceive their own attainment to be.

Despite the ability and self-assurance displayed by this sample of students, subject choices fell clearly along gendered lines. More males opted for maths and sciences and more females opted for arts and the humanities. The skewed subject choices of males and females continue to compound the issue of differential performance. There are many factors that influence the positive subject choices of students and their rejection of certain subjects when they are no-longer compulsory (Whitehead, 1996). However, not all the factors are linked to the students themselves. Considerations of the construction of these subjects, how they are defined, how they are assessed and wider pedagogical issues must all come into play in understanding why students choose the subjects they do.

Reflections on the research methods

At the heart of this research project is an understanding that different types and levels of data reveal different aspects of what is being studied. The emphasis is not on ignoring these differences but on understanding them and their relationship to differential performance. As this study has demonstrated, it is possible to identify a variety of factors that influence the ways in which students participate and perform at this stage of examining. Positioning research into gender equity in assessment and examinations within a post-positive framework allows for the recognition that students' worlds are gendered. The way students engage with learning and assessment tasks, examinations and the choices that they make are directly affected by this. Consequently, any research into differential performance cannot ignore the impact of these gendered realities. In the following discussion, three of the methods used, that are of particular interest, are briefly discussed.

The Classification Framework

The classification framework developed for this research provided a useful structure to identify the types of content, task types and contexts used in the examination papers. Use of this classification framework was not unproblematic. For example, it was difficult to discern the specific interaction between the item characteristics. As a result, the framework itself can only be used a an approximate measure of those features of examination items contributing to differential performance.

One weakness of this research is that the framework was applied to a limited range of items. Therefore, the use of such a framework in future research must employ a specific set of items and test populations. This would better enable certain item characteristics to be held common while others varied in an attempt to isolate those factors which might have an effect on sub-group performance.

Achieved weights analysis

The achieved weights analysis investigated the contribution of the different A level examination components to differential performance. This dimension was unique to this research. As stated previously, however, this analysis was not unproblematic. By adding the gender variable to the analysis, this research has shown that examination components do operate differentially for males and females. This research has demonstrated that the mean marks of each sub-group on each paper, as well as, the spread of marks, need to be considered in evaluating the extent of the contribution of examination components to differential performance. Consequently, it is both these factors that compound the interpretation of the achieved weights analysis. Future research will need to address the effect of differential validity of examination components for males and females.

Number of syllabuses used

A limitation of this study was the decision to use one syllabus from one examination board in each of the three subjects. However, there were historical and practical reasons for such a decision. When the proposal was submitted to the Nuffield Foundation for funding consideration, I was employed by ULEAC as a research officer and was granted access to their examination data. Moreover, it was not feasible in the initial stages of the research to obtain the co-operation and involvement of one or two other boards to collect scripts and examination data at an item level in a similar way. The project itself was independent of any other examination board work at the time. Yet, the syllabuses chosen reflected other popular syllabuses from other boards with common cores and similar types of content covered.

Evidence supporting the current literature

The patterns of performance that were discussed in Chapter 5 have supported those patterns identified in previous studies of performance. The size of the gaps indicate a similar magnitude to those found in other studies of A level performance, as well as, similar directions in terms of male or female advantage (Arnot, David and Weiner, 1996). A dimension of this project that advances considerations of differential performance is a rejection of the more common benchmarks used in reporting of A level performance. This study has focused on the higher grades where the differences are more distinct.

The evidence collected on teachers' and students' attitudes and perceptions of A level performance are similar to that reported in other studies (Stables and Stables, 1995; Gallagher *et al.*, 1996). These patterns support other findings that suggest that both teachers' and students' opinions are still largely traditional. This result is somewhat surprising given the attention paid to issues of equal opportunities and schooling over the last twenty years. In relation to how such attitudes might contribute to differential performance, the present study compared teachers' attitudes and perceptions of male and female performance with those of their students'. Within the limited scope of the population of teachers and students compared, the evidence suggests that the difference in their attitudes and perceptions, is a significant factor in the observed outcomes.

The theoretical aspects of gendered learning and its interaction with assessment (see Chapter 3) help to explain the differences in performance obtained. The focus, therefore, of this study was on social and environmental explanatory factors. Murphy (1996a, b, and c) has shown that since male and female students live in a gendered world, they have gendered experiences, views of relevance, expectations, attitudes to school and styles of expression and communication, that significantly effect assessment outcomes. Based mainly on the findings of Murphy (1996a, b, and c) and Halpern (1992), biological explanations were rejected at the outset of this study as less valid explanations of gender differences in performance. This study assumes that biological explanations cannot account for the magnitude of the differences obtained, nor the shifting patterns in outcomes observed, not only in the public examination system in the UK, but in assessment systems in other countries.

The data from this study also supports those manifestations of the effects of gendered learning such as learned helplessness (Dweck *et al.*, 1978) and gendered styles of learning and working (Becker, 1995; Blenekey *et al.*, 1986; Head, 1996). Maladaptive patterns of behaviour have been reflected in the attitudes and behaviours of students as perceived by their teachers. In the complex interaction of teachers' and students' perceptions, boys were seen, and saw themselves as risk takers and more confident than their female peers. Girls, on the other hand, were perceived, and perceived themselves, as more cautious and less confident. These effects are, to some extent, cumulative for girls and help explain why it is that girls make less progress between 16 and 18 than do boys.

In terms of the examination settings, gendered approaches to learning are reflected in how students differentially communicate what they know. Again, teachers and students indicated gender differences in terms of written responses and attention paid to presentation, neatness and general conscientiousness. A possible implication of these different styles of learning and communication is that students then tend to move into those subjects were they feel more comfortable and were their preferred style is encouraged. For example, it may be that connected and separate knowers tend to choose those subjects that support their particular style of knowing and thinking. This may also account for the relatively small number of women who pursue subjects (such as maths and science) where separated knowing is not only advantageous, but important.

This research study supports those explanations of differential performance that are related to the assessment technique used. In relation to mode of response, the work of Murphy (1980, 1982) and Newbold (1980) is still useful in interpreting the differences in performance. Later work on the use of real life contexts (Boaler, 1994; Cooper, 1996; Murphy, 1995), content effects (Stobart *et al.*, 1992; White 1996) and coursework effects in public examinations (Cresswell, 1990; Stobart *et al.*, 1992b) has enhanced our understanding of the patterns of male and female differences obtained in the different aspects of the A level examination. This study has both developed and supported those arguments set out in the work of Stobart, Elwood and Quinlan (1992) in relation to fairness in examinations. The critical issues are to do with the ways in which public examinations shape pupils' experiences, their perceptions of subjects and the ways in which their understanding is assessed. In this study these critical issues have been taken seriously acknowledging that these factors are crucial for both selection of, and performance within, examination courses.

New contributions

Through the triangulation of all the different levels of data there are some findings that cannot be fully explained through the current research literature. The contributions made by this research project to the area of debate lie, primarily, in the extension of those explanations related to the role of examinations in contributing to differential performance. The research has identified several new links between differential performance and examination structures that further explain patterns of gender-related differences observed in public examinations:

- Gender-related patterns of performance have to be interpreted in relation to the population who sit the examinations. The British examining context is unique. The A level system is a prime example of this. The populations who sit A level examinations have a qualitative impact on the results. Therefore, when investigating differential performance they need to be looked at more closely. In fact, recent work from the USA on test performance (Lewis and Willingham, 1997) is evaluating the statistical effect of self-selecting test populations on differential performance. A similar focus needs to be pursued in the UK. In explaining any of the differences observed we need to understand the statistical and educational impact of self-selecting test populations.

- The shifts in validity of examination components due to differences between intended and achieved weights are generally cause for concern. The crucial issues are how components may be differentially valid for different sub-groups. By addressing the issues of differential validity for different groups, the achieved weights analysis by gender has introduced an added dimension to a statistical exercise. This addition to the analysis enhances our understanding of the complexities surrounding differential performance.

- The research suggests that a link does exist between gender, styles of learning and the style of examination. Through triangulation of the data, a connection was identified between the ways in which examinations are structured and assessed and the gendered preferences for ways of working and communicating. The evidence from this study implies a shift in the assessment and definition of achievement between GCSE and A level that has an impact on performance.

- On the basis of this research study and my previous research experience, I would argue that generally, at GCSE, the preference for a connected style of thinking and knowing, for embedding and being reflective, is advantageous in many subjects. This may account for the higher achievement of girls at this stage of schooling since the style of the examination fits more with their preference for connected ways of working. In a similar vein, I would argue that at A level, a preference for a separate way of knowing and thinking and a tendency to extract and to be impulsive, is advantageous in the majority of subjects. This may explain boys' better performance at this stage since their preferred styles of working complement the styles of examining valued at A level. If this is the case, the styles of working, communicating and expression required for each examination needs to be explicitly acknowledged and taught so that all groups are provided with equal opportunities to succeed at all examination stages.

Looking forward - the need for intervention?

The debates about whether the A level should retain its present structure, change to accommodate wider educational developments and/or be replaced altogether are well known (DES, 1988c; Dearing, 1996; Hodgson and Spurs, 1997). From the Higginson report (DES, *op. cit.*) through to Dearing's Review of Post-16 qualifications, the A Level examination system has managed to survive the calls for it to be reconstructed in order to better suit the needs of the changing population of students who now sit this qualification. By its main purpose of selection for higher education, the A level has managed to retain its basic structure (predominantly assessed through final examinations) and continues to be upheld as the 'Gold Standard' of British examinations. However, the continuation of the A level in its present form is a more politically based decision than an educational one, even though many commentators suggest that the A level is not the most suitable qualification to prepare British young people for the changing world of education and employment in the 21st Century. The final discussion of this chapter considers future research agendas in relation to gender equity and the A level examination. The findings of this research indicate that we have much to do in ensuring fairness in these socially significant examinations.

One major change that has occurred within A level examinations over the last few years has been the introduction of modular syllabuses. Most A level examining boards now offer modular syllabuses in the majority of subjects studied at A level. Entry rates into modular syllabuses have shown them to be popular with schools and colleges, if not with politicians (AEB, 1995). Schools and colleges can opt to either treat the syllabuses in a totally modular way, taking the required modules in a series of sittings over the two year course of study, or opt to sit all the required modules as final examination papers at the end of a two year course, like traditional linear syllabuses. Even though problems have been acknowledged in technical issues related to awarding procedures in modular syllabuses (Quinlan, 1997, personal communication) their popularity and accessible links with other modular qualifications post-16 (such as GNVQs) are likely to give support to their continued development.

We know very little about the impact of modular assessment on differential performance. I would argue that in any future research agenda this impact should be investigated. The gap in performance between males and females is beginning to close with females showing a slight advantage in terms of the proportion of A-C grades obtained (see Chapter 5). In fact, the model of assessment inherent in modular syllabuses might well be shifting the balance in patterns of performance.

Another important issue is that the GCE A level has never been the focus of a specific review in terms of gender equity at a policy level. Equal opportunity is often mentioned in government agency and examining board literature but we have yet to see any systematic monitoring, year-on-year, of differential performance or investigations into the factors that create or affect it. If there is concern about producing fair and unbiased examinations, then there is a need to review those examinations which are already in place to gauge their impact. The formation of the new Qualifications and Curriculum Authority (QCA) in October 1997 to oversee all qualifications (both academic and vocational) would seem to represent such an opportunity for the introduction of the systematic monitoring of equity issues in public examinations and qualifications in general. Comparatively, the UK has a long way to go in committing itself to integrating considerations of equity in the area of qualifications at a policy level. Work from Australia demonstrates that positive transformations can take place in curriculum, assessment and pedagogy when there is a commitment to value those aspects, in assessment structures, that both boys and girls bring to their schooling.

In Australia, 'gender-inclusive' has become a shorthand term for including a comprehensive gender analysis in educational practices (Lewis, 1996). An example of how a gender-inclusive approach in a high stakes assessment situation successfully transformed both male and female participation and performance patterns is evident in the Victoria Certificate of Education (VCE) physics examination (Hildebrand, 1996). In this syllabus, integrated, formative work requirements value different learning approaches and provide a range of ways for students to show evidence of their learning. Assessment tasks are set in real world contexts, are accompanied by explicit guidelines and criteria, value qualitative understanding and require a variety of data sources and assessors.

The quite radical shift in the conceptualisation of learning and assessing brought about by the implementation of this syllabus means that it is no longer possible to teach and assess physics in traditional ways.

These changes in style of assessment have brought about better participation and performance rates for males and females. One could argue that the above example illustrates Goldstein's notion of an assessment led pedagogy (see Chapter 2). However, it is perhaps more constructive to see it as the practical implementation of a more equitable definition of assessment and an attempt to operate a fair assessment system that values the experiences of all those students who take part in it. It would be of interest, in the light of the findings reported in this thesis, to see what effect a gender-inclusive approach might have on the participation and performance of males and females in the GCE A level. In relation to present reviews of qualifications post-16 and general concerns about the reduction in students choosing to take science subjects in post-compulsory education and beyond, the evidence from this research suggests that it is timely to review how certain subjects are defined, taught and assessed in the GCE A level. In fact, several teachers expressed a belief that being pro-active in changing the image, the perceived difficulty of subjects and how subjects are integrated with the real world in which students live, would go some way to increasing participation and success.

Conclusions

Gender-equity in relation to A level examinations is a complex issue. As this thesis has demonstrated gender-equity in relation to A level examinations goes well beyond notions of insensitivity in the setting of examination papers. It involves, at a much deeper level, the construction of the subjects themselves, the relative experiences of the males and females who sit these examinations, the expectations they and their teachers bring to the subjects they study, and how students and teachers perceive their own capabilities and successes at this stage of schooling. As Connell, Johnson and White remind us, "...assessment practices are not technical devices which are socially neutral, but social techniques which have social consequences." (Connell *et al.*, 1992, p. 23, quoted in Hildebrand, 1996, p.169). The GCE A level possibly has the greatest social consequences of all the qualifications taken within the UK. Therefore, the ways in which examiners choose to assess the subjects and how achievement is defined at this stage of examining, must influence, and be influenced by considerations of equity in its broadest sense, that is, in terms of gender, ethnicity, class and special educational needs.

To obtain a more equitable definition of assessment at all stages of examining and testing in the UK, we need to acknowledge that the more positivistic characteristics of assessment of achievement (reliability, objectivity and quantitative outcomes) must be complemented by those more interpretative aspects (validity, subjectivity and qualitative processes) of educational assessment. Furthermore, in considering equity in relation to examinations Gipps and Murphy (1994) argue " that there is no such thing as a fair test, nor could there be: the situation is too complex and the notion too simplistic" (Gipps and Murphy, 1994, p. 273). If we accept Gipps and Murphy's stance as a truism, it follows then that all assessment experiences are not all equal for all groups. In light of this, what is offered to students at one of the most important stages of examining in the UK, in terms of syllabus content, assessment modes and access to a more comprehensive curriculum, needs to be systematically reviewed.

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Script Samples

A random sample of scripts were selected across the three subjects at the subject grade level. The scripts selected for the analysis of performance were chosen from the following syllabuses and components for each of the three subjects; each syllabus having been identified as the most popular in each of the three subjects:

Mathematics:

A pure maths and statistics syllabus(9374) and a pure maths and mechanics syllabus (9371) were chosen. The pure maths and statistics syllabus had a higher female entry and the pure maths and mechanics a higher male entry. ULEAC maths syllabuses are modular so that an A level in pure maths and statistics is made up of four modules: Pure Maths 1 (P1), Pure Maths 2 (P2), Statistics 1 (S1) and Statistics 2 (S2). An A level in pure maths and mechanics is made up of P1 and P2 with Mechanics 1 (M1) and Mechanics 2 (M2). The scripts used in this study were taken from candidates who took all four modules in one sitting. Table 1 shows the final numbers of scripts that were sampled for mathematics. For pure maths and statistics, a total of 313 scripts (164 male and 149 female) across four papers were selected, a total of 1252 scripts. For pure maths and mechanics, a total of 556 scripts (410 male and 146 female) were selected across four papers, 2224 scripts in all. Therefore, the analysis of performance on mathematics was carried out on roughly 3480 scripts.

Table 1
Number of scripts sampled at each grade for Mathematics

Syllabus Options	Grade A	Grade B	Grade C	Grade D	Grade E	Grade N	Grade U	Total
Pure maths & Stats	33 M F 16 17	34 M F 22 12	58 M F 30 28	66 M F 29 37	48 M F 28 20	42 M F 21 21	32 M F 18 14	313 M F 164 149
Pure maths & mech.	69 M F 51 18	112 M F 75 37	87 M F 69 18	88 M F 65 23	71 M F 53 17	77 M F 56 21	53 M F 41 13	556 M F 410 146

Physics:

Syllabus 9540 was chosen which has four papers; Paper 1 (multiple choice), Paper 2 (short and long item response), Paper 3 (passage analysis and topics in physics) and Paper 4 (practical paper). Scripts were available for Papers 2, 3, and 4. Marks were obtained for performance in Paper 1 and were used in the achieved weights analysis (outlined in Chapter 7). Table 2 shows the final numbers of scripts that were sampled for physics.

Table 2
Number of scripts sampled at each grade for physics

Syllabus Options	Grade A	Grade B	Grade C	Grade D	Grade E	Grade N	Grade U	Total
Physics	90 M F 74 16	100 M F 68 32	105 M F 76 29	105 M F 81 24	90 M F 73 17	65 M F 49 16	55 M F 44 11	610 M F 465 145

For physics, a total of 610 scripts (465 male and 145 female) across three papers were selected. Therefore, the analysis of performance on physics was carried out on 1830 scripts.

English Literature:

Syllabus 9170 was chosen which has both a coursework (option 1) and a non-coursework (option 2) option . The papers which make up the examination are Paper 1 (Comprehension and Appreciation), Paper 3 (Major authors) and Paper 4 (Topics in literature, which can be taken as a coursework or non-coursework paper). A selection of scripts by grade were taken across both the coursework and non-coursework options. For the coursework option, coursework portfolios were not available for sampling as these are not retained by ULEAC. However, candidates' marks on the coursework components were available and these were used in the achieved weights analysis (again see Chapter 7). Table 3 shows the final numbers of scripts that were sampled for English literature.

Table 3
Number of scripts sampled at each grade for English literature

Syllabus Options	Grade A	Grade B	Grade C	Grade D	Grade E	Grade N	Grade U	Total
Option 1	94 M F 24 70	120 M F 32 88	93 M F 26 67	91 M F 32 59	59 M F 18 41	32 M F 15 17	18 M F 8 10	507 M F 155 352
Option 2	38 M F 8 30	45 M F 14 31	40 M F 8 32	27 M F 3 24	29 M F 9 20	19 M F 7 12	24 M F 6 18	220 M F 55 165

For option 1 a total of 507 scripts (155 male and 352 female) across two papers were selected, a total of 1014 scripts. For option 2, a total of 220 scripts (55 male and 165 female) were selected across three papers, 660 scripts in all. Therefore, the analysis of performance on English literature was carried out on roughly 1670 scripts.

The following appendices (pp. 240-306) have been removed DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

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ULEAC Pure Maths Paper 1 (Mechanics Option) 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05	
Q1	4	3.02	1.21	2.97	1.17	75.50	74.25	1.25	0.67	
Q2	5	3.06	1.80	3.01	1.70	61.20	60.20	1.00	0.75	
Q3	7	4.68	2.40	4.94	2.10	66.86	70.57	-3.71	0.25	
Q3A	3	2.33	1.18	2.61	0.85	77.67	87.00	-9.33	0.01	*
Q3B	4	2.35	1.68	2.33	1.61	58.75	58.25	0.50	0.91	
Q4	8	5.68	2.59	3.37	2.21	71.00	42.13	28.88	0.01	*
Q4A	2	1.73	0.65	1.86	0.45	86.50	93.00	-6.50	0.02	*
Q4B	3	2.35	1.14	2.52	1.01	78.33	84.00	-5.67	0.11	
Q4C	3	1.60	1.34	1.98	1.29	53.33	66.00	-12.67	0.01	*
Q5	9	7.69	2.17	7.92	1.89	85.44	88.00	-2.56	0.26	
Q5A	4	3.69	0.96	3.86	0.61	92.25	96.50	-4.25	0.03	*
Q5B	5	4.00	1.76	4.06	1.68	80.00	81.20	-1.20	0.74	
Q6	9	5.27	3.63	5.48	3.26	58.56	60.89	-2.33	0.54	
Q7	12	4.65	2.62	4.34	2.49	38.75	36.17	2.58	0.23	
Q7A	4	1.56	1.41	1.41	1.46	39.00	35.25	3.75	0.30	
Q7B	4	2.82	1.40	2.71	1.47	70.50	67.75	2.75	0.46	
Q7C	4	0.27	0.79	0.22	0.70	6.75	5.50	1.25	0.53	
Q8	13	9.97	4.05	10.32	3.61	76.69	79.38	-2.69	0.37	
Q8A	4	3.28	1.44	3.44	1.34	82.00	86.00	-4.00	0.26	
Q8B	5	4.18	1.64	4.34	1.33	83.60	86.80	-3.20	0.29	
Q8C	1	0.76	0.56	0.73	0.45	76.00	73.00	3.00	0.46	
Q8D	3	1.75	1.37	1.82	1.37	58.33	60.67	-2.33	0.63	
Q9	15	10.59	4.85	10.89	4.37	70.60	72.60	-2.00	0.51	
Q9A	5	4.15	1.60	4.39	1.27	83.00	87.80	-4.80	0.01	*
Q9B	2	1.63	0.77	1.70	0.64	81.50	85.00	-3.50	0.27	
Q9C	3	2.22	1.20	2.24	1.19	74.00	74.67	-0.67	0.85	
Q9D	2	1.11	0.97	1.11	0.97	55.50	55.50	0.00	0.99	
Q9E	3	1.48	1.45	1.45	1.44	49.33	48.33	1.00	0.85	
Q10	18	12.08	5.03	12.34	4.82	67.11	68.56	-1.44	0.60	
Q10A	4	3.46	1.29	3.67	1.07	86.50	91.75	-5.25	0.07	
Q10B	3	2.42	1.06	2.52	0.98	80.67	84.00	-3.33	0.38	
Q10C	4	2.92	1.38	2.95	1.30	73.00	73.75	-0.75	0.79	
Q10D	7	3.28	2.72	3.20	2.78	46.86	45.71	1.14	0.80	
PAPER TOTAL	100	66.68	20.42	68.59	18.85	66.68	68.59	-1.91	0.34	

*statistically significant

ULEAC Pure Maths Paper 1 (Statistics Option) 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	4	2.99	1.23	3.00	1.21	74.75	75.00	-0.25	0.93
Q2	5	2.56	1.93	2.47	1.83	51.20	49.40	1.80	0.70
Q3	7	4.07	2.55	3.53	2.34	58.14	50.43	7.71	0.07
Q3A	3	2.25	1.24	2.19	1.23	75.00	73.00	2.00	0.71
Q3B	4	1.82	1.81	1.34	1.58	45.50	33.50	12.00	0.02
Q4	8	5.11	2.69	5.71	2.22	63.88	71.38	-7.50	0.04 *
Q4A	2	1.70	0.68	1.79	0.56	85.00	89.50	-4.50	0.20
Q4B	3	2.12	1.26	2.47	0.99	70.67	82.33	-11.67	0.01 *
Q4C	3	1.28	1.31	1.44	1.32	42.67	48.00	-5.33	0.31
Q5	9	7.82	2.18	7.62	2.04	86.89	84.67	2.22	0.44
Q5A	4	3.76	0.84	3.74	0.83	94.00	93.50	0.50	0.79
Q5B	5	4.05	1.80	3.89	1.86	81.00	77.80	3.20	0.45
Q6	9	4.16	3.71	4.30	3.77	46.22	47.78	-1.56	0.75
Q7	12	4.05	2.54	4.26	2.48	33.75	35.50	-1.75	0.50
Q7A	4	1.31	1.28	1.44	1.48	32.75	36.00	-3.25	0.45
Q7B	4	2.59	1.60	2.72	1.48	64.75	68.00	-3.25	0.48
Q7C	4	0.16	0.54	0.09	0.48	4.00	2.25	1.75	0.34
Q8	13	8.45	4.61	8.52	3.95	65.00	65.54	-0.54	0.88
Q8A	4	2.66	1.78	2.85	1.71	66.50	71.25	-4.75	0.35
Q8B	5	3.72	1.90	3.87	1.67	74.40	77.40	-3.00	0.47
Q8C	1	0.65	0.55	0.59	0.51	65.00	59.00	6.00	0.39
Q8D	3	1.44	1.39	1.21	1.34	48.00	40.33	7.67	0.17
Q9	15	10.24	5.00	10.05	4.55	68.27	67.00	1.27	0.73
Q9A	5	4.05	1.72	4.22	1.48	81.00	84.40	-3.40	0.37
Q9B	2	1.63	0.78	1.59	0.77	81.50	79.50	2.00	0.65
Q9C	3	1.99	1.35	1.97	1.31	66.33	65.67	0.67	0.88
Q9D	2	1.02	0.97	1.05	0.99	51.00	52.50	-1.50	0.81
Q9E	3	1.49	1.46	1.22	1.39	49.67	40.67	9.00	0.11
Q10	18	11.61	4.77	11.62	4.39	64.50	64.56	-0.06	0.99
Q10A	4	3.56	1.20	3.75	0.92	89.00	93.75	-4.75	0.13
Q10B	3	2.50	1.00	2.41	1.07	83.33	80.33	3.00	0.45
Q10C	4	2.92	1.39	2.95	1.34	73.00	73.75	-0.75	0.83
Q10D	7	2.64	2.64	2.50	2.59	37.71	35.71	2.00	0.67
PAPER TOTAL	100	61.05	20.55	61.09	18.36	61.05	61.09	-0.04	0.99

*statistically significant

ULEAC Pure Maths Paper 2 (Statistics Option) 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	6	2.99	2.46	3.05	2.35	49.83	50.83	-1.00	0.81
Q2	9	5.39	2.60	4.83	2.52	59.89	53.67	6.22	0.03 *
Q2A	3	1.96	1.35	1.68	1.43	65.33	56.00	9.33	0.06
Q2B	3	2.25	1.21	2.11	1.23	75.00	70.33	4.67	0.26
Q2C	3	1.18	0.92	1.05	0.78	39.33	35.00	4.33	0.09
Q3	9	2.12	1.89	2.13	1.75	23.56	23.67	-0.11	0.94
Q4	9	3.03	3.11	3.54	3.11	33.67	39.33	-5.67	0.11
Q5	11	6.95	3.20	7.18	2.91	63.18	65.27	-2.09	0.46
Q5A	4	2.65	1.65	2.79	1.61	66.25	69.75	-3.50	0.40
Q5B	3	2.54	0.93	2.59	0.84	84.67	86.33	-1.67	0.55
Q5C	4	1.77	1.49	1.80	1.45	44.25	45.00	-0.75	0.82
Q6	12	4.09	3.22	4.48	3.25	34.08	37.33	-3.25	0.24
Q7	12	5.14	4.42	5.80	4.13	42.83	48.33	-5.50	0.13
Q7A	4	2.35	1.76	2.76	1.67	58.75	69.00	-10.25	0.02 *
Q7B	8	2.79	3.15	3.04	3.06	34.88	38.00	-3.13	0.43
Q8	15	3.78	3.84	4.01	3.41	25.20	26.73	-1.53	0.54
Q8A	4	1.93	1.58	2.15	1.57	48.25	53.75	-5.50	0.17
Q8B	5	1.31	1.96	1.46	1.98	26.20	29.20	-3.00	0.46
Q8C	6	0.55	1.50	0.40	1.21	9.17	6.67	2.50	0.26
Q9	18	7.39	5.28	8.31	4.76	41.06	46.17	-5.11	0.07
Q9A	5	3.03	2.05	3.59	1.89	60.60	71.80	-11.20	0.01 *
Q9B	3	0.88	1.07	0.83	1.01	29.33	27.67	1.67	0.67
Q9C	5	1.65	1.78	1.78	1.77	33.00	35.60	-2.60	0.49
Q9D	5	1.83	1.90	2.11	1.80	36.60	42.20	-5.60	0.14
PAPER TOTAL	100	40.89	21.47	43.30	19.71	40.89	43.30	-2.41	0.24

*statistically significant

ULEAC Pure Maths Paper 2 (Statistics Option) 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	6	2.69	2.67	2.47	2.33	44.83	41.17	3.67	0.44
Q2	9	4.70	2.76	4.21	2.67	52.22	46.78	5.44	0.14
Q2A	3	1.61	1.39	1.40	1.41	53.67	46.67	7.00	0.21
Q2B	3	2.01	1.28	1.80	1.39	67.00	60.00	7.00	0.18
Q2C	3	1.07	0.84	1.01	0.70	35.67	33.67	2.00	0.52
Q3	9	2.17	1.94	2.01	1.73	24.11	22.33	1.78	0.46
Q4	9	2.86	2.69	3.03	3.01	31.78	33.67	-1.89	0.62
Q5	11	6.24	3.35	6.22	2.94	56.73	56.55	0.18	0.30
Q5A	4	2.39	1.70	2.67	1.63	59.75	66.75	-7.00	0.15
Q5B	3	2.34	1.05	2.49	0.97	78.00	83.00	-5.00	0.21
Q5C	4	1.54	1.44	1.46	1.34	38.50	36.50	2.00	0.62
Q6	12	3.03	2.98	2.74	2.69	25.25	22.83	2.42	0.39
Q7	12	4.47	3.95	5.03	4.12	37.25	41.92	-4.67	0.24
Q7A	4	2.38	1.74	2.42	1.73	59.50	60.50	-1.00	0.83
Q7B	8	2.09	2.83	2.61	2.99	26.13	32.63	-6.50	0.14
Q8	15	2.97	3.19	3.06	3.12	19.80	20.40	-0.60	0.80
Q8A	4	1.68	1.49	1.83	1.60	42.00	45.75	-3.75	0.41
Q8B	5	1.05	1.97	1.02	1.77	21.00	20.40	0.60	0.91
Q8C	6	0.22	0.78	0.19	0.77	3.67	3.17	0.50	0.73
Q9	18	6.51	4.61	6.76	4.60	36.17	37.56	-1.39	0.66
Q9A	5	2.71	2.08	2.96	1.90	54.20	59.20	-5.00	0.30
Q9B	3	0.61	0.95	0.54	0.87	20.33	18.00	2.33	0.53
Q9C	5	1.41	1.80	1.33	1.64	28.20	26.60	1.60	0.70
Q9D	5	1.79	1.77	1.93	1.83	35.80	38.60	-2.80	0.53
PAPER TOTAL	100	35.63	19.36	35.92	19.58	35.63	35.92	-0.29	0.90

*statistically significant

ULEAC Mechanics M1 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	6	4.58	1.86	4.01	2.02	76.33	66.83	9.50	0.00 *
Q1A	2	1.91	0.37	1.88	0.45	95.50	94.00	1.50	0.45
Q1B	4	2.67	1.74	2.13	1.87	66.75	53.25	13.50	0.00 *
Q2	6	4.43	1.54	4.39	1.69	73.83	73.17	0.67	0.83
Q3	8	5.77	2.43	5.56	2.41	72.13	69.50	2.63	0.38
Q3A	2	1.94	0.32	1.92	0.37	97.00	96.00	1.00	0.49
Q3B	4	2.29	1.81	2.14	1.83	57.25	53.50	3.75	0.40
Q3C	2	1.54	0.83	1.51	0.86	77.00	75.50	1.50	0.70
Q4	8	4.39	3.28	4.23	3.26	54.88	52.88	2.00	0.63
Q4A	6	3.31	2.55	3.16	2.54	55.17	52.67	2.50	0.55
Q4B	2	1.08	0.92	1.07	0.92	54.00	53.50	0.50	0.93
Q5	8	5.96	2.61	5.24	2.84	74.50	65.50	9.00	0.01 *
Q5A	3	2.51	0.99	2.36	1.06	83.67	78.67	5.00	0.15
Q5B	2	1.97	0.75	1.44	0.90	98.50	72.00	26.50	0.01 *
Q5C	3	1.79	1.36	1.44	1.40	59.67	48.00	11.67	0.01 *
Q6	9	7.04	2.71	6.97	2.75	78.21	77.39	0.82	0.79
Q6A	6	4.59	1.94	4.55	1.99	76.50	75.76	0.74	0.82
Q6B	3	2.45	1.06	2.41	1.06	81.63	80.19	1.44	0.68
Q7	10	5.35	3.00	5.40	2.88	53.50	54.00	-0.50	0.87
Q8	13	7.77	3.70	7.70	3.54	59.73	59.23	0.51	0.85
Q8A	3	2.69	0.84	2.83	0.57	89.71	94.17	-4.46	0.04 *
Q8B	10	5.08	3.33	4.87	3.27	50.77	48.67	2.09	0.52
Q9	15	8.67	5.04	8.74	5.02	57.78	58.24	-0.45	0.89
Q9A	5	3.73	1.69	3.56	1.80	74.63	71.29	3.35	0.34
Q9B	10	4.96	4.34	5.16	4.07	49.63	51.57	-1.94	0.64
Q10	17	8.63	5.42	8.28	4.99	50.77	48.71	2.05	0.50
Q10A	5	4.09	2.97	3.90	2.83	81.80	77.93	3.88	0.51
Q10B	8	3.33	2.63	3.36	2.79	41.57	42.04	-0.47	0.89
Q10C	4	1.21	1.70	1.00	1.52	30.25	25.00	5.25	0.19
PAPER TOTAL	100	59.98	22.32	59.22	22.73	59.98	59.22	0.75	0.74

*statistically significant

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	6	4.37	1.76	4.22	1.86	72.83	70.33	2.50	0.41
Q1A	2	1.54	0.66	1.52	0.67	77.00	76.00	1.00	0.74
Q1B	4	2.83	1.29	2.70	1.43	70.75	67.50	3.25	0.37
Q2	8	5.68	2.68	5.98	2.62	71.00	74.75	-3.75	0.27
Q2A	4	2.67	0.85	2.71	0.93	66.75	67.75	-1.00	0.72
Q2B	4	3.02	2.19	3.28	2.12	75.50	82.00	-6.50	0.23
Q3	9	4.14	2.58	4.79	2.34	46.00	53.22	-7.22	0.01 *
Q3A	6	3.58	2.21	4.15	1.90	59.67	69.17	-9.50	0.01 *
Q3B	3	0.56	0.80	0.63	0.85	18.67	21.00	-2.33	0.40
Q4	9	3.86	2.93	3.46	2.93	42.89	38.44	4.44	0.20
Q4A	7	3.50	2.55	3.11	2.54	50.00	44.43	5.57	0.16
Q4B	2	0.36	0.71	0.37	0.72	18.00	18.50	-0.50	0.89
Q5	11	5.41	3.81	5.15	3.81	49.18	46.82	2.36	0.52
Q5A	8	4.15	2.93	4.20	3.02	51.88	52.50	-0.62	0.90
Q5B	3	1.24	1.40	0.96	1.35	41.33	32.00	9.33	0.05 *
Q6	12	2.53	3.10	2.07	2.89	21.08	17.25	3.83	0.16
Q6A	8	2.17	2.64	1.86	2.52	27.13	23.25	3.88	0.27
Q6B	4	0.36	0.89	0.21	0.64	9.00	5.25	3.75	0.07
Q7	12	3.60	4.33	3.41	4.10	30.00	28.42	1.58	0.67
Q7A	10	3.01	3.84	2.30	3.75	30.10	23.00	7.10	0.94
Q7B	2	0.60	0.88	0.43	0.74	30.00	21.50	8.50	0.05 *
Q8	16	3.87	4.82	3.72	4.61	24.19	23.25	0.94	0.77
Q8A	3	1.18	1.31	1.15	1.31	39.33	38.33	1.00	0.83
Q8B	4	1.28	1.66	1.11	1.60	32.00	27.75	4.25	0.32
Q8C	2	0.29	0.68	0.23	0.61	14.50	11.50	3.00	0.35
Q8D	7	1.14	2.30	1.23	2.45	16.29	17.57	-1.29	0.71
Q9	17	8.97	5.67	9.03	5.94	52.76	53.12	-0.35	0.92
Q9A	8	5.47	2.94	5.27	3.03	68.38	65.88	2.50	0.53
Q9B	9	3.50	3.37	3.77	3.45	38.89	41.89	-3.00	0.45
PAPER TOTAL	100	38.49	23.01	39.53	22.48	38.49	39.53	-1.04	0.65

*statistically significant

ULEAC Statistics Paper 1 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	3	1.79	1.15	1.75	1.10	59.67	58.33	1.33	0.74
Q2	5	3.71	1.85	3.60	1.86	74.20	72.00	2.20	0.64
Q2A	1	0.72	0.50	0.76	0.43	72.00	76.00	-4.00	0.41
Q2B	2	1.55	0.83	1.52	0.88	77.50	76.00	1.50	0.80
Q2C	2	1.44	0.85	1.32	0.90	72.00	66.00	6.00	0.27
Q3	5	3.88	1.31	3.68	1.41	77.60	73.60	4.00	0.22
Q4	5	3.21	1.69	3.00	1.70	64.20	60.00	4.20	0.31
Q4A	2	1.17	0.99	1.00	1.02	58.50	50.00	8.50	0.17
Q4B	3	2.03	1.28	2.00	1.25	67.67	66.67	1.00	0.82
Q5	9	3.64	3.85	3.48	3.62	40.44	38.67	1.78	0.71
Q5A	7	2.53	2.66	2.37	2.56	36.14	33.86	2.29	0.61
Q5B	2	1.12	1.31	1.11	1.26	56.00	55.50	0.50	0.97
Q6	9	6.88	2.79	6.98	2.79	76.44	77.56	-1.11	0.76
Q6A	4	3.35	1.27	3.44	1.17	83.75	86.00	-2.25	0.53
Q6B	5	3.53	1.94	3.54	1.97	70.60	70.80	-0.20	0.97
Q7	12	4.11	2.88	4.16	3.20	34.25	34.67	-0.42	0.89
Q7A	3	0.98	0.95	1.05	1.28	32.67	35.00	-2.33	0.63
Q7B	3	1.81	1.35	1.57	1.33	60.33	52.33	8.00	0.14
Q7C	4	0.49	1.03	0.69	1.22	12.25	17.25	-5.00	0.15
Q7D	2	0.82	1.09	0.85	0.99	41.00	42.50	-1.50	0.85
Q8	13	6.32	4.20	6.29	3.69	48.62	48.38	0.23	0.96
Q8A	4	2.66	1.70	2.88	1.55	66.50	72.00	-5.50	0.28
Q8B	2	0.98	0.97	0.98	0.99	49.00	49.00	0.00	0.99
Q8C	3	0.84	1.17	0.67	1.00	28.00	22.33	5.67	0.18
Q8D	4	1.82	1.62	1.77	1.55	45.50	44.25	1.25	0.79
Q9	14	6.64	4.00	6.48	3.84	47.43	46.29	1.14	0.73
Q9A	4	2.48	1.48	2.31	1.51	62.00	57.75	4.25	0.33
Q9B	4	2.60	1.54	2.54	1.51	65.00	63.50	1.50	0.75
Q9C	6	1.56	2.03	1.65	1.95	26.00	27.50	-1.50	0.72
PAPER TOTAL	75	40.03	16.42	39.36	15.80	53.37	52.48	0.89	0.73

* statistically significant

ULEAC Statistics Paper 2 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	1	0.89	0.32	0.86	0.35	89.00	86.00	3.00	0.51
Q2	4	2.33	1.83	2.14	1.84	58.25	53.50	4.75	0.40
Q3	6	3.19	1.67	3.19	1.86	53.17	53.17	0.00	0.99
Q3A	4	2.22	1.24	2.18	1.36	55.50	54.50	1.00	0.84
Q3B	2	0.96	0.85	1.02	0.88	48.00	51.00	-3.00	0.59
Q4	8	2.65	2.52	2.70	2.64	33.13	33.75	-0.63	0.87
Q4A	7	2.53	2.48	2.63	2.63	36.14	37.57	-1.43	0.75
Q4B	1	0.11	0.34	0.08	0.29	11.00	8.00	3.00	0.36
Q5	8	2.27	2.25	2.60	2.34	28.38	32.50	-4.13	0.23
Q5A	2	0.92	0.99	0.97	0.99	46.00	48.50	-2.50	0.70
Q5B	3	0.34	0.92	0.46	1.03	11.33	15.33	-4.00	0.32
Q5C	2	0.78	0.96	0.97	1.00	39.00	48.50	-9.50	0.12
Q5D	1	0.22	0.41	0.21	0.43	22.00	21.00	1.00	0.86
Q6	10	6.53	2.48	6.29	2.81	65.30	62.90	2.40	0.46
Q6A	5	4.43	1.21	4.22	1.44	88.60	84.40	4.20	0.20
Q6B	5	2.11	1.84	2.07	1.90	42.20	41.40	0.80	0.85
Q7	11	4.65	2.40	4.92	2.61	42.27	44.73	-2.45	0.37
Q7A	4	2.72	1.23	2.60	1.26	68.00	65.00	3.00	0.46
Q7B	4	1.48	1.39	1.80	1.43	37.00	45.00	-8.00	0.06
Q7C	3	0.46	0.93	0.52	0.96	15.33	17.33	-2.00	0.60
Q8	13	6.13	4.16	6.12	4.40	47.15	47.08	0.08	0.99
Q8A	9	4.51	3.22	4.40	3.46	50.11	48.89	1.22	0.79
Q8B	4	1.60	1.54	1.71	1.58	40.00	42.75	-2.75	0.58
Q9	14	8.20	3.47	8.34	3.11	58.57	59.57	-1.00	0.72
Q9A	3	2.40	0.89	2.49	0.77	80.00	83.00	-3.00	0.39
Q9B	5	3.58	1.83	3.60	1.71	71.60	72.00	-0.40	0.90
Q9C	2	0.98	0.79	0.89	0.70	49.00	44.50	4.50	0.34
Q9D	4	1.24	1.37	1.36	1.42	31.00	34.00	-3.00	0.49
PAPER TOTAL	75	36.81	13.65	37.16	14.11	49.08	49.55	-0.47	0.84

* statistically significant

ULEAC Physics Paper 2 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	8	4.46	2.02	4.52	1.89	55.74	56.53	-0.79	0.74
Q2	7	3.98	2.00	3.62	1.92	56.90	51.73	5.17	0.06
Q3	6	2.80	1.68	2.88	1.93	46.75	47.98	-1.23	0.69
Q4	8	5.71	2.58	5.63	2.53	71.43	70.36	1.07	0.74
Q5	8	4.19	2.12	4.28	2.07	52.41	53.50	-1.09	0.68
Q6	10	4.69	3.13	4.81	3.05	46.86	48.11	-1.25	0.68
Q7	7	2.46	2.13	2.64	2.10	35.20	37.77	-2.57	0.39
Q8	24	10.99	5.65	10.74	5.19	45.80	44.76	1.04	0.64
Q8A	12	4.67	3.69	4.39	3.60	38.88	36.55	2.33	0.44
Q8B	12	6.39	3.41	6.00	2.97	53.27	50.00	3.27	0.44
Q8C	12	6.01	2.76	6.46	2.48	50.07	53.82	-3.76	0.16
Q9	24	11.30	5.86	12.89	5.55	47.08	53.69	-6.61	0.01 *
Q9A	12	5.50	3.10	6.13	2.97	45.85	51.07	-5.22	0.04 *
Q9B	12	4.39	2.79	5.42	3.14	36.59	45.17	-8.57	0.04 *
Q9C	12	6.86	3.87	7.31	3.49	57.20	60.88	-3.69	0.34
Q10	24	9.99	5.62	11.72	5.15	41.63	48.85	-7.22	0.00 *
Q10A	12	6.28	3.09	7.17	2.88	52.36	59.79	-7.42	0.00 *
Q10B	12	1.67	2.66	3.07	3.33	13.91	25.62	-11.71	0.05 *
Q10C	12	4.09	3.16	4.79	2.93	34.11	39.89	-5.78	0.04 *
PAPER TOTAL^	126	60.65	24.39	63.76	23.28	48.14	50.60	-2.46	0.19

*statistically significant

^ On question 8, 9 and 10 candidates do part a then choose either part b or c

- Number of candidates answering this question very small for both groups

ULEAC Physics Paper 3 1993

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05	
Q1	6	3.35	1.40	3.42	1.45	55.87	57.06	-1.19	0.61	
Q1A	2	0.47	0.66	0.53	0.72	23.48	26.64	-3.17	0.36	
Q1B	2	1.26	0.83	1.30	0.82	63.10	64.97	-1.87	0.64	
Q1C	2	1.62	0.72	1.60	0.73	81.04	79.93	1.12	0.76	
Q2	5	3.25	1.58	3.09	1.67	65.06	61.75	3.30	0.31	
Q3	6	3.90	1.63	3.63	1.59	64.92	60.46	4.46	0.09	
Q3A	3	1.76	1.14	1.68	1.12	58.68	55.96	2.72	0.46	
Q3B	3	2.14	0.90	1.95	0.91	71.23	64.96	6.27	0.04	*
Q4	4	1.75	1.35	2.12	1.30	43.81	52.92	-9.11	0.01	*
Q5	4	3.24	0.95	3.20	0.89	81.00	79.93	1.07	0.63	
Q6	5	3.17	1.07	3.34	1.15	63.38	66.86	-3.48	0.12	
Q7	6	1.97	1.26	1.55	1.11	32.76	25.80	6.96	0.00	*
Q7A	3	0.71	0.54	0.67	0.57	23.60	22.47	1.13	0.54	
Q7B	3	1.26	1.06	0.89	0.94	41.84	29.60	12.24	0.00	*
Q8	18	6.48	3.19	6.79	3.47	36.00	37.70	-1.70	0.49	
Q8A	11	4.68	2.17	5.03	2.52	42.54	45.70	-3.15	0.28	
Q8B	7	1.80	1.67	1.73	1.71	25.67	24.76	0.91	0.77	
Q9	18	7.22	3.32	7.92	3.21	40.12	43.98	-3.85	0.10	
Q9A	7	2.80	1.82	3.05	1.69	39.95	43.55	-3.60	0.26	
Q9B	6	1.70	1.19	2.36	1.51	28.28	39.36	-11.08	0.00	*
Q9C	5	2.73	1.45	2.58	1.43	54.67	51.60	3.06	0.42	
Q10	18	8.31	3.70	7.31	3.43	46.15	40.63	5.53	0.16	
Q10A	10	4.50	2.28	3.50	2.50	44.96	35.00	9.96	0.05	*
Q10B	5	1.85	1.43	1.69	1.36	37.09	33.75	3.34	0.54	
Q10C	3	2.01	1.27	2.13	1.26	66.96	70.83	-3.87	0.65	
Q11	18	7.52	3.97	7.91	3.73	41.76	43.95	-2.18	0.44	
Q11A	11	4.93	2.86	5.01	2.69	44.83	45.57	-0.74	0.82	
Q11B	7	2.56	1.72	2.86	1.57	36.59	40.84	-4.25	0.17	
Q12	18	4.71	2.88	3.25	2.22	26.18	18.06	8.12	0.28	
Q12A	12	3.52	2.50	2.50	1.73	29.29	20.83	8.46	0.33	
Q12A1	6	2.74	1.73	2.50	1.73	45.71	41.67	4.04	0.80	
Q12A2	3	0.49	0.81	0.33	0.76	16.41	10.87	5.54	0.23	
Q12A3	3	0.26	0.80	0.16	0.71	8.72	5.20	3.52	0.52	
Q12B	6	1.22	1.08	0.75	0.96	20.26	12.50	7.76	0.41	
PAPER TOTAL^	72	34.40	10.73	35.15	10.48	47.77	48.82	-1.05	0.46	

*statistically significant

^ On question 8, 9, 10, 11 and 12 candidates choose two questions only

ULEAC English Literature 1993
Paper 1
Coursework Option

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	10	4.69	1.92	5.09	1.87	46.90	50.90	-4.00	0.03 *
Q2	10	5.30	1.90	5.52	1.78	53.00	55.20	-2.20	0.23
PAPER TOTAL	20	9.99	3.54	10.61	3.38	49.95	53.05	-3.10	0.07

Paper 1
Non-Coursework Option

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1	10	5.25	1.75	5.02	1.75	52.50	50.20	2.30	0.41
Q2	10	5.52	1.63	5.52	1.79	55.20	55.20	0.00	0.99
PAPER TOTAL	20	10.77	3.09	10.55	3.25	53.85	52.75	1.10	0.66

ULEAC English Paper 3 1993 - Coursework Option

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05	
Q1A	10	5.68	1.74	5.34	1.88	56.77	53.41	3.36	0.37	
Q1B	10	4.30	2.07	4.89	1.60	42.96	48.92	-5.96	0.19	
Q2A	10	5.16	1.84	5.26	2.09	51.55	52.59	-1.03	0.74	
Q2B	10	5.31	2.56	5.40	2.15	53.08	54.00	-0.92	0.87	
Q3A	10	5.13	1.85	5.43	1.78	51.27	54.29	-3.01	0.32	
Q3B	10	4.00	2.62	5.53	2.29	40.00	55.26	-15.26	0.18	
Q4A	10	5.16	1.43	5.18	2.55	51.58	51.84	-0.26	0.96	
A4B	10	5.35	1.39	6.11	1.66	53.50	61.07	-7.57	0.09	
Q5A	10	4.48	1.94	5.49	1.88	44.76	54.88	-10.12	0.05	*
Q5B	10	4.29	2.20	4.63	1.92	42.94	46.33	-3.39	0.28	
Q6A	10	5.13	1.96	5.43	2.27	51.25	54.29	-3.04	0.70	
Q6B	10	4.56	1.90	4.91	2.31	45.60	49.06	-3.46	0.49	
Q7A	10	4.59	1.97	4.57	2.09	45.88	45.71	0.17	0.98	
Q7B	10	5.50	2.16	4.54	1.61	55.00	45.39	9.62	0.36	
Q8A	10	4.73	2.09	4.67	2.01	47.33	46.67	0.67	0.92	
Q8B	10	4.73	1.90	5.08	1.97	47.35	50.79	-3.44	0.32	
Q9A	10	4.89	2.29	4.59	1.55	48.89	45.86	3.03	0.57	
Q9B	10	3.44	1.21	5.00	1.76	34.38	50.00	-15.63	0.00	*
Q10A	10	4.63	2.30	5.09	2.20	46.35	50.87	-4.52	0.02	*
Q10B	10	3.48	2.09	4.61	2.15	34.76	46.08	-11.32	0.04	*
Q11A	10	5.80	1.79	5.86	2.24	58.00	58.57	-0.57	0.95	
Q11B	10	4.67	1.63	5.20	2.44	46.67	52.00	-5.33	0.55	
Q12A	10	5.80	2.68	4.78	1.56	58.00	47.78	10.22	0.47	
Q12B	10	-	-	6.67	1.16	-	-	-	-	
PAPER TOTAL^	40	19.07	7.01	20.35	7.03	47.68	50.88	-3.19	0.07	

*statistically significant

^ Each candidate to choose four questions

- No candidates answered this question

ULEAC English Paper 3 1993 -Non Coursework Option

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1A	10	5.08	1.44	4.89	2.31	50.80	48.90	1.90	0.73
Q1B	10	5.00	2.52	5.32	2.04	50.00	53.22	-3.22	0.76
Q2A	10	5.14	1.77	5.54	2.09	51.40	55.40	-4.00	0.40
Q2B	10	5.27	2.15	5.28	2.54	52.72	52.81	-0.09	0.99
Q3A	10	5.28	1.81	5.02	1.95	52.77	50.21	2.56	0.62
Q3B	10	-	-	0.52	1.86	-	5.22	-	-
Q4A	10	6.40	1.82	5.13	1.81	64.00	51.25	12.75	0.25
A4B	10	6.50	1.00	4.92	1.98	65.00	49.17	15.83	0.06
Q5A	10	6.11	2.03	5.38	3.06	61.10	53.75	7.35	0.43
Q5B	10	4.70	2.00	4.56	2.13	47.00	45.61	1.39	0.79
Q6A	10	4.82	1.72	5.46	2.11	48.18	54.57	-6.39	0.32
Q6B	10	5.07	1.49	5.46	2.25	50.71	54.57	-3.86	0.49
Q7A	10	3.50	2.08	4.67	1.88	35.00	46.66	-11.66	0.37
Q7B	10	5.00	2.65	7.60	0.89	50.00	76.00	-26.00	0.23
Q8A	10	4.00	3.27	4.40	1.14	40.00	44.00	-4.00	0.83
Q8B	10	4.41	2.27	5.50	2.45	44.13	55.00	-10.87	0.20
Q9A	10	5.25	1.55	5.45	2.35	52.50	54.50	-2.00	0.77
Q9B	10	6.50	0.71	4.06	1.83	65.00	40.56	24.44	-
Q10A	10	4.00	2.14	4.76	2.08	40.00	47.60	-7.60	0.22
Q10B	10	3.94	2.18	4.53	2.44	39.38	45.26	-5.89	0.39
Q11A	10	5.00	2.16	5.13	1.71	50.00	51.25	-1.25	0.92
Q11B	10	-	-	5.14	2.61	-	51.43	-	-
Q12A	10	-	-	7.33	1.53	-	73.30	-	-
Q12B	10	-	-	-	-	-	-	-	-
PAPER TOTAL^	40	19.59	6.65	20.21	8.00	48.97	50.53	-1.56	0.58

*statistically significant

^ Each candidate to choose four questions

- No candidates answered this question

ULEAC English Paper4 1993 -Non Coursework Option

Question	Max Mark	Male Mean	Male S.D	Female Mean	Female S.D	% Mean Male	% Mean Female	%Diff M-F	p<0.05
Q1A	10	5.80	1.93	6.41	1.78	58.00	64.14	-6.14	0.39
Q1B	10	-	-	4.85	3.11	-	48.46	-	-
Q2A	10	6.25	1.24	5.87	1.96	62.50	58.72	3.78	0.23
Q2B	10	5.82	2.23	4.84	2.12	58.18	48.40	9.78	0.23
Q3A	10	4.67	1.16	3.60	0.89	46.67	36.00	10.67	0.25
Q3B	10	6.50	0.71	5.14	1.86	65.00	51.43	13.57	-
Q4A	10	6.17	1.84	5.10	1.52	61.67	51.00	10.67	0.24
Q4B	10	4.00	1.73	6.00	1.76	40.00	60.00	-20.00	0.17
Q5A	10	7.25	1.26	5.83	1.80	72.50	58.33	14.17	0.12
Q5B	10	-	-	6.20	0.84	-	62.00	-	-
Q6A	10	6.22	1.40	5.89	2.50	62.22	58.89	3.33	0.57
Q6B	10	6.57	2.57	6.54	1.90	65.71	65.37	0.35	0.97
Q7A	10	-	-	-	-	-	-	-	-
Q7B	10	-	-	-	-	-	-	-	-
Q8A	10	-	-	-	-	-	-	-	-
Q8B	10	-	-	-	-	-	-	-	-
Q9A	10	-	-	-	-	-	-	-	-
Q9B	10	-	-	-	-	-	-	-	-
Q10A	10	5.00	2.40	5.20	1.47	50.00	52.00	-2.00	0.81
Q10B	10	7.25	1.28	6.10	1.83	72.50	60.95	11.55	0.05 *
Q11A	10	6.20	2.90	5.65	1.37	62.00	56.47	5.53	0.64
Q11B	10	5.83	2.86	5.64	2.44	58.33	56.43	1.90	0.89
Q12A	10	-	-	-	-	-	-	-	-
Q12B	10	6.33	2.08	4.56	1.74	63.33	45.56	17.78	0.28
Q13A	10	-	-	-	-	-	-	-	-
Q13B	10	-	-	-	-	-	-	-	-
Q14A	10	5.40	1.34	5.59	2.03	54.00	55.88	-1.88	0.81
Q14B	10	-	-	-	-	-	-	-	-
Q15A	10	5.88	2.17	3.96	1.97	58.75	39.60	19.15	0.05 *
Q15B	10	4.17	2.40	5.49	2.06	41.67	54.86	-13.19	0.25
Q16A	10	5.36	1.36	5.58	2.03	53.64	55.76	-2.12	0.47
Q16B	10	-	-	-	-	-	-	-	-
Q17A	10	-	-	-	-	-	-	-	-
Q17B	10	-	-	-	-	-	-	-	-
Q18A	10	-	-	-	-	-	-	-	-
Q18B	10	-	-	-	-	-	-	-	-
Q19A	10	-	-	-	-	-	-	-	-
Q19B	10	-	-	-	-	-	-	-	-
Q20A	10	6.00	2.28	5.13	1.86	60.00	51.25	8.75	0.43
Q20B	10	5.25	0.96	5.70	2.16	52.50	57.00	-4.50	0.60
Q21A	10	5.17	2.79	5.71	2.03	51.67	57.14	-5.48	0.66
Q21B	10	5.45	1.97	5.80	2.16	54.55	58.00	-3.45	0.64
Q22A	10	-	-	-	-	-	-	-	-
Q22B	10	-	-	-	-	-	-	-	-
Q23A	10	-	-	-	-	-	-	-	-
Q23B	10	-	-	-	-	-	-	-	-
Q24A	10	5.00	4.36	3.63		50.00	36.25	13.75	0.65
Q24B	10	5.67	2.34	4.71	2.07	56.67	47.08	9.58	0.39
PAPER TOTAL^	40	23.08	6.98	22.27	7.16	57.69	55.66	2.03	0.47

*statistically significant

^ Each candidate to choose four questions

- Number of candidates answering this question very small for both groups

Code : **E**

University of Leicester
School of Education

The Nuffield Foundation

Differential Performance at 18+
English Literature, Mathematics & Physics

English Literature Questionnaire

Notes for teachers at Single-Sex Schools

- *This questionnaire is concerned with gender differences in students' attitudes toward,s and performance in, English Literature at A level . We realise, therefore, that many of the questions may not seem directly relevant to single-sex schools. However, since we are interested in teachers' perceptions of gender difference, your views are still of value and interest. Furthermore, you may have experience of working in a co-educational environment upon which you can draw. With these points in mind, we ask you to complete the questionnaire as you feel able.*

Should you feel unable to answer any particular question / section, please indicate and move on to the next question / section.

Thank you

Part 1

The school /college

1a *Centre Type (please write appropriate number in the box provided)*
1=Secondary (Comprehensive); 2=Secondary (Selective; [e,g, Grammar School]);
3=Secondary (Modern); 4=Secondary (Independent); 5=Sixth-form College;
6=Tertiary College; 7=FE College; 8=Other

If 8 (Other) please specify.. ☐ P1

1b *Please state if LEA or Grant maintained* : 1=LEA 2=Grant ☐ P2

1c *Type of school/college*

1=Coeducational; 2=Single sex female; 3=single sex male* ☐ P3
**please see note on inside front page*

1d *Number of females in 2nd year sixth (Y13)* ☐ P4

Number of males in 2nd year sixth (Y13) ☐ P5

Yourself

2a. *Sex* 1=female 2=male ☐ P6

2b. *Number of years at present school/college* ☐ P7

2c. *Number of years teaching A level English Literature* ☐ P8

2d. *Position within your department* P9

Your department

3a. *Number of female teachers* ☐ P10

3b. *Number of male teachers* ☐ P11

3c. *Number of female teachers of A level English Literature* ☐ P12

Number of male teachers of A level English Literature ☐ P13

3d. *Which A level English Literature syllabus did you enter in.........*
1994 .... P14
1993 .... P15
1992 .... P16

3e. *If your choice of syllabus/es have changed between these years, please give reasons.*

P17

4. *Please indicate whether or not public examination results from your school/college are analysed by gender, age or ethnic origin . Please tick in the boxes provided*

	A Level	GCSE	GNVQ (etc)	
Gender	☐	☐	☐	P18-20
Age	☐	☐	☐	P21-23
Ethnic origin	☐	☐	☐	P24-26

5a. *What are the minimum GCSE requirements for A level study of English Literature in your school/college?*

....

.... P27

5b. *Would you consider/have you considered taking any steps to ensure a gender balanced in-take/entry for your subject at A level ? Please comment*

....

....

.... P28

Equal Opportunities

6a. *Has the differential performance of females and males in English Literature ever been the focus of a specific review in your school/college / department ? **

(1=Yes; 2=No) ☐ P29

....

....

....

If your school/college or department has a written policy on equal opportunities, or this is addressed in other school/college documentation, we would be interested to receive copies of such documents.

6b. *Please tell us about any strategies you personally use which specifically seek to address gender issues within your subject area (e.g. classroom practice, subject content /context etc.)*

....

....

P30

Part 2

Section A (i) : Attitudes and Motivation

- To what extent do you agree or disagree with the following statements ?
  Please number your responses in the boxes provided

1 Strongly disagree **2** Disagree **3** Neutral **4** Agree **5** Strongly Agree

Females are more confident than males of succeeding in English Literature ☐ A1

Males are more anxious than females about failure in English Literature ☐ A2

Females are more likely than males to lose interest in English Literature as the course progresses ☐ A3

Males are more likely than females to find English Literature increasingly difficult as the course progresses ☐ A4

Females enjoy English Literature more than males do ☐ A5

Males are more enthusiastic about English Literature than females are ☐ A6

Males are more adversely affected by final examinations than females are ☐ A7

Males are more concerned with presentation and neatness than females are ☐ A8

Males are more likely than females to go on to study English Literature at a higher (e.g. degree) level ☐ A9

Males are more conscientious in English Literature work than females are ☐ A10

Females are more likely than males to consider English Literature to be socially relevant ☐ A11

Females are more likely than males to consider a career in which English Literature plays an important role ☐ A12

Females are more likely than males to achieve higher grades in English Literature examinations ☐ A13

Males are more likely than females to achieve higher scores in teacher-assessed English Literature tests ☐ A14

Project work favours females more than it favours males ☐ A15

Females are better at working with others than males ☐ A16

Males are more likely than females to participate in class discussions ☐ A17

Females are more confident than males in verbally expressing their ideas ☐ A18

Section A (ii) In which of the four 4 areas referred to below do you consider that there are differences between females and males in confidence, enjoyment, motivation and aptitude Please tick the appropriate boxes.

COMPREHENSION & APPRECIATION	males much greater	males greater	no difference	females greater	females much greater	
Confidence						A19
Enjoyment						A20
Motivation						A21
Aptitude						A22
MAJOR AUTHORS						
Confidence						A23
Enjoyment						A24
Motivation						A25
Aptitude						A26
TOPICS IN LITERATURE						
Confidence						A27
Enjoyment						A28
Motivation						A29
Aptitude						A30
COURSEWORK						
Confidence						A31
Enjoyment						A32
Motivation						A33
Aptitude						A34

Section B : Major Authors

• In which of the following list of prescribed texts (1993/94) do you consider that females would experience more difficulty, that males would experience more difficulty , or that there would be no difference ? Please tick the appropriate boxes.

Section A. SHAKESPEARE	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females	
•comedies						B1
•tragedies						B2
•histories						B3
Section B. POETRY						
•Chaucer						B4
•Keats						B5
•Women poets						B6
•Heaney						B7
Section C._ OTHER WORKS						
•Shaw						B8
•Brontë						B9
•Woolf						B10
•Naipaul						B11

Section C :Topics in Literature

a) In your experience, which of the following topics present more difficulties for females, more difficulties for males, or no difficulties for either group ? Please tick the appropriate boxes.

Topic	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females	
Aspects of comedy						C1
Approaches to narrative						C2
20th Century themes						C3

• Please indicate below any particular texts/issues within the 3 topics referred to above *(aspects of comedy, approaches to narrative, 20th century themes)* which, in your experience, are especially problematic for females or for males :

Problematic for females

Problematic for males :

Section D : Teacher assessed coursework (Paper 4C)

In which of the following options, do you consider that females do better, that males do better, or that there is no difference between females and males. Please tick the appropriate boxes.

Option	males much better	males better	no difference	females better	females much better	
sustained study (c 4,000 words)						E1
shorter pieces (c 2,000 words)						E2
short story writing						E3
script writing						E4

over ->

Section E : Performance in English Literature

In your experience, do you think that the following areas of English Literature present more difficulty for females, for males, or no difficulties for either group ?

Please tick the appropriate boxes.

Area	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females
Participating in group discussions about texts					
Writing under timed (e.g. test/exam) conditions					
participating in drama/role play					
appreciation of literary form and content					
appropriate punctuation grammatical structures & spelling					
analysis of literary texts					
understanding of differences between literary genres					
ability to martial & sustain a coherent argument					
comprehension & appreciation of unseen poetry/prose					
expressing personal responses to texts					
essay writing					

Part 3

Entry Patterns *

If possible please give :

• *the numbers of students entered for A level English Literature at your school/college in the following years*

Females

1992		1993		1994		F1-3

Males

1992		1993		1994		F4-6

• *the numbers of males & females attaining A, B & C grades in A level English Literature at your school/college in the following years*

Females

	A	B	C		A	B	C		A	B	C
1992				1993				1994			

F7-15

Males

	A	B	C		A	B	C		A	B	C
1992				1993				1994			

F18-26

**** We appreciate that obtaining this information may present difficulties for you. However, Examining Boards should have issued the school/college with details of results broken down by grade and gender. A photocopy of this sheet and/or statistics produced by your school/college will suffice here.***

over ->

Please feel free to make any additional comments concerning the questionnaire and/or the issues raised within it in the space below

Thank you for completing this questionnaire

Code : **M**

University of Leicester
School of Education

The Nuffield Foundation

Differential Performance at 18+
English Literature, Mathematics & Physics

Mathematics Questionnaire

Notes for teachers at Single-Sex Schools

- *This questionnaire is concerned with gender differences in students' attitudes towards, and performance in, Mathematics at A level . We realise, therefore, that many of the questions may not seem directly relevant to single-sex schools. However, since we are interested in teachers' perceptions of gender difference, your views are still of value and interest. Furthermore, you may have experience of working in a co-educational environment upon which you can draw. With these points in mind, we ask you to complete the questionnaire as you feel able.*

Should you feel unable to answer any particular question / section, please indicate and move on to the next question / section.

Thank you

Part 1

The school /college

1a *Centre Type (please write appropriate number in the box provided)*
1=Secondary (Comprehensive); 2=Secondary (Selective; [e,g, Grammar School]);
3=Secondary (Modern); 4=Secondary (Independent); 5=Sixth-form College;
6=Tertiary College; 7=FE College; 8=Other

If 8 (Other) please specify.. ☐ P1

1b *Please state if LEA or Grant maintained* : 1=LEA 2=Grant ☐ P2

1c *Type of school/college*

1=Coeducational; 2=Single sex female; 3=single sex male* ☐ P3
**please see note on inside front page*

1d *Number of females in 2nd year sixth (Y13)* ☐ P4

Number of males in 2nd year sixth (Y13) ☐ P5

<u>Yourself</u>

2a. *Sex* 1=female 2=male ☐ P6

2b. *Number of years at present school/college* ☐ P7

2c. *Number of years teaching A level Maths* ☐ P8

2d. *Position within your department* P9

<u>Your department</u>

3a. *Number of female teachers* ☐ P10

3b. *Number of male teachers* ☐ P11

3c. *Number of female teachers of A level Maths* ☐ P12

Number of male teachers of A level Maths ☐ P13

3d. *Which A level Maths syllabus did you enter in.........*
1994 .... P14
1993 .... P15
1992 .... P16

3e. *If your choice of syllabus/es have changed between these years, please give reasons.*

P17

4. *Please indicate whether or not public examination results from your school/college are analysed by gender, age or ethnic origin. Please tick in the boxes provided*

	A Level	**GCSE**	**GNVQ (etc)**	
Gender	☐	☐	☐	P18-20
Age	☐	☐	☐	P21-23
Ethnic origin	☐	☐	☐	P24-26

5a. *What are the minimum GCSE requirements for A level study of Maths in your school/college?*

....

....P27

5b. *Would you consider/have you considered taking any steps to ensure a gender balanced in-take/entry for your subject at A level ? Please comment*

....

....

....P28

Equal Opportunities

6a. *Has the differential performance of females and males in <u>Maths</u> ever been the focus of a specific review in your school/college / department ? **

(1=Yes; 2=No) ☐ P29

....

....

....

If your school/college or department has a written policy on equal opportunities, or this is addressed in other school/college documentation, we would be interested to receive copies of such documents.

6b. *Please tell us about any strategies you <u>personally</u> use which specifically seek to address gender issues within your subject area (e.g. classroom practice, subject content /context etc.)*

....

....

.... P30

Part 2

Section A (i) : Attitudes and Motivation

• To what extent do you agree or disagree with the following statements?
Please number your responses in the boxes provided

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

Females are more confident than males of succeeding in Maths ☐ A1

Males are more anxious than females about failure in Maths ☐ A2

Females are more likely than males to lose interest in Maths as the course progresses ☐ A3

Males are more likely than females to find Maths increasingly difficult as the course progresses ☐ A4

Females enjoy Maths more than males do ☐ A5

Males are more enthusiastic about Maths than females are ☐ A6

Males are more adversely affected by final examinations than females are ☐ A7

Males are more concerned with presentation and neatness than females are ☐ A8

Males are more likely than females to go on to study Maths at a higher (e.g. degree) level ☐ A9

Males are more conscientious in Maths work than females are ☐ A10

Females are more likely than males to consider Maths to be socially relevant ☐ A11

Females are more likely than males to consider a career in which Maths plays an important role ☐ A12

Females are more likely than males to achieve higher grades in Maths examinations ☐ A13

Males are more likely than females to achieve higher scores in teacher-assessed Maths tests ☐ A14

Project work favours females more than it favours males ☐ A15

Females are better at working with others than males ☐ A16

Males are more likely than females to participate in class discussions ☐ A17

Females are more confident than males in verbally expressing their ideas ☐ A18

Section A (ii) : In which of the following areas, *pure maths*, *mechanics* and *statistics* do you consider that there are differences between females and males in confidence, enjoyment , motivation and aptitude .
Please tick the appropriate boxes.

PURE MATHS	males much greater	males greater	no difference	females greater	females much greater	
Confidence						A19
Enjoyment						A20
Motivation						A21
Aptitude						A22
MECHANICS						
Confidence						A23
Enjoyment						A24
Motivation						A25
Aptitude						
STATISTICS						
Confidence						A26
Enjoyment						A27
Motivation						A28
Aptitude						A29

Section B : Performance

• In which of the following areas of Maths do you consider that females experience more difficulty, males experience more difficulty, or do you consider that there is no difference? Please tick the appropriate boxes

Content Area	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females	
Further algebra						B1
Functions & Cartesian geometry						B2
Trigonometry						B3
Calculus						B4
Vectors						B5
Sequences, series & limits						B6
Complex numbers						B7
Mechanics						B8
Probability						B9
Descriptive statistics						B10

Section C : Assesssment Objectives

• In which of the following assessment areas for Maths do you consider that females do better, that males do better, or that there is no difference between females and males? Please tick the appropriate boxes.

Assessment Objective	males do much better	males do better	no difference	females do better	females do much better	
applying/interpreting mathematical knowledge						C1
setting out work in clear & logical form						C2
organisation & presentation of information						C3
making logical deductions						C4
generalisation						C5
interpretation/ evaluation of data						C6

Part 3

Entry Patterns *

If possible please give :

• the numbers of students entered for A level Maths at your school/college in the following years

Females

1992		1993		1994	

F1-3

Males

1992		1993		1994	

F4-6

• the numbers of males & females attaining A, B & C grades in A level Maths at your school/college in the following years

Females

	A	B	C		A	B	C		A	B	C
1992				1993				1994			

F7-15

Males

	A	B	C		A	B	C		A	B	C
1992				1993				1994			

F18-26

*** We appreciate that obtaining this information may present difficulties for you. However the Examining Board should have issued the school/college with details of results broken down by grade and gender. A photocopy of this sheet and/or statistics produced by your school/college will suffice here.***

Please feel free to make any additional comments concerning the questionnaire and/or the issues raised within it in the space below

Thank you for completing this questionnaire

Code : **P**

University of Leicester
School of Education

The Nuffield Foundation

Differential Performance at 18+
English Literature, Mathematics & Physics

Physics Questionnaire

Notes for teachers at Single-Sex Schools

- *This questionnaire is concerned with gender differences in students' attitudes towards, and performance in, Physics at A level . We realise, therefore, that many of the questions may not seem directly relevant to single-sex schools. However, since we are interested in teachers' perceptions of gender difference, your views are still of value and interest. Furthermore, you may have experience of working in a co-educational environment upon which you can draw. With these points in mind, we ask you to complete the questionnaire as you feel able.*

Should you feel unable to answer any particular question / section, please indicate and move on to the next question / section.

Thank you

Part 1

The school /college

1a *Centre Type (please write appropriate number in the box provided)*
1=Secondary (Comprehensive); 2=Secondary (Selective; [e,g, Grammar School]);
3=Secondary (Modern); 4=Secondary (Independent); 5=Sixth-form College;
6=Tertiary College; 7=FE College; 8=Other

If 8 (Other) please specify.. ☐ P1

1b *Please state if LEA or Grant maintained* : 1=LEA 2=Grant ☐ P2

1c *Type of school/college*

1=Coeducational; 2=Single sex female; 3=single sex male* ☐ P3

**please see note on inside front page*

1d *Number of females in 2nd year sixth (Y13)* ☐ P4

Number of males in 2nd year sixth (Y13) ☐ P5

Yourself

2a. *Sex* 1=female 2=male ☐ P6

2b. *Number of years at present school/college* ☐ P7

2c. *Number of years teaching A level Physics* ☐ P8

2d. *Position within your department* P9

Your department

3a. *Number of female teachers* ☐ P10

3b. *Number of male teachers* ☐ P11

3c. *Number of female teachers of A level Physics* ☐ P12

Numbers of male teachers of A level Physics ☐ P13

3d. *Which A level Physics syllabus did you enter in.........*

1994 .... P14

1993 .... P15

1992 .... P16

3e. *If your choice of syllabus/es have changed between these years, please give reasons.*

P17

4. *Please indicate whether or not public examination results from your school/college are analysed by gender, age or ethnic origin . Please tick in the boxes provided*

	A Level	**GCSE**	**GNVQ (etc)**	
Gender	☐	☐	☐	P18-20
Age	☐	☐	☐	P21-23
Ethnic origin	☐	☐	☐	P24-26

5a. *What are the minimum GCSE requirements for A level study of Physics in your school/college?*

....

....P27

5b. *Would you consider/have you considered taking any steps to ensure a gender balanced in-take/entry for your subject at A level ? Please comment*

....

....

....P28

Equal Opportunities

6a. *Has the differential performance of females and males in Physics ever been the focus of a specific review in your school/college / department ? **

(1=Yes; 2=No) ☐ P29

....

....

....

If your school/college or department has a written policy on equal opportunities, or this is addressed in other school/college documentation, we would be interested to receive copies of such documents.

6b. *Please tell us about any strategies you personally use which specifically seek to address gender issues within your subject area (e.g. classroom practice, subject content /context etc.)*

....

....

.... P30

Part 2

Section A (i) : Attitudes and Motivation

• To what extent do you agree or disagree with the following statements ?
Please number your responses in the boxes provided

1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree

Females are more confident than males of succeeding in Physics ☐ A1

Males are more anxious than females about failure in Physics ☐ A2

Females are more likely than males to lose interest in Physics as the course progresses ☐ A3

Males are more likely than females to find Physics increasingly difficult as the course progresses ☐ A4

Females enjoy Physics more than males do ☐ A5

Males are more enthusiastic about Physics than females are ☐ A6

Males are more adversely affected by final examinations than females are ☐ A7

Males are more concerned with presentation and neatness than females are ☐ A8

Males are more likely than females to go on to study Physics at a higher (e.g. degree) level ☐ A9

Males are more conscientious in Physics work than females are ☐ A10

Females are more likely than males to consider Physics to be socially relevant ☐ A11

Females are more likely than males to consider a career in which Physics plays an important role ☐ A12

Females are more likely than males to achieve higher grades in Physics examinations ☐ A13

Males are more likely than females to achieve higher scores in teacher-assessed Physics tests ☐ A14

Project work favours females more than it favours males ☐ A15

Females are better at working with others than males ☐ A16

Males are more likely than females to participate in class discussions ☐ A17

Females are more confident than males in verbally expressing their ideas ☐ A18

Section A (ii) : Do you consider that there are differences between females and males in Physics in terms of their confidence, enjoyment , motivation and aptitude Please tick the appropriate boxes.

	males much greater	males greater	no difference	females greater	females much greater	
Confidence						A19
Enjoyment						A20
Motivation						A21
Aptitude						A22

Section B : Performance

• In which of the following areas of Physics do you consider that females experience more difficulty, males experience more difficulty, or do you consider that there is no difference between females and males ?

Area	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females	
Materials & matter						B1
Mechanics						B2
Electric circuits						B4
Wave phenomena						B5
Nuclear physics / radioactivity						B6
Energy						
Optics / light						B7
Electromagnetism						B8
Thermal phenomena						B9

Section C : Assessment Objectives

• In which of the following assessment areas do you condsider that females experience more difficulty, males experience more difficulty, or do you consider that there is no difference between females and males ?

Assessment objective	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females	
knowledge understanding of concepts & principles						C1
application of knowledge & undertsanding						C2
analysis & evaluation of information/data						C3
design & planning of experiments						C4

Section D : Examinations

• In your experience, which of the following modes of examining Physics present more difficulty for females, more difficulty for males, or in which there is no difference ? Please tick the appropriate boxes.

Exam	much more difficult for males	more difficult for males	no difference	more difficult for females	much more difficult for females	
multiple-choice questions *(paper 1)*						D1
short questions *(paper 2. section 1)*						D2
long questions *(paper 2. section 2)*						D3
passage analysis *(paper 3. section 1)*						D4
topic questions *(paper 3. section 2)*						D5
practical exercises *(paper 4)*						D6
data analysis *(paper 4)*						D7

Part 3

Entry Patterns *

If possible please give :

• *the numbers of students entered for A level Physics at your school/college in the following years*

Females

1992 ☐ 1993 ☐ 1994 ☐ F1-3

Males

1992 ☐ 1993 ☐ 1994 ☐ F4-6

• *the numbers of males & females attaining A, B & C grades in A level Physics at your school/college in the following years*

Females

	A	B	C		A	B	C		A	B	C
1992				1993				1994			

F7-15

Males

	A	B	C		A	B	C		A	B	C
1992				1993				1994			

F18-26

***** *We appreciate that obtaining this information may present difficulties for you. However Examining Boards should have issued the school/college with details of results broken down by grade and gender. A photocopy of this sheet and/or statistics produced by your school/college will suffice here.***

over ->

Please feel free to make any additional comments concerning the questionnaire and/or the issues raised within it in the space below

Thank you for completing this questionnaire

Nuffield Project : Case Studies/School Visits
Interview Schedule : Teachers

Introduction

Explain a bit more about the project; the purpose of the interview to explore in some more detail certain aspects of the questionnaire and issues around male and female performance at A level.

Departmental/school policy

1 ...note that (check q'aire) your department/school (examination board) does/does not analyse (provide) examination results by gender
If <u>does</u> how is this information used? (e.g. administration, publication or monitoring of male/female performance). Does it have any influence on the organisation of the subject?
If <u>does not</u>- would you consider it to be useful, and if so how/why??

2 ...note that (check q'aire) the differential performance of males and females has/has not been the focus of a specific review in your department?
If <u>has</u> what has been the outcome of this review?
If <u>has not</u>: is it a consideration? Is it a problem? Is it seen as important?

3 *...note that (check q'aire) there is/is not a departmental/school written policy on equal opportunities?*
If so, how much do you refer to this document in the work of the department? Is it helpful?
If no - is such a document necessary? Why?

GCSE -> A level

4 ....note that (check q'aire) the minimum GCSE requirement to study mathematics (physics, English lit) at A level in (subject) is (x).
Is there a difference in the number of males and females who achieve this minimum and go on to study the subject at A level?
If <u>yes</u> : Have you considered/implemented any strategy to encourage /allow greater numbers of males/females to opt for (subject) at A level?
If so : what are they/might they be?

5 Do you think that GCSE is a good general preparation for A level study in (subject)?
(-probe : different assessment techniques and (physics) Double Science as a preparation for single science A levels).

6 Of those who have gone on to A level : are you aware of any changes between GCSE and A level in (subject) in male and female :
-performance (prompt : crossover?)
-attitude (e.g. confidence/motivation)?

Syllabus

7 *Why did you/your department choose the ULEAC syllabus?*
Do you think the syllabus you have chosen and the way in which it is assessed provides suitable opportunities for both males and females to perform at their best? (explore ideas here - e.g. assessment structures for males and females).

(Mainly for maths departments)
What do you think of the modular approach to learning and assessment? Do you think it benefits females and males differently?
Have you seen a change in the take-up of your subject because of the modular approach?

Explore whether English Lit and physics departments are taking up the ULEAC modular approach and if so what are their thoughts on this?

The students

8 Do you think males and females differ in their perception of (subject)? If so : where do you think this image originates? What effect/s does it have on their attitude/performance ?

9 (a)Do you think that males and females approach the subject in different ways ?
(b) Are there certain content areas of (subject) in which you think males and females show different weaknesses and/or strengths? (prompt with areas of syllabus).

10 In your opinion, are the dynamics of the classroom affected by having a majority of males/females?* If so, in what ways? How would a more balanced group be different?

*check q'aire for figures

Teaching

11 ...note that (check q'aire) there are x male and x female teachers in your department. Do you feel that this has any bearing on the way that the subject is taught, or the way in which it is perceived by male and female students ? (Explore issue of role models for students)

12 (a)...note that (check q'aire) you have mentioned some personal strategies that you use to specifically address gender issues in your subject area ? Explore these : what has been there effect/any further thoughts?

<u>or</u> (b)...note that (check q'aire) you have not mentioned any personal strategies to specifically address gender issues in your subject area ? Explore this : simple omission ? not necessary/relevant?/not an issue?

13 *Would you like to see A level reformed?*
(explore - wider choice of assessment techniques; syllabus content; structure of the post-16 curriculum; expansion of the 16-18 curriculum and issues of gender).

Code : **E**

University of London
Institute of Education

The Nuffield Foundation

In Collaboration with
The School of Education
Leicester University

English Literature Questionnaire

Notes

- The following questionnaire is about your experience of and attitudes towards the study of English Literature at A Level.

- All responses will be treated with confidentiality and will not be seen by anyone except members of the research team without your express permission.

- Please answer the questions as honestly and openly as you can.

Thank you

Section A

about yourself

1) sex — male ☐ female ☐

2) school year — lower 6th ☐ upper 6th ☐ other ☐

(if other, please specify)..

2) A level subjects being studied

1)..

2)..

3)..

4)..

3) GCSE subjects taken and grade awarded

	Grade
1)..	☐
2)..	☐
3)..	☐
4)..	☐
5)..	☐
6)..	☐
7)..	☐
8)..	☐

Section B. 1) To what extent do you agree or disagree with the following statements?
Please number your responses in the boxes provided.

1 Strongly Disagree   2 Disagree   3 Neutral   4 Agree   5 Strongly Agree

I am confident of succeeding in my English literature studies..	☐
I have lost interest in English literature as the course has progressed	☐
I enjoy studying English literature	☐
I am not enthusiastic about English literature	☐
I am anxious about failure in English literature	☐
I generally do well in examinations	☐
I make efforts with presentation and neatness in my English literature work	☐
I have found English literature increasingly difficult as the course has progressed	☐
I would like to go on to study English literature at a higher (e.g. degree) level	☐
I am conscientious in my English literature work...	☐
I think that the study of English literature is relevant to today's society	☐
English literature is likely to play an important role in my future career............................	☐
I expect to get a good grade in my English literature examination	☐
I usually get good marks in class -based English literature tests	☐
I am good at project work in English literature..	☐
I enjoy working with others in my English literature work	☐
I feel comfortable about taking part in class-based discussions	☐
I am better at expressing my ideas verbally than in written form	☐

2) Look at the four 6 areas of the English Literature course referred to below. For each area please say :
a) how confident you feel
b) how motivated you feel
c) how good (able) you are
d) how enjoyable it is

Please tick the appropriate boxes.

In Comprehension & Appreciation,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it.....						enjoyable
In Novel work,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it.....						enjoyable
In Poetry work,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it.....						enjoyable
In Drama work,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it.....						enjoyable
In Coursework,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it.....						enjoyable

3) When considering the English literature course in general, how would you rate your - confidence, motivation, ability and enjoyment compared with that of **male** and **female** students in your year/group?

a) In general, compared with **males** in my year/group..

	much more	more	neither more nor less	less	much less	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

b) In general, compared with **females** in my year/group..

	much more	more	neither more nor less	less	much less	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

4) How difficult or easy do you find each of the following areas of English Literature work ?

Please tick the appropriate boxes.

Area	very difficult	fairly difficult	neither easy nor difficult	fairly easy	very easy	not covered yet
Participating in group discussions about texts						
Writing under timed (e.g. test/exam) conditions						
participating in drama/role play						
appreciation of literary form and content						
punctuation grammatical structures & spelling						
analysis of literary works						
understanding differences between literary genres						
comprehension/ appreciation of unseen poetry/prose						
expressing personal responses to texts						

Please feel free to make any additional comments concerning the questionnaire and/or the issues raised within it in the space below

Thank you for completing this questionnaire

Code : **M**

University of London
Institute of Education

The Nuffield Foundation

In Collaboration with
The School of Education
Leicester University

Mathematics Questionnaire

Notes

- The following questionnaire is about your experience of and attitudes towards the study of Mathematics at A Level.

- All responses will be treated with confidentiality and will not be seen by anyone except members of the research team without your express permission.

- Please answer the questions as honestly and openly as you can.

Thank you

Section A

about yourself

1) sex — male ☐ female ☐

2) school year — lower 6th ☐ upper 6th ☐ other ☐

(if other, please specify)..

2) A level subjects being studied

1)...

2)...

3)...

4)...

3) GCSE subjects taken and grade awarded

Grade

1)... ☐

2)... ☐

3)... ☐

4)... ☐

5)... ☐

6)... ☐

7)... ☐

8)... ☐

Section B. 1) To what extent do you agree or disagree with the following statements? Please number your responses in the boxes provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

I am confident of succeeding in my maths studies	☐
I have lost interest in maths as the course has progressed	☐
I enjoy studying maths	☐
I am not enthusiastic about maths	☐
I am anxious about failure in maths	☐
I generally do well in maths examinations..	☐
I make efforts with presentation and neatness in my maths work	☐
I have found maths increasingly difficult as the course has progressed	☐
I would like to go on to study maths at a higher (e.g. degree) level	☐
I am conscientious in my maths work	☐
I think that the study of maths is relevant to today's society	☐
Maths is likely to play an important role in my future career	☐
I expect to get a good grade in my maths examination	☐
I usually get good marks in class -based maths tests in	☐
I am good at project work in maths	☐
I enjoy working with others in my maths work	☐
I feel comfortable about taking part in class-based discussions	☐
I am better at expressing my ideas verbally than in written form	☐

2) Look at the 3 areas of the maths course referred to below.

For each area please indicate:
a) how confident you feel
b) how motivated you feel
c) how good (able) you are
d) how enjoyable the area is

Please tick the appropriate boxes.

In Pure maths,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable
In Mechanics,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable
In Statistics,	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

3) When considering the mathematics course in genera l, how would you rate your - confidence, motivation, ability and enjoyment compared with that of **male** and **female** students in your year/group?

a) In general, compared with **males** in my year/group..

	much more	more	neither more nor less	less	much less	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

b) In general, compared with **females** in my year/group..

	much more	more	neither more nor less	less	much less	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

4) How difficult or easy do you find the following content areas of maths ?

Please tick the appropriate boxes.

Content Area	very difficult	fairly difficult	neither easy nor difficult	fairly easy	very easy	not covered yet
Further algebra						
Functions/Cartesian geometry						
Trigonometry						
Calculus						
Vectors						
Sequences, series & limits						
Complex numbers						
Mechanics						
Probability						
Descriptive statistics						

Please feel free to make any additional comments concerning the questionnaire and/or the issues raised within it in the space below

Thank you for completing this questionnaire

Code : **P**

University of London
Institute of Education

The Nuffield Foundation

In Collaboration with
The School of Education
Leicester University

Physics Questionnaire

Notes

• The following questionnaire is about your experience of and attitudes towards the study of Physics at A Level.

• All responses will be treated with confidentiality and will not be seen by anyone except members of the research team without your express permission.

• Please answer the questions as honestly and openly as you can.

Thank you

Section A

about yourself

1) sex male ☐ female ☐

2) school year lower 6th ☐ upper 6th ☐ other ☐

(if other, please specify)...

2) A level subjects being studied 1)..

2)..

3)..

4)..

3) GCSE subjects taken and grade awarded

Grade

1).. ☐

2).. ☐

3).. ☐

4).. ☐

5).. ☐

6).. ☐

7).. ☐

8).. ☐

Section B. 1) To what extent do you agree or disagree with the following statements? Please number your responses in the boxes provided.

1	Strongly Disagree	2	Disagree	3	Neutral	4	Agree	5	Strongly Agree

I am confident of succeeding in my physics studies	☐
I have lost interest in physics as the course has progressed	☐
I enjoy studying physics	☐
I am not enthusiastic about physics	☐
I am anxious about failure in physics	☐
I generally do well in examinations	☐
I make efforts with presentation and neatness in my physics work	☐
I have found physics increasingly difficult as the course has progressed	☐
I would like to go on to study physics at a higher (e.g. degree) level	☐
I am conscientious in my physics work	☐
I think that the study of physics is relevant to today's society	☐
Physics is likely to play an important role in my future career	☐
I expect to get a good grade in my physics examination	☐
I usually get good marks in class-based physics tests	☐
I am good at project work in physics	☐
I enjoy working with others in my physics work	☐
I feel comfortable about taking part in class-based discussions	☐
I am better at expressing my ideas verbally than in written form	☐

2) In considering the physics as a subject, please indicate :
a) how confident you feel b) how motivated you feel
c) how good (able) you are d) how enjoyable the area is

Please tick the appropriate boxes.

In Physics	very	fairly	slightly	not very	not at all	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

3) When considering the physics course in genera l, how would you rate your confidence, motivation, ability and enjoyment compared with that of **male** and **female** students in your year/group?

a) In general, compared with **males** in my year/group..

	much more	more	neither more nor less	less	much less	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

b) In general, compared with **females** in my year/group..

	much more	more	neither more nor less	less	much less	
I am........						confident
I am........						motivated
I am........						able
I find it....						enjoyable

4) How difficult or easy do you find the following content areas of physics ?
Please tick the appropriate boxes.

Content Area	very difficult	fairly difficult	neither easy nor difficult	fairly easy	very easy	not covered yet
Materials & matter						
Mechanics						
Electric circuits						
Wave phenomena						
Nuclear physics / radioactivity						
Energy						
Optics / light						
Electromagnetism						
Thermal phenomena						

Please feel free to make any additional comments concerning the questionnaire and/or the issues raised within the space below

Thank you for completing this questionnaire

Nuffield Project : Case Studies/School Visits
Interview Schedule: Students

Introduction

explain a bit more about the project; the purpose of the interview to explore in some more detail issues around male and female performance at A level

GCSE -> A level

1. What were your reasons for choosing the subjects you are studying at A level?

2 Do you think that GCSE was a good preparation for A level study - in general, for (subject) (- probe reasons for yes or no).

3 What do you think are the main differences you have experienced between GCSE and A level? (- prompt - style, approach, assessment, which do you prefer?)

4 How do you feel about the imbalance of males and females in certain A level classes - is this a problem? How does it compare to your experiences of GCSE classes?(focus on minority here, i.e. males or females)

The subject

5 What sort of 'image' do you think (subject) has amongst those who study it? Are there differences in the ways in which males and females see it?
(a) If negative (general) - where does this image originate? What can be done to change this image? If the image changed do you think more students would take the subject?
(b)If negative (for males/females) - where does this image originate? What can be done to change this image? If the image changed do you think more males/females would take the subject?

6 Do males and females approach the studying of (subject) differently? Is one approach more useful than another?

7 Do males and females have different attitudes towards (subject) (prompt : confidence, motivation etc.)

The syllabus

8 Are there certain content/syllabus areas of mathematics (physics, English lit) in which you think males and females show different strengths/weaknesses. (Explore - prompt with areas of syllabus).

9 What do you think about the syllabus/s you are studying and how they are assessed? Would you prefer to be assessed in different ways, having more choice? Would this allow you to perform better? If so, why/how? Do you like the modular approach to learning and assessment?

The school/teacher

10 How important do you think the individual teacher and/or department affect your attitudes towards (subject)? Does the sex of the teacher make a difference? (explore issue of role models : do they play an important part in how you view subjects and your participation in certain subjects)?

11 *Are issues of equal opportunities seen as important in your school/department? Do you think that your school/department is pro-active about issues of gender and performance and how these relate to going on to HE or careers? Is there a need to be pro-active? Is a consideration of these issues important?*

General

12 How many of you want to go on to study (subject) at University /college and/or seek a career where (subject) is relevant? (explore)

13 *Are any of you aware of the popular debate in the press/media about male/female performance? What do you think about this? Do you feel that they are talking about you?*

14 *Would you like to see A level reformed? - More subjects, different styles of assessment, etc.*